### JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NATIONAL WATER SUPPLY AND DRAINAGE BOARD MINISTRY OF HOUSING AND PLANTATION INFRASTRUCTURE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

# THE DETAILED DESIGN STUDY ON GREATER KANDY WATER SUPPLY AUGMENTATION PROJECT IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

### FINAL REPORT

**VOLUME III** 

**DATA AND ATTACHMENTS** 

**MAY 2002** 

NJS CONSULTANTS CO., LTD. NIHON SUIDO CONSULTANTS CO., LTD.

## ON GREATER KANDY WATER SUPPLY AUGMENTATION PROJECT IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

### FINAL REPORT VOLUME III DATA AND ATTACHMENTS

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### **Abbreviations and Acronyms**

### 1. Unit

cm centimeter ft. foot g gram

gpcd gram per capita per day ha hectare  $(1 \text{ ha} = 10,000\text{m}^2)$ 

hr hour
kg kilogram
km kilometer
km², or sq.km square kilometer

kV kilovolt
kW kilowatt
kWh kilowatt hour

l, or L liter

l/day, or l/d liter per day
l/sec, or l/s liter per second
lpcd, or Lpcd liter per capita per day

m meter

m/s, or m/sec meters per second m<sup>2</sup>, or sq.m square meter m<sup>3</sup>, or cu.m cubic meter

m³/d, or cu.m/day cubic meter per day
m³/min cubic meter per minute
m³/s, or cu.m/sec cubic meter per second
MCM million cubic meter
mgd million gallons per day
mg/l milligram per liter

mm millimeter
Mpa megapascal
ppm parts per million
Rs. Sri Lankan Rupee

V volt

### 2. Water Quality

BOD<sub>5</sub> Biochemical Oxygen Demand (20°C, 5 days) COD Chemical Oxygen Demand

DO Dissolved Oxygen
EC Electrical Conductivity
pH Hydrogen ion potential
SS Suspended Solids
TS Total Solids

### 3. Organizations

ADB Asian Development Bank

CEA Central Environmental Authority

CEB Ceylon Electricity Board CPC Central Provincial Council

FINNIDA Finnish International Development Agency
GS Gramasevaka Divison (local administrative unit)

IBRD International Bank for Reconstruction and Development (World

Bank)

ICC Interagency Co-ordinating Committee

IDA International Development Association (soft loan facility of IBRD)

IMF International Monetary Fund

JBIC Japan Bank for International Cooperation (Japan)
JICA Japan International Cooperation Agency (Japan)

KMC Kandy Municipal Council MASL Mahaweli Authority of Sri Lanka

MHUD Ministry of Housing and Urban Development

MOF Ministry of Finance
MSL Mean Sea Level

NJS Nippon Jogesuido Sekkei Co., Ltd. NSC Nihon Suido Consultants Co., Ltd.

NWSDB, or NWS&DB National Water Supply and Drainage Board

OECD Organization for Economic Cooperation and Development

PS Pradeshiya Sabha (local administrative unit)

RDA Road Development Authority
RSC Regional Support Center, NWSDB

UC Urban Council

UDA Urban Development Authority

### 4. Others

BOT Build - Operate - Transfer
BWL Bottom Water Level

CED Central Environmental Division

CPI Consumer Price Index

EAC Environmental auditing Commission
EIA Environmental Impact Assessment
EIRR Economic Internal Rate of Return
FIRR Financial Internal Rate of Return

FY Fiscal Year

GDP Gross Domestic Product

GL Ground Level

GNP Gross National Product
GST Government Sales Tax
HWL High Water Level

HH Household

IEE Initial Environmental Examination

LWL Low Water Level L/S Lift Station

NGO Non-Governmental Organization

NRW Non-revenue Water

ODA Official Development Assistance
PEU Project Environmental Unit

P/S Pumping Station
SLS Sri Lankan Standards
STP Sewage Treatment Plant
T.A Technical Assistance
TWL Top Water Level
UFW Unaccounted-For-Water
VAT Value Added Tax

WID Women in Development
WTP Water Treatment Plant

WWTP Wastewater Treatment Plant (=STP)

| 01 | Intake and Water Treatment Plant Process Calculations |
|----|---|
|    |   |
|    |   |
|    |   |
|    |   |

### Grit Chamber

Dimension: Width (m) Length (m) (Sand sedimentation Depth h=0.5m at Inlet Mouth)
6.00 33.50

Water Duty River Water Diameter of Sand Settling Sedi. Sand Grit Chamber Grit Chamber Effective Effective Required Retention Velocity Surface Load Remark H.W.L. (m) L.W.L. (m) Velocity (cm/sec) (units) Level (m) Sand (mm) Depth in G.C. Depth (m) Volume Flow Length (m) Time (min) (cm/sec) Ratio (mm/min) Case 1 115,500 437.60 0.15 0.00 437.11 434.06 3.05 1226 7.4 200 1.5 15.29 3.7 115,500 437.60 1.5 1.00 Case 2 0.15 437.09 435.06 2,03 816 7.4 10.17 5.5 200 Case 3 115,500 2 437,60 0,15 1.5 1 94 437.01 436.00 1.01 406 ---7.4 5.06 11.0 200 115,500 438.30 724 Case 4 0.15 1.5 1.94 437.80 436.00 1.80 7.4 9.02 200 Case 5 115,500 440.74 0.15 1.5 1.94 440.29 436.00 4.29 1725 7.4 21.50 2.6 200 115,500 437.60 0.8 1226 13.9 3.7 200 Case 6 0.10 0.00 437.11 434.06 3.05 15.29 115,500 437.60 Case 7 0.10 0.8 1.00 437.09 435.06 2.03 816 13.9 10.17 5.5 200 ~115,500 ·\*\* 2 437.60 1.94 Case 8 -0.10 0.8 437.01 436.00 1.01 406 13.9 95,06 11.0 200 Case 9 115,500 438.30 0.8 1.94 724 0.10 437.80 436.00 1.80 13.9 9.02 6.2 200 Case 10 115,500 2 440.74 0.10 0.8 1.94 440.29 436.00 4.29 1725 13,9 21.50 2.6 200 115,500 437.60 0.15 1.5 0.00 Case II 436.87 434.06 2.81 565 29.7 7.04 7.9 199 0.15 1.00 436.78 437.60 346 Case 12 115,500 435,06 1,72 29.7 4.31 €13.0 399 Case 13 115,500 437.60 1.5 1.94 399 0.15 436.47 436.00 0.47 94 29.7 1.18 47.4 115,500 Case 14 438.30 0.15 1.5 1.94 437.54 436.00 1.54 310 29.7 3.86 14.5 399 Case 15 115,500 440.74 0.15 1.5 840 29.7 399 1.94 440.18 436.00 4.18 10.47 5,3 Case 16 115,500 437.60 0.10 0.8 0.00 436.87 434.06 2.81 565 55.7 7.04 7.9 399 115,500 437.60 346 55.7 399 Case 17 0.10 0.8 1.00 436.78 435,06 1.72 4.31 13.0 437.60 Case 18 115,500 0.10 0,8 1.94 436,47 436,00 0.47 94 55.7 1.18 47.4 399 115,500 0.8 310 Case 19 438.30 0.10 1.94 437.54 436.00 1.54 55.7 3.86 14.5 399 Case 20 115,500 440.74 0.10 0.8 437.54 436.00 1.54 310 55.7 3.86 14.5 399

| Case I Capacity Calculatio | n of Grit Char | nber (River W    | ater Level + 4     | 37.60m)          | 2 unit  | duty       |
|----------------------------|----------------|------------------|--------------------|------------------|---------|------------|
|                            | (Grit Chamb    | er High Water    | Level              | + 437.11 m)      |         |            |
|                            | (Grit Chamb    | er Low Water     | Level              | + 434.06 m)      | no soil |            |
| Flow Rate                  | 110000*        | 1.05=            | 115500             | cum/day          |         |            |
| Average Velocity           |                |                  |                    | 2-7 cm/sec       |         |            |
| Surface Load Ratio         |                |                  |                    | 200-500mm/min    |         |            |
| Width/Length               |                |                  |                    | 3-8              |         |            |
| Effective Depth            |                |                  |                    | 3-4m             |         |            |
| Retention Time             |                |                  |                    | 10-20min         |         |            |
| Regired Length             |                | L=K*(H*V/U       | D/B=               | 20 2011111       |         | 7.4 m      |
| roqued Dengar              | L:             | Required Len     | *                  |                  |         | ,,,,       |
|                            | K:             | Safety Factor    | <b>~</b> ` '       |                  |         | 2          |
|                            | H:             | Effective Dep    | • •                |                  |         | 3.05 m     |
|                            | V:             | Average Velo     |                    |                  |         | 3.7 cm/sec |
|                            | U:             | Sand Settling    | •                  | (Dia.0.15mm)     |         | 1.5 cm/sec |
|                            | B:             | Number of B      | -                  | (1718.0.1511111) |         | 2          |
|                            | W:             | Width            | asilis             |                  |         | 6.0 m      |
|                            | ·VV.           | Sediment         |                    |                  |         | 0.0 111    |
|                            | Dia. of        | I I              |                    |                  |         |            |
|                            | 1              | Velocity         |                    |                  |         |            |
|                            | Sand(mm)       | (cm/sec)         |                    |                  |         |            |
|                            | 0.30           |                  |                    |                  |         |            |
|                            | 0.20           |                  |                    |                  |         |            |
|                            | 0.15           |                  |                    |                  |         |            |
|                            | 0.10           |                  |                    |                  |         |            |
|                            | 0.08           |                  |                    |                  |         |            |
| Water Level                |                | Max. Flood       |                    | 1447 ft          |         | 1.00 m     |
|                            |                | Max. Operati     |                    | 1446 ft          |         | 0.74 m     |
|                            |                | Min. Operation   |                    | 1438 ft          |         | 8.30 m     |
|                            |                | Spillway Cres    | st                 | 1425 ft          | 43      | 4.34 m     |
| n' n                       | T . I TO T .   |                  |                    | 1420.0           | 42      | C 00       |
| River Bottom Level at      | Intake Point   |                  |                    | 1430 ft          | 43      | 6.00 m     |
|                            |                |                  |                    | Effective        |         |            |
| Grit Chamber Dimens        | ion            | Width(m)         | I oneth(m)         |                  | Basin   |            |
| GIR Chamber Dimens         | ЮП             | Width(m)<br>6.0× | Length(m)<br>33.5× | Depth(m)         | Dasin   | 2          |
|                            |                | 0.0^             | 33.3^              | 5.1*             |         | 2          |
| Effective Volume per       | Pacin(m3)      |                  |                    |                  |         | 613        |
| Basin                      | Dasin(ins)     |                  |                    |                  | 2       |            |
|                            | -1(m-2)        |                  |                    |                  | 2 unit  | 1226       |
| Effective Volume Tota      | ai(m3)         |                  |                    | 15.20            |         | 1220       |
| Retention Time             |                |                  |                    | 15.29            | min     |            |
| Average Velocity           |                |                  |                    | 3.65             | cm/sec  |            |
| Surface Load Ratio         |                |                  |                    | 200              | mm/min  |            |
| Length/Width               |                |                  |                    | 5.6              |         |            |

| Case 2 Capacity Calculation |              | mber (River W<br>er High Water |            | 37.60m)<br>+ 437.09 m) | 2 unit duty        |        |
|-----------------------------|--------------|--------------------------------|------------|------------------------|--------------------|--------|
|                             |              | er Low Water                   |            | + 435.06 m)            | soil h=1.00m       |        |
| Flow Rate                   | 110000*      |                                |            | cum/day                | 5011 11 11 10 1111 |        |
| Average Velocity            | 110000       | 1.03                           | 115500     | 2-7 cm/sec             |                    |        |
| Surface Load Ratio          |              |                                |            | 200-500mm/min          |                    |        |
| Width/Length                |              |                                |            | 3-8                    |                    |        |
| ~                           |              |                                |            |                        |                    |        |
| Effective Depth             |              |                                |            | 3-4m                   |                    |        |
| Retention Time              |              | T TEL/TTATE/                   | / T) 000   | 10-20min               |                    |        |
| Reqired Length              | _            | L=K*(H*V/                      | •          |                        | 7.4                | m      |
|                             | L:           | Required Lea                   |            |                        | _                  |        |
|                             | K:           | Safety Factor                  |            |                        | 2                  |        |
|                             | H:           | Effective De                   |            |                        | 2.03               | m      |
|                             | V:           | Average Vel                    | ocity      |                        | 5.5                | cm/sec |
|                             | U:           | Sand Settling                  | g Velocity | (Dia.0.15mm)           | 1.5                | cm/sec |
|                             | B:           | Number of B                    | asins      |                        | 2                  |        |
|                             | W:           | Width                          |            |                        | 6.0                | m      |
|                             |              | Sediment                       |            |                        |                    |        |
|                             | Dia. of      | Velocity                       |            |                        |                    |        |
|                             | Sand(mm)     | (cm/sec)                       |            |                        |                    |        |
|                             | 0.30         |                                |            |                        |                    |        |
|                             | 0.20         |                                |            |                        |                    |        |
|                             | 0.15         |                                |            |                        |                    |        |
|                             | 0.10         |                                |            |                        |                    |        |
|                             | 0.08         |                                |            |                        |                    |        |
| Water Level                 | 0,00         | Max. Flood                     |            | 1447 f                 | t 441.00           | m      |
| Water Lever                 |              | Max. Operati                   | ion        | 1446 f                 |                    |        |
|                             |              | _                              |            | 1438 f                 |                    |        |
|                             |              | Min. Operati                   |            |                        |                    |        |
|                             |              | Spillway Cre                   | est        | 1425 f                 | t 434.34           | m      |
| River Bottom Level at       | Intake Point |                                |            | 1430 f                 | t 436.00           | m      |
|                             |              |                                |            | TOPE - stine           |                    |        |
| 0:4011                      |              | 177: 1d. ()                    | T (1.6)    | Effective              | D                  |        |
| Grit Chamber Dimensi        | on           | Width(m)                       | Length(m)  | Depth(m)               | Basin              |        |
|                             |              | 6.0×                           | 33.5×      | 2.0×                   | 2                  |        |
| Effective Volume per I      | Basin(m3)    |                                |            |                        | 408                |        |
| Basin                       | ousni(ms)    |                                |            |                        | 2 unit duty        |        |
| Effective Volume Tota       | 1(m3)        |                                |            |                        | 816                |        |
| Retention Time              |              |                                |            | 10.17                  | min                |        |
| Average Velocity            |              |                                |            | 5.49                   | cm/sec             |        |
|                             |              |                                |            | 200                    | mm/min             |        |
| Surface Load Ratio          |              |                                |            |                        | uminin             |        |
| Length/Width                |              |                                |            | 5.6                    |                    |        |

| Case 3 Capacity Calculation |                  |               |               |               | 2 unit duty  |
|-----------------------------|------------------|---------------|---------------|---------------|--------------|
|                             |                  | er High Water |               | + 437.01 m)   | 11. 104      |
|                             | •                | er Low Water  |               | + 436.00 m)   | soil h=1.94m |
| Flow Rate                   | 110000*          | 1.05=         | 115500        | cum/day       |              |
| Average Velocity            |                  |               |               | 2-7 cm/sec    |              |
| Surface Load Ratio          |                  |               |               | 200-500mm/min |              |
| Width/Length                |                  |               |               | 3-8           |              |
| Effective Depth             |                  |               |               | 3-4m          |              |
| Retention Time              |                  |               |               | 10-20min      |              |
| Reqired Length              |                  | L=K*(H*V/     | U)/B=         |               | 7.4 m        |
|                             | L:               | Required Let  | ngth(m)       |               |              |
|                             | K:               | Safety Facto  | r(-)          |               | 2            |
|                             | H:               | Effective De  |               |               | 1.01 m       |
|                             | V:               | Average Vel   | •             |               | 11.0 cm/sec  |
|                             | U:               | Sand Settling | -             | (Dia.0.15mm)  | 1.5 cm/sec   |
|                             | B:               | Number of E   | -             | (=            | 2            |
|                             | W:               | Width         |               |               | 6.0 m        |
|                             | r <del>'''</del> | Sediment      |               |               |              |
|                             | Dia. of          | Velocity      |               |               |              |
|                             | Sand(mm)         | (cm/sec)      |               |               |              |
|                             | 0.30             |               |               |               |              |
|                             | 0.20             |               |               |               |              |
|                             | 0.15             | 4             |               |               |              |
|                             | 0.13             |               |               |               |              |
|                             | 0.10             |               |               |               |              |
| XX . X 1                    | 0.08             |               |               | 1447 £        | 441.00 m     |
| Water Level                 |                  | Max. Flood    | •             | 1447 fi       |              |
|                             |                  | Max. Operat   |               | 1446 fi       |              |
|                             |                  | Min. Operati  |               | 1438 f        |              |
|                             |                  | Spillway Cre  | est           | 1425 f        | 434.34 m     |
| River Bottom Level at       | Intake Point     |               |               | 1430 fi       | 436.00 m     |
|                             |                  |               |               | Effective     |              |
| Cuit Chamban Dimanai        |                  | U7: Jel. ()   | I amostly(ms) |               | Basin        |
| Grit Chamber Dimensi        | on               | Width(m)      | Length(m)     | Depth(m)      | Dasiii 2     |
|                             |                  | 6.0×          | 33.5×         | 1.0×          | 2            |
| Effective Volume per I      | Basin(m3)        |               |               |               | 203          |
| Basin                       |                  |               |               |               | 2 unit duty  |
| Effective Volume Tota       | l(m3)            |               |               |               | 406          |
| Retention Time              |                  |               |               | 5.06          | min          |
| Average Velocity            |                  |               |               | 11.03         | cm/sec       |
| Surface Load Ratio          |                  |               |               | 200           | mm/min       |
|                             |                  |               |               | 5.6           | IEDIN IIIIII |
| Length/Width                |                  |               |               | 3.0           |              |

| Case 4 Capacity Calculation |              | nber (River W<br>er High Water |               | 38.30m)<br>+ 437.80 m) | 2 unit duty     | •        |
|-----------------------------|--------------|--------------------------------|---------------|------------------------|-----------------|----------|
|                             | •            | er Low Water                   |               | + 436.00 m)            | soil h=1.94m    |          |
| Flow Rate                   | *110000      |                                |               | cum/day                | 3011 II-1.24III |          |
| Average Velocity            | 110000       | 1.05                           | 113300        | 2-7 cm/sec             |                 |          |
| Surface Load Ratio          |              |                                |               | 200-500mm/min          |                 |          |
| Width/Length                |              |                                |               | 3-8                    |                 |          |
| Effective Depth             |              |                                |               | 3-4m                   |                 |          |
| Retention Time              |              |                                |               | 10-20min               |                 |          |
| Reqired Length              |              | L=K*(H*V/U                     | η/ <b>D</b> — | 10-20mm                | 7.4             | m        |
| -                           | L:           | Required Ler                   | •             |                        | 7.4             | . 111    |
|                             | K:           | Safety Factor                  |               |                        | 2               |          |
|                             | к.<br>Н:     | Effective Dep                  |               |                        | 1.80            |          |
|                             | V:           | _                              |               |                        |                 |          |
|                             |              | Average Velo                   | -             | (TS1= 0.1#             |                 | cm/sec   |
|                             | U:           | Sand Settling                  | -             | (Dia.0.15mm)           |                 | cm/sec   |
|                             | B:<br>W:     | Number of B                    | asıns         |                        | 2               | :<br>) m |
| •                           | w:           | Width                          |               |                        | 0.0             | m        |
|                             | D:£          | Sediment                       |               |                        |                 |          |
|                             | Dia. of      | Velocity                       |               |                        |                 |          |
|                             | Sand(mm)     | (cm/sec)                       |               |                        |                 |          |
|                             | 0.30         |                                |               |                        |                 |          |
|                             |              |                                |               |                        |                 |          |
|                             | 0.15         |                                |               |                        |                 |          |
|                             | 0.10         |                                |               |                        |                 |          |
| Water Level                 | 0,08         | Max. Flood                     |               | 1447                   | ft 441.00       | ٠        |
| water Level                 |              |                                |               | 1446                   |                 |          |
|                             |              | Max. Operati                   |               |                        |                 |          |
|                             |              | Min. Operation                 |               | 1438                   |                 |          |
|                             |              | Spillway Cre                   | St            | 1425                   | ft 434.34       | m        |
| River Bottom Level at       | Intake Point |                                |               | 1430                   | ft 436.00       | m        |
|                             |              |                                |               |                        |                 |          |
|                             |              |                                |               | Effective              |                 |          |
| Grit Chamber Dimension      | on           | Width(m)                       | Length(m)     | Depth(m)               | Basin           |          |
|                             |              | 6.0×                           | 33.5×         | 1.8×                   | 2               | <u>.</u> |
| Effective Volume per E      | Basin(m3)    |                                |               |                        | 362             | <u>!</u> |
| Basin                       |              |                                |               |                        | 2 unit duty     | •        |
| Effective Volume Total      | l(m3)        |                                |               |                        | 724             |          |
| Retention Time              |              |                                |               | 9.02                   | min             |          |
| Average Velocity            |              |                                |               | 6.19                   | cm/sec          |          |
| Surface Load Ratio          |              |                                |               | 200                    | mm/min          |          |
| Length/Width                |              |                                |               | 5.6                    |                 |          |
|                             |              |                                |               |                        |                 |          |

| Case 5 Capacity Calculati            | 2 unit dut   | y              |                  |               |              |          |
|--------------------------------------|--------------|----------------|------------------|---------------|--------------|----------|
|                                      |              | ber High Wate  |                  | + 440.29 m)   |              |          |
| Flow Rate                            | 110000       | ber Low Water  |                  | + 436.00 m)   | soil h=1.94m |          |
| Average Velocity                     | 110000       | * 1.05=        | 115500           | cum/day       |              |          |
| Surface Load Ratio                   |              |                |                  | 2-7 cm/sec    |              |          |
|                                      |              |                |                  | 200-500mm/min |              |          |
| Width/Length                         |              |                |                  | 3-8           |              |          |
| Effective Depth                      |              |                |                  | 3-4m          |              |          |
| Retention Time                       |              |                |                  | 10-20min      |              |          |
| Reqired Length                       |              | L=K*(H*V/      | •                |               | 7.           | 4 m      |
|                                      | L:           | Required Le    | <b>-</b> ' '     |               |              |          |
|                                      | K:           | Safety Facto   | r(-)             |               |              | 2        |
|                                      | H:           | Effective De   | pth              |               | 4.           | 3 m      |
|                                      | V:           | Average Vel    | ocity            |               | 2.           | 6 cm/sec |
|                                      | U:           | Sand Settling  | y Velocity       | (Dia.0.15mm)  |              | 5 cm/sec |
|                                      | B:           | Number of B    | asins            | ` ,           |              | 2        |
|                                      | W:           | Width          |                  |               |              | 0 m      |
|                                      |              | Sediment       |                  |               | 0            | • •••    |
|                                      | Dia. of      | Velocity       |                  |               |              |          |
|                                      | Sand(mm)     | (cm/sec)       |                  |               |              |          |
|                                      | 0.30         |                |                  |               |              |          |
|                                      | 0.20         |                |                  |               |              |          |
|                                      | 0.15         |                |                  |               |              |          |
|                                      | 0.10         |                |                  |               |              |          |
|                                      | 0.08         |                |                  |               |              |          |
| Water Level                          |              | Max. Flood     |                  | 1447 f        | t 441.00     | ١        |
|                                      |              | Max. Operati   | On               | 1446 f        |              |          |
|                                      |              | Min. Operation |                  | 1438 f        |              |          |
|                                      |              | Spillway Cre   |                  |               |              |          |
|                                      |              | Spinway Cic    | 5L               | 1425 fi       | t 434.34     | m        |
| River Bottom Level at                | Intoka Point |                |                  | 1420.0        |              |          |
| Taver Dottom Bever at                | make Foint   |                |                  | 1430 fi       | t 436.00     | ) m      |
|                                      |              |                |                  | T. C          |              |          |
| Grit Chamber Dimensi                 | ion          | Width          | T are methodoxia | Effective     | <b>.</b> .   |          |
| on chamber binners                   | ion          | Width(m)       | Length(m)        | Depth(m)      | Basin        |          |
|                                      |              | 6.0×           | 33.5×            | 4.3×          | 2            | 2        |
| Effective Volume per l               | Daniu (2)    |                |                  |               |              |          |
| Basin                                | basin(m3)    |                |                  |               | 862          |          |
|                                      | 1(2)         |                |                  |               | 2 unit duty  |          |
| Effective Volume Tota Retention Time | u(m3)        |                |                  |               | 1725         | į.       |
|                                      |              |                |                  | 21.50         | min          |          |
| Average Velocity                     |              |                |                  | 2.60          | cm/sec       |          |
| Surface Load Ratio                   |              |                |                  | 200           | mm/min       |          |
| Length/Width                         |              |                |                  | 5.6           |              |          |
|                                      |              |                |                  |               |              |          |

| Case 6 Capacity Calculation |              |               |           |               | 2 unit duty |        |
|-----------------------------|--------------|---------------|-----------|---------------|-------------|--------|
|                             | •            | er High Water |           | + 437.11 m)   |             |        |
|                             | •            | er Low Water  |           | + 434.06 m)   | no soil     |        |
| Flow Rate                   | 110000*      | 1.05=         | 115500    | cum/day       |             |        |
| Average Velocity            |              |               |           | 2-7 cm/sec    |             |        |
| Surface Load Ratio          |              |               |           | 200-500mm/min |             |        |
| Width/Length                |              |               |           | 3-8           |             |        |
| Effective Depth             |              |               |           | 3-4m          |             |        |
| Retention Time              |              |               |           | 10-20min      |             |        |
| Reqired Length              |              | L=K*(H*V/     | •         |               | 13.9        | m      |
|                             | L:           | Required Le   |           |               | _           | •      |
|                             | K;           | Safety Factor |           |               | 2           |        |
|                             | H:           | Effective De  | _         |               | 3.05        |        |
|                             | V:           | Average Vel   | -         |               |             | cm/sec |
|                             | U:           | Sand Settling |           | (Dia.0.10mm)  |             | cm/sec |
|                             | B:           | Number of B   | asins     |               | 2           |        |
| ,                           | W:           | Width         |           |               | 6.0         | m      |
| į                           |              | Sediment      |           |               |             |        |
| 5                           | Dia. of      | Velocity      |           |               |             |        |
|                             | Sand(mm)     | (cm/sec)      |           |               |             |        |
|                             | 0.30         |               |           |               |             |        |
|                             | 0.20         | 2.1           |           |               |             |        |
|                             | 0.15         | 1.5           |           |               |             |        |
| 1                           | 0.10         |               |           |               |             |        |
| į                           | 0.08         |               |           |               |             |        |
| Water Level                 |              | Max. Flood    |           | 1447 f        |             |        |
|                             |              | Max. Operat   |           | 1446 f        |             |        |
|                             |              | Min. Operati  |           | 1438 f        | t 438.30    | m      |
|                             |              | Spillway Cre  | est       | 1425 f        | t 434.34    | m      |
| River Bottom Level at       | Intake Point |               |           | 1430 f        | t 436.00    | m      |
|                             |              |               |           | Effective     |             |        |
| Grit Chamber Dimension      | on           | Width(m)      | Length(m) | Depth(m)      | Basin       |        |
|                             |              | 6.0×          | 33.5×     | 3.1×          | 2           |        |
| Effective Volume per E      | Basin(m3)    |               |           |               | 613         |        |
| Basin                       |              |               |           |               | 2 unit duty | •      |
| Effective Volume Total      | l(m3)        |               |           |               | 1226        | ,      |
| Retention Time              | -            |               |           | 15.29         | min         |        |
| Average Velocity            |              |               |           | 3.65          | cm/sec      |        |
| Surface Load Ratio          |              |               |           | 200           | mm/min      |        |
| Length/Width                |              |               |           | 5.6           |             |        |
| -                           |              |               |           |               |             |        |

| Case 7 Capacity Calculation |              | mber (River V<br>er High Wate |           | 37.60m)<br>+ 437.09 m) | 2 unit duty     |        |
|-----------------------------|--------------|-------------------------------|-----------|------------------------|-----------------|--------|
|                             |              | er Low Water                  |           | + 437.09 m)            | soil h=1.00m    |        |
| Flow Rate                   | 110000*      |                               |           | cum/day                | S011 II-1.00XII |        |
| Average Velocity            | 110000       | 1.05-                         | 115500    | 2-7 cm/sec             |                 |        |
| Surface Load Ratio          |              |                               |           | 200-500mm/min          |                 |        |
| Width/Length                |              |                               |           | 3-8                    |                 |        |
| Effective Depth             |              |                               |           | 3-4m                   |                 |        |
| Retention Time              |              |                               |           | 10-20min               |                 |        |
| Regired Length              |              | L=K*(H*V/                     | T 1\/D_   | 10-20mm                | 13.9            |        |
| Reques Length               | τ.           | -                             |           |                        | 13.9            | . пі   |
|                             | L:<br>K:     | Required Le                   |           |                        | 2               |        |
|                             |              | Safety Facto                  |           |                        |                 |        |
| •                           | H:<br>V:     | Effective De                  | -         |                        | 2.03            |        |
|                             |              | Average Vel                   | -         | (D'- 0 10)             |                 | cm/sec |
|                             | U:           | Sand Settling<br>Number of E  | -         | (Dia.0.10mm)           | 0.8             | cm/sec |
|                             | B:           |                               | sasıns    |                        |                 | m      |
|                             | W:           | Width                         |           |                        | 0.0             | m      |
|                             | D:e          | Sediment                      | ł         |                        |                 |        |
|                             | Dia. of      | Velocity                      |           |                        |                 |        |
|                             | Sand(mm)     | (cm/sec)                      |           |                        |                 |        |
|                             | 0.30         | <b>←</b>                      |           |                        |                 |        |
|                             | 0.20         |                               |           |                        |                 |        |
|                             | 0.13         |                               |           |                        |                 |        |
|                             | 0.10         |                               |           |                        |                 |        |
| Water Level                 | 0.08         | Max. Flood                    |           | 1447 :                 | ft 441.00       |        |
| water Lever                 |              |                               | inn       | 1446                   |                 |        |
|                             |              | Max. Operati<br>Min. Operati  |           | 1438                   |                 |        |
|                             |              | Spillway Cre                  |           | 1425 :                 |                 |        |
|                             |              | Spillway Cit                  | 281       | 1423 .                 | II 434.34       | . 111  |
| River Bottom Level at       | Intake Point |                               |           | 1430 :                 | ft 436.00       | m      |
|                             |              |                               |           | Effective              |                 |        |
| Grit Chamber Dimens         | ion          | Width(m)                      | Length(m) | Depth(m)               | Basin           |        |
|                             |              | 6.0×                          | 33.5×     |                        | 2               |        |
|                             |              | 0.0                           | 33.3      | 2.0                    | -               | '      |
| Effective Volume per        | Basin(m3)    |                               |           |                        | 408             | !      |
| Basin                       |              |                               |           |                        | 2 unit duty     | •      |
| Effective Volume Total      | al(m3)       |                               |           |                        | 816             | i      |
| Retention Time              |              |                               |           | 10.17                  | min             |        |
| Average Velocity            |              |                               |           | 5.49                   | cm/sec          |        |
| Surface Load Ratio          |              |                               |           | 200                    | mm/min          |        |
| Length/Width                |              |                               |           | 5.6                    |                 |        |
|                             |              |                               |           |                        |                 |        |

| Case 8 Capacity Calculation |              | mber (River W<br>er High Water |             | 37.60m)<br>+ 437.01 m)      | 2 unit duty     |        |
|-----------------------------|--------------|--------------------------------|-------------|-----------------------------|-----------------|--------|
|                             | -            | er High Water<br>er Low Water  |             | + 436.00 m)                 | soil h=1.94m    |        |
| Elect Data                  | 110000*      |                                |             | ,                           | SOII II—1.94III |        |
| Flow Rate                   | 110000*      | 1.03=                          | 113300      | cum/day<br>2-7 cm/sec       |                 |        |
| Average Velocity            |              |                                |             | 2-7 cm/sec<br>200-500mm/min |                 |        |
| Surface Load Ratio          |              |                                |             |                             |                 |        |
| Width/Length                |              |                                |             | 3-8                         |                 |        |
| Effective Depth             |              |                                |             | 3-4m                        |                 |        |
| Retention Time              |              |                                |             | 10-20min                    |                 |        |
| Reqired Length              |              | L=K*(H*V/U                     | •           |                             | 13.9            | m      |
|                             | L:           | Required Len                   | ıgth(m)     |                             |                 |        |
|                             | K:           | Safety Factor                  | (-)         |                             | 2               |        |
|                             | H:           | Effective Dep                  | oth         |                             | 1.01            | m      |
|                             | V:           | Average Velo                   | city        |                             | 11.0            | cm/sec |
|                             | U:           | Sand Settling                  | Velocity    | (Dia.0.10mm)                | 0.8             | cm/sec |
|                             | B:           | Number of B                    | asins       |                             | 2               |        |
|                             | W:           | Width                          |             |                             | 6.0             | m      |
|                             | <u></u>      | Sediment                       |             |                             |                 |        |
|                             | Dia. of      | Velocity                       |             |                             |                 |        |
|                             | Sand(mm)     | (cm/sec)                       |             |                             |                 |        |
|                             | 0.30         | <u> </u>                       |             |                             |                 |        |
|                             | 0.20         |                                |             | •                           |                 |        |
|                             | 0.15         |                                |             |                             |                 |        |
|                             | 0.10         | 4                              |             |                             |                 |        |
|                             | 0.10         |                                |             |                             |                 |        |
| Water Level                 | 0.00         | Max. Flood                     |             | 1447 fi                     | 441.00          | m      |
| water Level                 |              |                                | on          | 1447 fi                     |                 |        |
|                             |              | Max. Operati                   |             |                             |                 |        |
|                             |              | Min. Operation                 |             | 1438 fi                     |                 |        |
|                             |              | Spillway Cre                   | SI          | 1425 fi                     | 434.34          | m      |
| River Bottom Level at       | Intake Point |                                |             | 1430 fi                     | 436.00          | m      |
|                             |              |                                |             | Effective                   |                 |        |
| Grit Chamber Dimensi        | an           | Width(m)                       | I on ath(m) | Depth(m)                    | Basin           |        |
| Gitt Chamber Diffiensi      | OII          | Width(m)                       | Length(m)   |                             | 2               |        |
|                             |              | 6.0×                           | 33.5×       | 1.0*                        | 2               | •      |
| Effective Volume per I      | Basin(m3)    |                                |             |                             | 203             |        |
| Basin                       |              |                                |             |                             | 2 unit duty     | ,      |
| Effective Volume Tota       | l(m3)        |                                |             |                             | 406             |        |
| Retention Time              |              |                                |             | 5.06                        | min             |        |
| Average Velocity            |              |                                |             | 11.03                       | cm/sec          |        |
| Surface Load Ratio          |              |                                |             | 200                         | mm/min          |        |
| Length/Width                |              |                                |             | 5.6                         |                 |        |
| Zongan maan                 |              |                                |             | 5.0                         |                 |        |

| e 9 Capacity Calculation |                |               |           |               | 2 unit duty  |        |
|--------------------------|----------------|---------------|-----------|---------------|--------------|--------|
|                          | •              | er High Water |           | + 437.80 m)   |              |        |
|                          | •              | er Low Water  |           | + 436.00 m)   | soil h=1.94m |        |
| Flow Rate                | 110000*        | 1.05=         | 115500    | cum/day       |              |        |
| Average Velocity         |                |               |           | 2-7 cm/sec    |              |        |
| Surface Load Ratio       |                |               |           | 200-500mm/min |              |        |
| Width/Length             |                |               |           | 3-8           |              |        |
| Effective Depth          |                |               |           | 3-4m          |              |        |
| Retention Time           |                |               |           | 10-20min      |              |        |
| Reqired Length           |                | L=K*(H*V/     | -         |               | 13.9 1       | m      |
|                          | L:             | Required Let  |           |               |              | -      |
|                          | K:             | Safety Factor |           |               | 2            |        |
|                          | Н:             | Effective De  | -         |               | 1.80 1       |        |
|                          | V:             | Average Vel   | -         |               |              | cm/sec |
|                          | U:             | Sand Settling | •         | (Dia.0.10mm)  |              | cm/sec |
|                          | B:             | Number of B   | Basins    |               | 2            |        |
|                          | W:             | Width         |           |               | 6.0 1        | m      |
|                          |                | Sediment      |           |               |              |        |
|                          | Dia. of        | Velocity      |           |               |              |        |
|                          | Sand(mm)       | (cm/sec)      |           |               |              |        |
|                          | 0.30           |               |           |               |              |        |
|                          | 0.20           |               |           |               |              |        |
|                          | 0.15           |               |           |               |              |        |
|                          | 0.10           |               |           |               |              |        |
|                          | 0.08           |               |           |               |              |        |
| Water Level              |                | Max. Flood    |           | 1447 :        |              |        |
|                          |                | Max. Operat   |           | 1446          |              |        |
|                          |                | Min. Operati  |           | 1438          |              |        |
|                          |                | Spillway Cre  | est       | 1425          | ft 434.34 i  | m      |
| River Bottom Level a     | t Intake Point |               |           | 1430          | ft 436.00 i  | m      |
|                          |                |               |           | Effective     |              |        |
| Grit Chamber Dimens      | sion           | Width(m)      | Length(m) | Depth(m)      | Basin        |        |
|                          |                | 6.0×          | 33.5×     | 1.8×          | 2            |        |
| Effective Volume per     | Basin(m3)      |               |           |               | 362          |        |
| Basin                    |                |               |           |               | 2 unit duty  |        |
| Effective Volume Tot     | al(m3)         |               |           |               | 724          |        |
| Retention Time           |                |               |           | 9.02          | min          |        |
| Average Velocity         |                |               |           | 6.19          | cm/sec       |        |
| Surface Load Ratio       |                |               |           | 200           | mm/min       |        |
| Length/Width             |                |               |           | 5.6           |              |        |
|                          |                |               |           |               |              |        |

| Case 10 Capacity Calculation | 2 unit duty   |                               |           |                            |                     |
|------------------------------|---------------|-------------------------------|-----------|----------------------------|---------------------|
|                              |               | oer High Wate<br>oer Low Wate |           | + 440.29 m)<br>+ 436.00 m) | soil h=1.94m        |
| Flow Rate                    | 110000        |                               |           | cum/day                    | 50H H 115 HH        |
| Average Velocity             |               |                               |           | 2-7 cm/sec                 |                     |
| Surface Load Ratio           |               |                               |           | 200-500mm/min              |                     |
| Width/Length                 |               |                               |           | 3-8                        |                     |
| Effective Depth              |               |                               |           | 3-4m                       |                     |
| Retention Time               |               |                               |           | 10-20min                   |                     |
| Regired Length               |               | L=K*(H*V/                     | (ID/B=    | 10-20Hilli                 | 13.9 m              |
|                              | L:            | Required Le                   |           |                            | 13.9 111            |
|                              | K:            | Safety Facto                  |           |                            | 2                   |
|                              | H:            | Effective De                  |           |                            | 4.29 m              |
|                              | V:            | Average Ve                    | •         |                            | 2.6 cm/sec          |
|                              | U:            | Sand Settlin                  |           | (Dia.0.10mm)               | 0.8 cm/sec          |
|                              | B:            | Number of I                   | - ·       | (Dia.o.Tolimit)            | 2                   |
|                              | W:            | Width                         | 3451115   |                            | 6.0 m               |
|                              | F             | Sediment                      | 1         |                            | 0.0 111             |
|                              | Dia. of       | Velocity                      |           |                            |                     |
|                              | Sand(mm)      | (cm/sec)                      |           |                            |                     |
|                              | 0.30          |                               |           |                            |                     |
|                              | 0.20          |                               |           |                            |                     |
|                              | 0.15          |                               |           |                            |                     |
|                              | 0.10          |                               |           |                            |                     |
|                              | 0.08          |                               |           |                            |                     |
| Water Level                  |               | Max. Flood                    |           | 1447                       | ft 441.00 m         |
|                              |               | Max. Operat                   | ion       | 1446                       |                     |
|                              |               | Min. Operati                  |           | 1438                       |                     |
|                              |               | Spillway Cre                  |           | 1425 1                     |                     |
|                              |               | , , ,                         |           | 1,20                       | (5)151 111          |
| River Bottom Level at        | Intake Point  |                               |           | 1430 1                     | ft 436.00 m         |
|                              |               |                               |           | Effective                  |                     |
| Grit Chamber Dimensi         | on            | Width(m)                      | Length(m) | Depth(m)                   | Basin               |
|                              |               | 6.0×                          | 33.5×     | 4.3×                       | 2                   |
| Effective Volume per I       | Basin(m3)     |                               |           |                            | 862                 |
| Basin                        |               |                               |           |                            | 2 unit duty         |
| Effective Volume Tota        | l(m3)         |                               |           |                            | 2 diff duty<br>1725 |
| Retention Time               | · · · · · · · |                               |           | 21.50                      | min                 |
| Average Velocity             |               |                               |           | 2.60                       | cm/sec              |
| Surface Load Ratio           |               |                               |           | 200                        | mm/min              |
| Length/Width                 |               |                               |           | 5.6                        | HHID HIH            |
|                              |               |                               |           | 5.0                        |                     |

| ase 11 Capacity Calculation |              | mber (River V<br>er High Water |           | 37.60m)<br>+ 436.87 m) | I unit duty |        |
|-----------------------------|--------------|--------------------------------|-----------|------------------------|-------------|--------|
|                             | •            | er riigh Water<br>er Low Water |           | + 434.06 m)            | no soil     |        |
| Flow Rate                   | 110000*      |                                |           | cum/day                | 110 5011    |        |
| Average Velocity            | 110000       | 1.05-                          | 115500    | 2-7 cm/sec             |             |        |
| Surface Load Ratio          |              |                                |           | 200-500mm/min          |             |        |
|                             |              |                                |           | 3-8                    |             |        |
| Width/Length                |              |                                |           | 3-4m                   |             |        |
| Effective Depth             |              |                                |           | 3-4m<br>10-20min       |             |        |
| Retention Time              |              | T TZ#/TT#17/T                  | n (n)     | 10-20min               | 20.7        |        |
| Reqired Length              | т.           | L=K*(H*V/U                     | ,         |                        | 29.7        | m      |
|                             | L:           | Required Ler                   | •         |                        | 0           |        |
|                             | K:           | Safety Factor                  |           |                        | 2           |        |
|                             | H:           | Effective Dep                  |           |                        | 2.81        |        |
| •                           | V:           | Average Velo                   | _         | (T) (A)                |             | cm/sec |
|                             | U:           | Sand Settling                  | -         | (Dia.0.15mm)           |             | cm/sec |
|                             | B:           | Number of B                    | asins     |                        | 1           |        |
|                             | <u>W:</u>    | Width                          |           |                        | 6.0         | m      |
|                             | L            | Sediment                       |           |                        |             |        |
|                             | Dia. of      | Velocity                       |           |                        |             |        |
|                             | Sand(mm)     | (cm/sec)                       |           |                        |             |        |
|                             | 0.30         |                                |           |                        |             |        |
|                             | 0.20         |                                |           |                        |             |        |
|                             | 0.15         |                                |           |                        |             |        |
|                             | 0.10         | <del></del>                    |           |                        |             |        |
|                             | 0.08         |                                |           |                        |             |        |
| Water Level                 |              | Max. Flood                     |           | 1447 ft                |             |        |
|                             |              | Max. Operati                   |           | 1446 ft                |             | •      |
|                             |              | Min. Operation                 |           | 1438 ft                |             |        |
|                             |              | Spillway Cre                   | st        | 1425 ft                | 434.34      | m      |
| River Bottom Level at       | Intake Point |                                |           | 1430 ft                | 436.00      | m      |
|                             |              |                                |           | Effective              |             |        |
| Grit Chamber Dimens         | ion          | Width(m)                       | Length(m) | Depth(m)               | Basin       |        |
|                             |              | 6.0×                           | 33.5×     | • • •                  | 1           |        |
| Effective Volume per        | Basin(m3)    |                                |           |                        | 565         |        |
| Basin                       | ` ,          |                                |           |                        | 1 unit duty | ,      |
| Effective Volume Tota       | al(m3)       |                                |           |                        | 565         |        |
| Retention Time              | • •          |                                |           | 7.04                   | min         |        |
| Average Velocity            |              |                                |           | 7.93                   | cm/sec      |        |
| Surface Load Ratio          |              |                                |           | 399                    | mm/min      |        |
| Length/Width                |              |                                |           | 5.6                    |             |        |
|                             |              |                                |           |                        |             |        |

| (Grit Chamber High Water Level + 436.78 m) (Grit Chamber Low Water Level + 435.06 m) soil h=1.00m  Flow Rate 110000* 1.05= 115500 cum/day  Average Velocity 2-7 cm/sec Surface Load Ratio 200-500mm/min Width/Length 3-8 |      |
|--|------|
| Flow Rate 110000* 1.05= 115500 cum/day  Average Velocity 2-7 cm/sec  Surface Load Ratio 200-500mm/min  |      |
| Average Velocity 2-7 cm/sec Surface Load Ratio 200-500mm/min   |      |
| Surface Load Ratio 200-500mm/min   |      |
|  |      |
|  |      |
| ······································   |      |
| Effective Depth 3-4m   |      |
| Retention Time 10-20min  |      |
| Required Length $L=K*(H*V/U)/B=$ 29.7 m  |      |
| L: Required Length(m)  |      |
| K: Safety Factor(-) 2  |      |
| H: Effective Depth 1.72 m  |      |
| V: Average Velocity 13.0 cm/s  | eec. |
| U: Sand Settling Velocity (Dia.0.15mm) 1.5 cm/s  |      |
| B: Number of Basins 1  | ,cc  |
|  |      |
| W: Width 6.0 m   |      |
| 1 1  |      |
| Dia. of Velocity   |      |
| Sand(mm) (cm/sec)  |      |
| 0.30 3.2   |      |
| 0.20 2.1   |      |
| 0.15 1.5   |      |
| 0.10 0.8   |      |
| 0.08 0.6   |      |
| Water Level Max. Flood 1447 ft 441.00 m  |      |
| Max. Operation 1446 ft 440.74 m  |      |
| Min. Operation 1438 ft 438.30 m  |      |
| Spillway Crest 1425 ft 434.34 m  |      |
|  |      |
| River Bottom Level at Intake Point 1430 ft 436.00 m  |      |
| 70.0   |      |
| Effective  |      |
| Grit Chamber Dimension Width(m) Length(m) Depth(m) Basin   |      |
| 6.0× 33.5× 1.7× 1  |      |
|  |      |
| Effective Volume per Basin(m3) 346   |      |
| Basin 1 unit duty  |      |
| Effective Volume Total(m3) 346   |      |
| Retention Time 4.31 min  |      |
| Average Velocity 12.95 cm/sec  |      |
| Surface Load Ratio 399 mm/min  |      |
| Length/Width 5.6   |      |

| Case 13 Capacity Calculation |              | mber (River '<br>er High Wate                    |              | 37.60m)<br>+ 436.47 m) | 1 unit duty                            |   |
|------------------------------|--------------|--|--------------|------------------------|--|---|
|                              | •            | er Low Water                                     |              | + 436.00 m)            | soil h=1.94m                           |   |
| Flow Rate                    | 110000*      |  |              | cum/day                | 30H H 1.74H                            |   |
| Average Velocity             | 110000       | 1.05   | 115500       | 2-7 cm/sec             |  |   |
| Surface Load Ratio           |              |  |              | 200-500mm/min          |  |   |
|                              |              |  |              | 3-8                    |  |   |
| Width/Length                 |              |  |              |                        |  |   |
| Effective Depth              |              |  |              | 3-4m                   |  |   |
| Retention Time               |              |  |              | 10-20min               |  |   |
| Reqired Length               | _            | L=K*(H*V/  | ,            |                        | 29.7 m                                 |   |
|                              | L:           | Required Le                                      | •            |                        |  |   |
|                              | K:           | Safety Facto                                     |              |                        | 2                                      |   |
|                              | H:           | Effective De                                     |              |                        | 0.47 m                                 |   |
|                              | V:           | Average Vel                                      | locity       |                        | 47.4 cm/se                             | С |
|                              | U:           | Sand Settlin                                     | g Velocity   | (Dia.0.15mm)           | 1.5 cm/se                              | С |
|                              | B:           | Number of E                                      | Basins       |                        | 1                                      |   |
|                              | W:           | Width  |              |                        | 6.0 m                                  |   |
|                              |              | Sediment   |              |                        |  |   |
|                              | Dia. of      | Velocity   |              |                        |  |   |
|                              | Sand(mm)     | (cm/sec)   |              |                        |  |   |
|                              | 0.30         | <del> </del>                                     |              |                        |  |   |
|                              | 0.20         |  |              |                        |  |   |
|                              | 0.15         |  |              |                        |  |   |
|                              | 0.10         | <del>                                     </del> |              |                        |  |   |
|                              | 0.08         |  |              |                        |  |   |
| Water Level                  | . 0.00       | Max. Flood                                       |              | 1447                   | ft 441.00 m                            |   |
| Water Level                  |              | Max. Plood Max. Operat                           | ion          | 1447                   |  |   |
|                              |              | -  |              |                        |  |   |
|                              |              | Min. Operat                                      |              | 1438                   |  |   |
|                              |              | Spillway Cro                                     | est          | 1425                   | ft 434.34 m                            |   |
| River Bottom Level at        | Intake Point |  |              | 1430                   | ft 436.00 m                            |   |
|                              |              |  |              | Effective              |  |   |
| Grit Chamber Dimensi         |              | Width(m)   | I amorth(ma) |                        | Basin                                  |   |
| GHI Chambel Dimensi          | OH           | Width(m)   | Length(m)    | Depth(m)               |  |   |
|                              |              | 6.0×   | 33.5×        | 0.5×                   | 1                                      |   |
| Effective Volume per I       | Basin(m3)    |  |              |                        | 94                                     |   |
| Basin                        |              |  |              |                        | 1 unit duty                            |   |
| Effective Volume Tota        | l(m3)        |  |              |                        | 94                                     |   |
| Retention Time               |              |  |              | 1.18                   | min                                    |   |
| Average Velocity             |              |  |              | 47.40                  | cm/sec                                 |   |
| Surface Load Ratio           |              |  |              | 399                    | mm/min                                 |   |
| Length/Width                 |              |  |              | 5.6                    | ************************************** |   |
| 20112012 11 10011            |              |  |              | 5.0                    |  |   |

| Case 14 Capacity Calculatio |              | mber (River V<br>er High Water |           | 38.30m)<br>+ 437.54 m) | 1 unit duty      |        |
|-----------------------------|--------------|--------------------------------|-----------|------------------------|------------------|--------|
|                             | -            | er Low Water                   |           | + 436.00 m)            | soil h=1.94m     |        |
| Flow Rate                   | 110000*      |                                |           | cum/day                | \$011 II—1.54III |        |
| Average Velocity            | 110000       | 1.05-                          | 115500    | 2-7 cm/sec             |                  |        |
| Surface Load Ratio          |              |                                |           | 200-500mm/min          |                  |        |
| = -                         |              |                                |           |                        |                  |        |
| Width/Length                |              |                                |           | 3-8                    |                  |        |
| Effective Depth             |              |                                |           | 3-4m                   |                  |        |
| Retention Time              |              | T TF4/774777                   | r. m      | 10-20min               | 20.5             |        |
| Reqired Length              | _            | L=K*(H*V/U                     | •         |                        | 29.7 1           | m      |
|                             | L:           | Required Ler                   |           |                        | _                | •      |
|                             | K:           | Safety Factor                  |           |                        | 2                |        |
|                             | H:           | Effective Dep                  |           |                        | 1.54 1           |        |
|                             | V:           | Average Velo                   | •         |                        | 14.5             | cm/sec |
|                             | U:           | Sand Settling                  | •         | (Dia.0.15mm)           | 1.5              | cm/sec |
|                             | B:           | Number of B                    | asins     |                        | 1                |        |
|                             | W:           | Width                          |           |                        | 6.0 1            | m      |
|                             |              | Sediment                       |           |                        |                  |        |
|                             | Dia. of      | Velocity                       |           |                        |                  |        |
|                             | Sand(mm)     | (cm/sec)                       |           |                        |                  |        |
|                             | 0.30         | 3.2                            |           |                        |                  |        |
|                             | 0.20         | 2.1                            |           |                        |                  |        |
|                             | 0.15         | 1.5                            |           |                        |                  |        |
|                             | 0.10         | 0.8                            |           |                        |                  |        |
| -                           | 0.08         |                                |           |                        |                  |        |
| Water Level                 |              | Max. Flood                     |           | 1447 f                 | t 441.00 i       | m      |
|                             |              | Max. Operati                   | on        | 1446 f                 | t 440.74 i       | m      |
|                             |              | Min. Operation                 |           | 1438 f                 |                  |        |
|                             |              | Spillway Cre                   |           | 1425 f                 |                  |        |
|                             |              | opinius ore                    | •         | 1,251                  |                  |        |
| River Bottom Level at       | Intake Point |                                |           | 1430 f                 | t 436.00 i       | m      |
|                             |              |                                |           | Effective              |                  |        |
| Grit Chamber Dimensi        | on           | Width(m)                       | Length(m) | Depth(m)               | Basin            |        |
|                             |              | 6.0×                           | 33.5×     | 1.5×                   | 1                |        |
| Effective Volume per I      | Basin(m3)    |                                |           |                        | 310              |        |
| Basin                       |              |                                |           |                        | 1 unit duty      |        |
| Effective Volume Tota       | l(m3)        |                                |           |                        | 310              |        |
| Retention Time              |              |                                |           | 3.86                   | min              |        |
| Average Velocity            |              |                                |           | 14.47                  | cm/sec           |        |
| Surface Load Ratio          |              |                                |           | 399                    | mm/min           |        |
| Length/Width                |              |                                |           | 5.6                    |                  |        |

| Case 15 Capacity Calculation |               | amber (River V<br>oer High Water |              | •             | 1 unit duty  | ,      |
|------------------------------|---------------|----------------------------------|--------------|---------------|--------------|--------|
|                              |               |                                  |              | + 440.18 m)   |              |        |
| Flow Rate                    |               | per Low Water                    |              | + 436.00 m)   | soil h=1.94m |        |
|                              | 110000*       | 1.05=                            | 115500       | cum/day       |              |        |
| Average Velocity             |               |                                  |              | 2-7 cm/sec    |              |        |
| Surface Load Ratio           |               |                                  |              | 200-500mm/min |              |        |
| Width/Length                 |               |                                  |              | 3-8           |              |        |
| Effective Depth              |               |                                  |              | 3-4m          |              |        |
| Retention Time               |               |                                  |              | 10-20min      |              |        |
| Reqired Length               |               | L=K*(H*V/                        | •            |               | 29.7         | m      |
|                              | L:            | Required Ler                     | ngth(m)      |               |              |        |
|                              | K:            | Safety Factor                    | r(-)         |               | 2            |        |
|                              | H:            | Effective De                     | pth          |               | 4.18         | m      |
|                              | V:            | Average Velo                     | ocity        |               | 5.3          | cm/sec |
|                              | U:            | Sand Settling                    | Velocity     | (Dia.0.15mm)  | 1.5          | cm/sec |
|                              | B:            | Number of B                      | •            | ,             | 1            |        |
|                              | W:            | Width                            |              |               | 6.0          |        |
|                              |               | Sediment                         |              |               | 0.0          | ***    |
|                              | Dia. of       | Velocity                         |              |               |              |        |
|                              | Sand(mm)      | (cm/sec)                         |              |               |              |        |
|                              | 0.30          |                                  |              |               |              |        |
|                              | 0.20          |                                  |              |               |              |        |
|                              | 0.15          |                                  |              |               |              |        |
|                              | 0.10          |                                  |              |               |              |        |
|                              | 0.08          |                                  |              |               |              |        |
| Water Level                  | 0.00          | Max. Flood                       |              | 1447 f        | 441.00       |        |
|                              |               | Max. Operati                     | on.          |               |              |        |
|                              |               | -                                |              | 1446 f        |              |        |
|                              |               | Min. Operation                   |              | 1438 f        |              |        |
|                              |               | Spillway Cres                    | St           | 1425 f        | t 434.34     | m      |
| River Bottom Level at        | Intoles Daine |                                  |              | 1.00.0        |              |        |
| River Bottom Level at        | make Point    |                                  |              | 1430 f        | t 436.00     | m      |
|                              |               |                                  |              | T:CC4:        |              |        |
| Grit Chamber Dimensi         | on            | Width(m)                         | T am anth () | Effective     | ъ.           |        |
| Gitt Chamber Dimensi         | OIL           | Width(m)                         | Length(m)    | Depth(m)      | Basin        |        |
|                              |               | 6.0×                             | 33.5×        | 4.2×          | 1            |        |
| Effective Volume per I       | Pasin(m2)     |                                  |              |               | 0.40         |        |
| Basin                        | oasin(m5)     |                                  |              |               | 840          |        |
|                              | 1(2)          |                                  |              |               | 1 unit duty  |        |
| Effective Volume Tota        | ı(ms)         |                                  |              |               | 840          |        |
| Retention Time               |               |                                  |              | 10.47         | min          |        |
| Average Velocity             |               |                                  |              | 5.33          | cm/sec       |        |
| Surface Load Ratio           |               |                                  |              | 399           | mm/min       |        |
| Length/Width                 |               |                                  |              | 5.6           |              |        |

| ase 16 Capacity Calculation | on of Grit Cha | mber (River W  | ater Level + 4 | 37.60m)       | 1 ı     | anit duty |        |
|-----------------------------|----------------|----------------|----------------|---------------|---------|-----------|--------|
|                             | (Grit Chamb    | er High Water  | Level          | + 436.87 m)   | )       |           |        |
|                             | (Grit Chamb    | er Low Water I | Level          | + 434.06 m)   | no soil |           |        |
| Flow Rate                   | 110000*        | 1.05=          | 115500         | cum/day       |         |           |        |
| Average Velocity            |                |                |                | 2-7 cm/sec    |         |           |        |
| Surface Load Ratio          |                |                |                | 200-500mm/min |         |           |        |
| Width/Length                |                |                |                | 3-8           |         |           |        |
| Effective Depth             |                |                |                | 3-4m          |         |           |        |
| Retention Time              |                |                |                | 10-20min      |         |           |        |
| Reqired Length              |                | L=K*(H*V/U     | )/B=           |               |         | 55.7      | m      |
| ;                           | L:             | Required Len   | gth(m)         |               |         |           |        |
|                             | K:             | Safety Factors |                |               |         | 2         |        |
|                             | H:             | Effective Dep  |                |               |         | 2.81      | m      |
|                             | V:             | Average Velo   |                |               |         | 7.9       | cm/sec |
|                             | U:             | Sand Settling  | -              | (Dia.0.10mm)  | )       | 0.8       | cm/sec |
|                             | B:             | Number of Ba   |                | · ·           |         | 1         |        |
|                             | W:             | Width          |                |               |         | 6.0       | m      |
|                             |                | Sediment       |                |               |         |           |        |
|                             | Dia. of        | Velocity       |                |               |         |           |        |
|                             | Sand(mm)       | (cm/sec)       |                |               |         |           |        |
|                             | 0.30           | <del></del>    |                |               |         |           |        |
|                             | 0.20           |                |                |               |         |           |        |
|                             | 0.15           |                |                |               |         |           |        |
|                             | 0.10           |                |                |               |         |           |        |
|                             | 0.08           |                |                |               |         |           |        |
| Water Level                 |                | Max. Flood     |                | 1447          | 7 ft    | 441.00    | m      |
|                             |                | Max. Operation | on             | 1446          | 5 ft    | 440.74    | m      |
|                             |                | Min. Operation |                | 1438          | 3 ft    | 438.30    | m      |
|                             |                | Spillway Cres  |                | 1425          | 5 ft    | 434.34    | m      |
| River Bottom Level at       | Intake Point   |                |                | 1430          | ) ft    | 436.00    | m      |
|                             |                |                |                | Effective     |         |           |        |
| Grit Chamber Dimens         | ion            | Width(m)       | Length(m)      | Depth(m)      | В       | asin      |        |
|                             |                | 6.0×           | 33.5×          | 2.8>          | C       | 1         |        |
| Effective Volume per        | Basin(m3)      |                |                |               |         | 565       |        |
| Basin                       |                |                |                |               | 1 1     | unit duty |        |
| Effective Volume Total      | al(m3)         |                |                |               |         | 565       |        |
| Retention Time              |                |                |                | 7.04          |         |           |        |
| Average Velocity            |                |                |                | 7.93          |         |           |        |
| Surface Load Ratio          |                |                |                | 399           |         | in        |        |
| Length/Width                |                |                |                | 5.6           |         |           |        |
|                             |                |                |                |               |         |           |        |

| Case 17 Capacity Calculatio |              | mber (River V<br>er High Water |           | 37.60m)<br>+ 436.78 m) | 1 unit duty | 4        |
|-----------------------------|--------------|--------------------------------|-----------|------------------------|-------------|----------|
|                             |              | er Low Water                   |           | + 435.06 m)            |             |          |
| Flow Rate                   | 110000*      |                                |           | cum/day                | 3011 1.0011 |          |
| Average Velocity            | 110000       | 1.05                           | 115500    | 2-7 cm/sec             |             |          |
| Surface Load Ratio          |              |                                |           | 200-500mm/min          |             |          |
| Width/Length                |              |                                |           | 3-8                    |             |          |
| Effective Depth             |              |                                |           | 3-4m                   |             |          |
| Retention Time              |              |                                |           | 10-20min               |             |          |
| Regired Length              |              | L=K*(H*V/                      | IN/R=     | 10-2011111             | 55 ′        | 7 m      |
| Requed Eength               | L:           | Required Lei                   | •         |                        | 55.         |          |
|                             | K:           | Safety Factor                  |           |                        | ,           | 2        |
|                             | H:           | Effective De                   |           |                        |             | 2 m      |
|                             | V:           | Average Vel                    | •         |                        |             | cm/sec   |
|                             | U:           | Sand Settling                  | _         | (Dia.0.10mm)           |             | 8 cm/sec |
|                             | B:           | Number of B                    |           | (Dia.o.Toliuli)        |             | 1        |
|                             | W:           | Width                          | asilis    |                        |             | ) m      |
|                             | · · ·        | Sediment                       |           |                        | 0.0         | J 111    |
|                             | Dia. of      | Velocity                       |           |                        |             |          |
|                             | Sand(mm)     | (cm/sec)                       |           |                        |             |          |
|                             | 0.30         |                                |           |                        |             |          |
|                             | 0.20         |                                |           |                        |             |          |
|                             | 0.15         |                                |           |                        |             |          |
|                             | 0.13         |                                |           |                        |             |          |
|                             | 0.08         | 1                              |           |                        |             |          |
| Water Level                 | 0.00         | Max. Flood                     |           | 1447                   | ft 441.0    | n m      |
| Water Level                 |              | Max. Operati                   | ion       | 1446                   |             |          |
|                             |              | Min. Operati                   |           | 1438                   |             |          |
|                             |              | Spillway Cre                   |           | 1425                   |             |          |
|                             |              | opinway Cic                    | ,3t       | 1423                   | 10 101.0    | T 111    |
| River Bottom Level at       | Intake Point |                                |           | 1430                   | ft 436.0    | 0 m      |
|                             |              |                                |           | Effective              |             |          |
| Grit Chamber Dimensi        | on           | Width(m)                       | Length(m) | Depth(m)               | Basin       |          |
| GIN CIMING DIMENSI          |              | 6.0×                           | 33.5×     | - · · ·                |             | 1        |
|                             |              | 0,0                            | 55.5      |                        |             | •        |
| Effective Volume per I      | Basin(m3)    |                                |           |                        | 34          | 6        |
| Basin                       | ` ′          |                                |           |                        | l unit dut  | у        |
| Effective Volume Tota       | ıl(m3)       |                                |           |                        | 34          | 6        |
| Retention Time              | - /          |                                |           | 4.31                   | min         |          |
| Average Velocity            |              |                                |           | 12.95                  |             |          |
| Surface Load Ratio          |              |                                |           | 399                    |             |          |
| Length/Width                |              |                                |           | 5.6                    |             |          |
| -                           |              |                                |           |                        |             |          |

| se 18 Capacity Calculati            |                  |                |           |                       | 1 unit duty  |        |
|-------------------------------------|------------------|----------------|-----------|-----------------------|--------------|--------|
|                                     | •                | er High Water  |           | + 436.47 m)           | 71. 104      |        |
| P! D-4-                             | •                | er Low Water   |           | ± 436.00 m)           | soil h=1.94m |        |
| Flow Rate                           | 110000*          | 1.05=          | 115500    | cum/day<br>2-7 cm/sec |              |        |
| Average Velocity Surface Load Ratio |                  |                |           |                       |              |        |
| <del>-</del>                        |                  |                |           | 200-500mm/min         |              |        |
| Width/Length                        |                  |                |           | 3-8                   |              |        |
| Effective Depth                     |                  |                |           | 3-4m                  |              |        |
| Retention Time                      |                  | T 17+/TT+17/T  | T) (T)    | 10-20min              | 55.5         |        |
| Reqired Length                      | τ.               | L=K*(H*V/U     |           |                       | 55.7         | m      |
|                                     | L:               | Required Ler   |           |                       | •            | •      |
|                                     | K:               | Safety Factor  |           |                       | 2            |        |
|                                     | H:               | Effective Dep  |           |                       | 0.47         |        |
|                                     | V:               | Average Velo   | -         | (7.1.0.10.)           |              | cm/sec |
|                                     | U:               | Sand Settling  | -         | (Dia.0.10mm)          |              | cm/sec |
|                                     | B:               | Number of B    | asıns     |                       | 1            |        |
|                                     | <u>W:</u>        | Width          |           |                       | 6.0          | m      |
|                                     | <i>z</i> . •     | Sediment       |           |                       |              |        |
|                                     | Dia. of          | Velocity       |           |                       |              |        |
|                                     | Sand(mm)         | (cm/sec)       |           |                       |              |        |
|                                     | 0.30             |                |           |                       |              |        |
|                                     | 0.20             |                |           |                       |              |        |
|                                     | 0.15             |                |           |                       |              |        |
|                                     | 0.10             |                |           |                       |              |        |
| Water Level                         | 0.08             | <del></del>    |           | 1447 6                | 441.00       |        |
| water Level                         |                  | Max. Flood     |           | 1447 f                |              |        |
|                                     |                  | Max. Operati   |           | 1446 f                |              |        |
|                                     |                  | Min. Operation |           | 1438 f                |              |        |
|                                     |                  | Spillway Cre   | SI        | 1425 f                | t 434.34     | m      |
| River Bottom Level a                | t Intake Point   |                |           | 1430 f                | t 436.00     | m      |
|                                     | ii zimiio i oiii |                |           | 11501                 | 150.00       | 711    |
|                                     |                  |                |           | Effective             |              |        |
| Grit Chamber Dimens                 | sion             | Width(m)       | Length(m) | Depth(m)              | Basin        |        |
|                                     |                  | 6.0×           | 33.5×     | 0.5×                  | 1            |        |
| Effective Volume per                | · Racin(m3)      |                |           |                       | 94           |        |
| Basin                               | Dasin(mis)       |                |           |                       | I unit duty  |        |
| Effective Volume Tot                | tal(m3)          |                |           |                       | 94           |        |
| Retention Time                      |                  |                |           | 1.18                  | min          |        |
| Average Velocity                    |                  |                |           | 47.40                 | cm/sec       |        |
| Surface Load Ratio                  |                  |                |           | 399                   | mm/min       |        |
| Length/Width                        |                  |                |           | 5.6                   | MAID HIMI    |        |
| Conguir widui                       |                  |                |           | 2.0                   |              |        |

| Case 19 Capacity Calculation |                 | mber (River V<br>er High Water |               | 38.30m)<br>+ 437.54 m) | 1 unit duty      |        |
|------------------------------|-----------------|--------------------------------|---------------|------------------------|------------------|--------|
|                              | -               | er Low Water                   |               | + 436.00 m)            | soil h=1.94m     |        |
| Flow Rate                    | 110000*         |                                |               | cum/day                | DO21 11 117 1111 |        |
| Average Velocity             | 110000          |                                |               | 2-7 cm/sec             |                  |        |
| Surface Load Ratio           |                 |                                |               | 200-500mm/min          |                  |        |
| Width/Length                 |                 |                                |               | 3-8                    |                  |        |
| Effective Depth              |                 |                                |               | 3-4m                   |                  |        |
| Retention Time               |                 |                                |               | 10-20min               |                  |        |
| Regired Length               |                 | L=K*(H*V/0                     | Л/ <b>В</b> = | 10 20mm                | 55.7             | m      |
| reduce new part              | L:              | Required Lei                   | •             |                        | 33.7             |        |
|                              | K:              | Safety Factor                  |               |                        | 2                |        |
|                              | H:              | Effective De                   | • •           |                        | 1.54             |        |
|                              | V:              | Average Vel                    |               |                        |                  | cm/sec |
|                              | U:              | Sand Settling                  | <del>-</del>  | (Dia.0.10mm)           |                  | cm/sec |
|                              | B:              | Number of B                    |               | (1512.0.1011111)       | 1                |        |
|                              | W:              | Width                          | 43113         |                        | 6.0              |        |
|                              | / <del>''</del> | Sediment                       |               |                        | 0.0              | 111    |
|                              | Dia, of         | Velocity                       |               |                        |                  |        |
| i                            | Sand(mm)        | (cm/sec)                       |               |                        |                  |        |
|                              | 0.30            | <u>`</u>                       |               |                        |                  |        |
| !                            | 0.20            |                                |               |                        |                  |        |
|                              | 0.15            | <del></del>                    |               |                        |                  |        |
|                              | 0.10            | <del></del>                    |               |                        |                  |        |
|                              | 0.08            | +                              |               |                        |                  |        |
| Water Level                  | 3.53            | Max. Flood                     |               | 1447                   | ft 441.00        | m      |
| .,                           |                 | Max. Operati                   | ion           | 1446                   |                  |        |
|                              |                 | Min. Operati                   |               | 1438                   |                  |        |
|                              |                 | Spillway Cre                   |               | 1425                   |                  |        |
|                              |                 | opining) or                    |               | 1123                   |                  | ***    |
| River Bottom Level at        | Intake Point    |                                |               | 1430                   | ft 436.00        | m      |
|                              |                 |                                |               | Effective              |                  |        |
| Grit Chamber Dimensi         | on              | Width(m)                       | Length(m)     | Depth(m)               | Basin            |        |
|                              |                 | 6.0×                           | 33.5×         |                        | 1                |        |
|                              |                 |                                |               |                        |                  |        |
| Effective Volume per I       | Basin(m3)       |                                |               |                        | 310              |        |
| Basin                        | ,               |                                |               |                        | I unit duty      |        |
| Effective Volume Tota        | I(m3)           |                                |               |                        | 310              |        |
| Retention Time               | `/              |                                |               | 3.86                   | min              |        |
| Average Velocity             |                 |                                |               | 14.47                  | cm/sec           |        |
| Surface Load Ratio           |                 |                                |               | 399                    | mm/min           |        |
| Length/Width                 |                 |                                |               | 5.6                    |                  |        |
|                              |                 |                                |               | 2.0                    |                  |        |

| Case 20 Capacity Calculation | on of Grit Cha<br>(Grit Chamb | amber (River V<br>oer High Wate | Water Level + 4 | 40.74m)<br>+ 440.18 m) | 1 unit duty     |
|------------------------------|-------------------------------|---------------------------------|-----------------|------------------------|-----------------|
|                              |                               | er Low Water                    |                 | + 436.00 m)            | soil h=1.94m    |
| Flow Rate                    | 110000*                       |                                 |                 | cum/day                | SOII II-1.94III |
| Average Velocity             | 110000                        | 1.03                            | 115500          | 2-7 cm/sec             |                 |
| Surface Load Ratio           |                               |                                 |                 | 200-500mm/min          |                 |
| Width/Length                 |                               |                                 |                 | 3-8                    |                 |
| Effective Depth              |                               |                                 |                 | 3-4m                   |                 |
| Retention Time               |                               |                                 |                 | 10-20min               |                 |
| Regired Length               |                               | L=K*(H*V/                       | ( ) /D —        | 10-20mm                | 55.7            |
| Request Length               | L:                            | Required Les                    | •               |                        | 55.7 m          |
|                              | K:                            | Safety Factor                   |                 |                        |                 |
|                              | н:                            | Effective De                    | • •             |                        | 2               |
|                              | V:                            | Average Vel                     |                 |                        | 4.2 m           |
|                              | U:                            | Sand Settling                   | -               | (D:- 0.10 )            | 5.3 cm/sec      |
|                              | о.<br>В:                      | Number of B                     | •               | (Dia.0.10mm)           | 0.8 cm/sec      |
|                              | W:                            | Width                           | asins           |                        | 1               |
|                              |                               | Sediment                        |                 |                        | 6.0 m           |
|                              | Dia. of                       | Velocity                        |                 |                        |                 |
|                              | Sand(mm)                      | (cm/sec)                        |                 |                        |                 |
|                              | 0.30                          |                                 |                 |                        |                 |
|                              | 0.30                          |                                 |                 |                        |                 |
|                              | 0.15                          |                                 |                 |                        |                 |
|                              | 0.10                          |                                 |                 |                        |                 |
|                              | 0.08                          | <del></del>                     |                 |                        |                 |
| Water Level                  | 0.00                          | Max. Flood                      |                 | 1447 1                 | t 441.00 m      |
|                              |                               | Max. Operati                    | on              | 1446 1                 |                 |
|                              |                               | Min. Operation                  |                 | 1438 1                 |                 |
|                              |                               | Spillway Cre                    |                 | 1425 1                 |                 |
|                              |                               | Spinway Cre                     | St              | 1425 1                 | t 434.34 m      |
| River Bottom Level at        | Intake Point                  |                                 |                 | 1430 f                 | t 436.00 m      |
|                              |                               |                                 |                 | Effective              |                 |
| Grit Chamber Dimensi         | on                            | Width(m)                        | Length(m)       | Depth(m)               | Basin           |
|                              |                               | 6.0×                            | 33.5×           | 4.2×                   | 1               |
|                              |                               |                                 |                 |                        | 1               |
| Effective Volume per I       | Basin(m3)                     |                                 |                 |                        | 840             |
| Basin                        | . ,                           |                                 |                 |                        | 1 unit duty     |
| Effective Volume Tota        | l(m3)                         |                                 |                 |                        | 840             |
| Retention Time               | •                             |                                 |                 | 10.47                  | min             |
| Average Velocity             |                               |                                 |                 | 5.33                   | cm/sec          |
| Surface Load Ratio           |                               |                                 |                 | 399                    | mm/min          |
| Length/Width                 |                               |                                 |                 | 5.6                    | COMPA BABBA     |
| _                            |                               |                                 |                 | 2.3                    |                 |

Existing Small Stream Reconstruction Plan outside of Intake site (W=2.0m,H=1.00m,Water Depth h=0.50mQ2,h=0.67mQ3) Downstream (gate point of intake site - release point) 1 Existing Open Channel

at gate point of intake site h1= 443.500 m GL. 445.000 m Bottom Level 442.000 m EL 442.500 m at release point h2= Length L= 135.00 m

Average Gradient (I=(h1-h2)/L) Ι= 0.0111

2 Proposed Water Flow

2.1 Rainfall Discharge Flow

Q1=A+I+CR= 0.693 m3/sec (Rainfall discharge) 24.93 ha A= (Catchment area) where I= 50 mm/h (Rainfall intensity) CR= 0.2 (Coefficient of run-off)

2.2 Balancing Tank Oveflow Discharge Flow

Q2= 1.273 m3/sec (Overflow 110,000m3/day) Q3= 1.910 m3/sec (Overflow 110,000\*1.5m3/day)

3 Proposed open channel

Bottom Level at gate point of intake site at release point

441.500 m (EL 442.500 m) Channel Depth H= 1.000 m hl= 441.000 m 442,500 m) Channel Depth H= Mahaweli River HHWL+441.00m

Level Deference between gate and release point h0=h1-h2=

0.500 m (0+325 - 0+462) 137.00 m Length Ľ= Adopted Gradient (I=(h1-h2)/L) 0.003650

4 Water Depth and Channel Bottom Gradient for Q2=1,273m3/sec

Sectional Area of Reconstruction Stream

Q2= 1.273 m3/sec

Inflow sectional area

2=b\*h= 1.01 m2 where 2.00 m (Channel Width)

0.504 m (Water Depth)

Velocity

V2=Q2/a= 1.26 m/sec

Hydraulic radius

R=(h\*b+(0.3\*2\*h)/2)/(b+1.044\*2\*h)= 0.380 m

Roughness coefficient

Head losses are calculated using Manning Formula.

h=n^2\*L\*v^2/R^(4/3)

137.00 m where L=

0.497 = 0.500 m 0.500 (Proposed Bottom Level Deference h0) ΟK

0.003649635 1= h/L =

5 Water Depth and Channel Bottom Gradient for Q3=1.910m3/sec

Sectional Area of Reconstruction Stream

1.910 m3/sec 03=

Inflow sectional area

a=b\*h= 1.34 m2 2.00 m (Channel Width) where 0.670 m (Water Depth) h=

Velocity

V3=Q3/a= 1.43 m/sec

Hydraulic radius

R=(h+b+(0.3+2+h)/2)/(b+1.044+2+h)= 0.453 m

Roughness coefficient

0.025

Head losses are calculated using Manning Formula.

h=n^2\*L\*v^2/R^(4/3)

where 137.00 m

0.499 h= = 0.500 m0.500 (Proposed Bottom Level Deference h0) OK

Appendix 6.2 Sri Lanka - Kandy Water Supply Project
Capacity Calculation for Katugastota Treatment Plant Q=110,000 cu m/day

| Item               | Total System      |         |         | First Stag     | e            |         |
|--------------------|-------------------|---------|---------|----------------|--------------|---------|
| Planned Flow       | Q= 110,000 cu     | m/day   |         | Q= 36,670      | cu m/day     |         |
| Plant Capacity     | Q= 115,500 cu     | m/day   |         | Q= 38,500      | cu m/day     |         |
| (Daily Max)        | = 4,813 cu m/hour |         |         |                | cu m/hour    |         |
|                    | = 80.2 cu m/min   |         |         | = 26.7         | cu m/min     |         |
|                    | = 1.337 cu        | m/sec   |         | = 0.446        | cu m/sec     |         |
| (1) Balancing Tank |                   |         |         |                |              |         |
| Criteria           | Retention Time    | T =     | 1.5 min | Retention Time | T =          | 1.5 min |
|                    | Recirculation     | a =     | 0.0 %   | Recirculation  | a =          | 0.0 %   |
| Dimension          | Rectangular       | l units |         | Rectangular    | 1 units      |         |
|                    | Lm x W m:         | CDm xun | its     | Lm x W         | m x D m x ur | nits    |
|                    | 7.0 9.0           | 2.0     | i       | 7.0 9.0        | 2.0          | 1       |
|                    | V= 126,0 cu       | m       |         | V= 126.0       | cu m         |         |
|                    | T= 1.57 mi        | n       |         | T= 4.49        | min          |         |

Appendix 6.2 Sri Lanka - Kandy Water Supply Project
Capacity Calculation for Katugastota Treatment Plant Q=110,000 cu m/day

| Item                           | Total System                      | First Stage   |
|--------------------------------|-----------------------------------|---|
| Planned Flow                   | Q= 110,000 cu m/day               | Q= 36,670 cu m/day  |
| I latined 1 low                | 110,000 cu iib day                | 20,070 cu m/azy   |
| Plant Capacity                 | Q= 115,500 cu m/day               | Q= 38,500 cu m/day  |
| (Daily Max)                    | = 4.813 cu m/hour                 | = 1,604 cu m/hour   |
| (Daily Max)                    | = 80.2 cu m/min                   | = 26.7 cu m/min   |
|                                | = 1.337 cu m/sec                  | = 0.446 cu m/sec  |
| (1) Receiving Well             | 1.557 Cu iipsec                   | - 0.440 cu m/sec  |
| (1) Receiving West<br>Criteria | Retention Time T = 1.5 min        | Retention Time T = 1.5 min  |
| Cinena                         | Recirculation a = 3.0 %           |   |
|                                | Recirculation a = 3.0 %           | Recirculation a = 3.0 %   |
| Dimension                      | Rectangular 1 units               | To a state of the |
| Dimension                      |                                   | Rectangular I units   |
|                                | Lm x W mx Dm x units              | Lm x W mx Dm x units  |
|                                | 4.5 8.1 5.0 1                     | 4.5 8.1 5.0 1   |
|                                | 4                                 |   |
|                                | V= 182.3 cu m                     | V= 182.3 cu m   |
|                                | T= 2.2 min                        | T= 6.3 min  |
| (2) Mixing Chamber             |                                   |   |
| Criteria                       | Retention Time T= 1-5 min         | Retention Time T= 1 - 5 min   |
|                                | Recirculation a = 3.0 %           | Recirculation a = 3.0 %   |
|                                |                                   |   |
| Dimension                      | Rectangular 6 units               | Rectangular 2 units   |
|                                | Lm x W mx Dm x units              | Lm x W mx Dm x units  |
|                                | 3.5 2.5 3.90 6                    | 3.5 2.5 3.90 2  |
|                                |                                   | <b>+</b>  |
| Unit Volume                    | UV = 34.1 cu m/unit               | UV = 34.1 cu m/unit   |
| Total Volume                   | V = 205 cu m                      | V = 68 cu m   |
| Retention Time                 | t≖ 2.5 m.in                       | t = 2.5 min   |
| Mixing                         | Hydraulic Mixing                  | Hydraulic Mixing  |
| (3) Flocculator                |                                   |   |
| Criteria                       | Retention Time T = 20 - 40 min    | Retention Time T = 20 - 40 min  |
|                                | Recirculation a = 3.0 %           | Recirculation a = 3.0 %   |
|                                | Required Volume V = 1,652 cu.m to | Required Volume V = 551 cu.m to   |
|                                | 3,305 cu.m                        | 1,102 cu.m  |
|                                |                                   |   |
| Unit Flow                      | q = 13.4 cu m/min/basin           | q = 13.4 cu m/min/basin   |
|                                |                                   |   |
| Dimension                      | 6 units                           | 2 units   |
| Step I                         | Wm xLm xDm xNo,ofChannel          | W m x L m x D m x No.of Channel   |
|                                | 1.1 11.0 3.5 2                    | 1.1 11,0 3.5 2  |
| Step 2                         | I                                 | Wm xLm xDm xNo.ofChannel  |
|                                | 1.5 11.0 3.5 2                    | 1.5 11.0 3.5 2  |
| Step 3                         | Wm xLm xDm xNo.ofChannet          | Wm xLm xDm xNo.ofChannel  |
|                                | 2.3 11.0 3.5 2                    | 2.3 11.0 3.5 2  |
|                                |                                   |   |
| Volume                         | Step 1 84.7 cu m/unit             | Step 1 84.7 cu m/unit   |
|                                | Step 2 115.5 cu m/unit            | Step 2 115.5 cu m/unit  |
|                                | Step 3 177.1 cu m/unit            | Step 3 177.1 cu m/unit  |
|                                | Volume / Unit 377.3 cu m/unit     | Volume / Unit 377.3 cu m/unit   |
| Total Volume                   | V = 2,264 cu m                    | V = 755 cu m  |
| Retention Time                 |                                   | 28.2 minutes  |

Appendix 6.2 Sri Lanka - Kandy Water Supply Project
Capacity Calculation for Katugastota Treatment Plant Q=110,000 cu m/day

| Item                             | Total System   | Phase !   |  |  |  |
|----------------------------------|--|---|--|--|--|
| (4) Seddimentation Basin<br>Type | Rectangular, Horizontal Flow                                   | Rectangular, Horizontal Flow                              |  |  |  |
|                                  |  |   |  |  |  |
| Unit Flow                        | q = 826 cu m/hr/basin<br>  (Recircutation a= 3.0 % )           | q = 826 cu m/hr/basin<br>(Recirculation a= 3.0 %)         |  |  |  |
|                                  | (Recticulation a= 5.0 %)                                       | (Recirculation a= 5,0%)                                   |  |  |  |
| Criteria                         | Retention Time T = 2.5 hours                                   | Retention Time T = 2.5 hours                              |  |  |  |
|                                  | Surface Load a = 15 - 30 mm/min                                | Surface Load a = 15 - 30 mm/min                           |  |  |  |
|                                  | Hor. Flow Velocity v < 0.40 m/min  L/W Ratio L/W = 3 - 8 times | Hor. Flow Velocity v < 0.40 m/min                         |  |  |  |
|                                  | L/W Ratio  | L/W Ratio L/W = $3-8$ times Depth D = $3-4$ m             |  |  |  |
|                                  | Depth of 50 cm or more is provided for sludge settlement.      | Depth of 50 cm or more is provided for sludge settlement. |  |  |  |
|                                  |  |   |  |  |  |
| Original Dimension               | No. 6 basins Wm x L m x D m x N                                | No. 2 basins Wm x Lm x Dm x N                             |  |  |  |
|                                  | W m x L m x D m x N<br>11 50 4.0 6                             |   |  |  |  |
|                                  | 11 ,0  | 11 30 4.0   |  |  |  |
| Volume                           | V = 2,200 cu m/basin   | V = 2,200 cu m/basin                                      |  |  |  |
|                                  | T = 2.66 hours   | T = 2.7 hours   |  |  |  |
|                                  | L/W = 4.5  | L/W = 4.5   |  |  |  |
|                                  | a = 25.0 mm/min<br>v = 0.313 m/min                             | a = 25.0 mm/min<br>  v = 0.313 m/min                      |  |  |  |
| nor row velocity                 | V = VICTO HYMMO  | O.O.D. Mymm   |  |  |  |
| Revised Dimension                | No. 6 basins   | No. 2 basins  |  |  |  |
| ı                                | Wm xLm xDm xN  | Wm xLm xDm xN   |  |  |  |
| •                                | 11 41 4.0 6  | 11 41 4.0 2   |  |  |  |
| •                                | 1st step 11.0 m 100 %Q<br>2nd step 10.0 m 100 %Q               | 1st step 11.0 m 100 %Q<br>2nd step 10.0 m 100 %Q          |  |  |  |
| :                                | 3rd step 10.0 m 80 %Q  | 3rd step 10.0 m 80 %Q                                     |  |  |  |
| •                                | 4th step 10.0 m 60 %Q  | 4th step 10.0 m 60 %Q                                     |  |  |  |
| İ                                | Total Length 41.0 m  | Total Length 41.0 m                                       |  |  |  |
|                                  | V = 1,804 cu m/basin   | V = 1,804 cu m/basin                                      |  |  |  |
|                                  | T = 2.18 hours   | T = 2.18 hours  |  |  |  |
| L/W Ratio<br>Surface Load        | L/W = 3.7<br>a = 25.0 mm/min                                   | L/W = 3.7<br>a = 25.0 mm/min                              |  |  |  |
|                                  | v = 0.313 m/min  | v = 0.313 m/min   |  |  |  |
| 1101.110.11 70100119             | S.S.E. Hallet  | V.S. I.S. Hyllrai   |  |  |  |
| Overflow Weir                    | Load = 500 m3/m/day  | Load = 500 m3/m/day                                       |  |  |  |
| Trough Length                    | L = 24 m or longer   | L = 24 m or longer  |  |  |  |
|                                  | No. 8 troughs/unit   | No. 8 troughs/unit  |  |  |  |
|                                  | Lm x N   | L m x N   |  |  |  |
|                                  | 2.0 8  | 2.0 8   |  |  |  |
|                                  |  |   |  |  |  |
|                                  | L = 32.0 m   | L = 32.0 m  |  |  |  |
|                                  | Weir Load L= 372 m3/m/day                                      | Weir Load L= 372 m3/m/day                                 |  |  |  |
| ~! · · · ·                       |  |   |  |  |  |
| Sludge Removal                   | Recipro Type Collector   | Recipro Type Collector                                    |  |  |  |
| ļ                                |  | 1   |  |  |  |
| Sludge Amount                    | So = Q * (K*(T1-T2)+B*156/666)*10^-6                           | }   |  |  |  |
| Solid Amount                     | where So:Sludge dry weight(ton)                                | 1   |  |  |  |
| (ton-DS)                         | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \                          |   |  |  |  |
| !                                | K:Coefficient converting turbidity to SS (0.8-1.5 ->>1.2)      | 1   |  |  |  |
| ,                                | T1:Turbidity in raw water (ave=                                | o <del> </del>  |  |  |  |
| ļ                                | T2: Turbidity after Sedimentation ( ave = 0)                   | 1   |  |  |  |
|                                  | B:Aium dosage rate (ave.=                                      | D   |  |  |  |
|                                  | $B = 4 + 2 * (T1-T2) ^ 0.5 = 16.6$                             |   |  |  |  |
|                                  | So = 5.81 ton-DS/day   | So = 1.94 ton-DS/day                                      |  |  |  |
|                                  | ŕ  |   |  |  |  |
| }                                | Water Contents of Drained Sludge                               | Water Contents of Drained Sludge                          |  |  |  |
|                                  | (with wash-out water)  w = 98.0 %                              | (with wash-out water)  w = 98.0 %                         |  |  |  |
|                                  |  |   |  |  |  |
|                                  |  |   |  |  |  |
|                                  | Frequency of Cleaning : Once a Year                            | Frequency of Cleaning: Once a Year                        |  |  |  |
|                                  |  |   |  |  |  |
|                                  | Frequency of Cleaning : Once a Year    Total                   | Frequency of Cleaning : Once a Year                       |  |  |  |
|                                  | Total v = 106,115 cu.m/year                                    | Total v = 35,372 cu.m/year                                |  |  |  |

Appendix 6.2 Sri Lanka - Kandy Water Supply Project
Capacity Calculation for Katugastota Treatment Plant Q=110,000 cu m/day

| Item                      | Total Syste                                       | em                        |                                | First Stage  | <del>,,</del>           | 1.0                          |
|---------------------------|---|---------------------------|--------------------------------|--|-------------------------|------------------------------|
| (5) Rapid Sand Filter     |   |                           |                                | 1  |                         |                              |
| Туре                      | Down Flow, Single Me                              | edia                      |                                | Down Flow, Single Media                                | ı                       |                              |
| No.                       | ]   | 12 units (wash            | 3 group)                       | 4  | units (wash             | 1 group)                     |
| Unit Flow                 | q = 9,90<br>(Recirculation                        | 00 cu m/day/unit<br>on a= | 3.0 % )                        | q = 9,900<br>(Recirculation                            | cu m/day/unit<br>a=     | 3.0 % )                      |
|                           | Filtration Rate                                   | Fr =<br>(for              | 150 m/day<br>normal operation) | Filtration Rate  | Fr = (for no.           | 150 m/day<br>rmal operation) |
|                           | Filter Area per Unit                              | A <                       | 150 sq m                       | Filter Area per Unit                                   | A <                     | 150 sq m                     |
| Dimension                 | Wm xLm<br>7.2 9.                                  | x N units<br>6 12 (4 f    | liters/group)                  | W m x L m<br>7.2 9.6                                   | x N units<br>4 (4 filte | rs/group)                    |
|                           | A = 69  | .l sqm/unit               |                                | A = 69.1   | sq m/unit               |                              |
| Filtration Rate           | Fr = 143  | .2 m/day                  |                                | Fr = 143.2   | m/day                   |                              |
|                           |   | .0 m/day                  |                                | Fr'= 191.0   | •                       |                              |
| Filters for Backwashing   | 3 units out of 12 are war. 2.                     | asning<br>3 filters/group |                                | 1 units out of 4 are washin                            | ng<br>filters/group     |                              |
| Filter Washing            |   |                           |                                |  |                         |                              |
| Frequency                 | Once a day for each fil                           | lter                      |                                | Once a day for each filter                             |                         |                              |
| Water Rate                | Backwashing                                       | rate =<br>duration =      | 0.30 m3/m2/min<br>12 min       | Backwashing  | rate = duration =       | 0.30 m3/m2/min<br>12 min     |
| Air Rate                  | Air Scouring                                      | rate = duration =         | 1.00 m3/m2/min<br>3 min        | Air Scouring   | rate = duration =       | 1.00 m3/m2/min<br>3 min      |
| Water Amount              |   |                           |                                | i  |                         |                              |
|                           | Backwashing                                       | Vb =                      | 248.8 cu m/unit                | Backwashing  | Vb =                    | 248.8 cu m/unit              |
| for Total Units           | Total Amount for Was<br>Percentage for Planned    | _                         | 2,986.0 cu m/day<br>2.6 %      | Total Amount for Washin<br>Percentage for Planned Fl   | -                       | 995.3 cu m/day<br>2.6 %      |
| Solid Amount              | So = Q*K*(T1-T2)*1                                | 10^-6                     |                                |  |                         |                              |
| in Wastewater             |   | ludge dry weight(ton)     |                                |  |                         |                              |
| (ton-DS)                  | l   | ted water amount(m3/      | d)                             |  |                         |                              |
| ` '1                      | ,   | ficient converting turb   | •                              |  |                         |                              |
|                           |   | to SS (0.8-1.5 ->>1       | •                              |  |                         |                              |
|                           | l   | bidity before filter(ave  |                                |  |                         |                              |
|                           | T2 :Turi  | bidity after filter(ave = | . 0                            |  |                         |                              |
|                           | So = 0.6  | 69 ton-DS/day             |                                | So = 0.23  | ton-DS/day              |                              |
| SS Contents               |   | 32 mg/l                   |                                | s = 232  | mg/l                    |                              |
| (6) Backwash Water Storag |   | tention [ lait-           |                                | at the Outlet - £45 - E'll .                           | ian I laise             |                              |
|                           | at the Outlet of the Filt<br>V > Backwash Water f |                           | l unit                         | at the Outlet of the Filtrat<br>V > Backwash Water for | ion Units               | 1 unit                       |
| Required Volume           | V = 248.8   | cu m                      |                                | V = 248.8  | cu m                    |                              |
| Dimension                 | No.   | 1 units                   |                                | No. 1  | units                   |                              |
|                           | Lm x W m  |                           | N units                        | L m x W m  | x Dm mxN                | units<br>l                   |
| Total Volume              | v = 29  | 96 cu m                   |                                | v = 296  | cu m                    |                              |

Appendix 6.2 Sri Lanka - Kandy Water Supply Project
Capacity Calculation for Katugastota Treatment Plant Q=110,000 cu m/day

| Item                                | Total System   | First Stage   |
|-------------------------------------|--|---|
| (7) Clear Water Reservoir           |  |   |
| Criteria                            | Retention Time T > 1.0 hours   | Retention Time T > 1.0 hours  |
| Required Volume                     | V = 4,580 cu m   | V ≈ 1,530 cu m  |
| Dimension                           | No. 6 units<br>L m x W m x D m m x N units<br>21.0 13.8 3.0 6  | No. 2 units Lm xWm xDm mxN units 21.0 13.8 3.0 2  |
| Total Volume                        | V = 5,216 cu m   | V = 1,739 cu m  |
| Retention Time                      | T = 1.14 hours   | T = 1.14 hours  |
| (8) Alum Dissolving Tank            |  |   |
| Coagulant                           | Solid Aluminum Sulphate (Al2(SO4)3)<br>containing 15 % Al2-O3  | Solid Aluminum Sulphate (Al2(SO4)3)<br>containing 15 % Al2-O3   |
| Criteria                            | Dosage Rate :   10-60   mg-solid alum/l     Average   30   mg/l  | Dosage Rate : 10-60 mg-solid alum/l   Average 30 mg/l     Coagulant Solution : 10 % sg = 1.0525   Retention Time 24 hours   Dissolving Time 2 hours |
| Dosage Amount<br>Coagulant Solution | Wt = 3,465 kg-Alum/day (Max dosage)<br>V = 32.9 cu m/day   | Wt = 1,155 kg-Ahum/day (Max dosage)<br>V = 11.0 cu m/day  |
| Solution Tank<br>Dimension          | Square 4 units L m x W mx D m x units 2.0 2.0 2.5 4  | Square 2 units<br>Lm x W m x Dm x units<br>2.0 2.0 2.5 2  |
| Total Volume<br>Retention Time      | V = 40.0 cu m<br>T = 29.2 hours  | V = 20.0 cu m<br>T = 43.7 hours   |
| Storage                             | Period 30 days<br>Bulk s. g. 0.60  | Period 30 days Bulk s. g. 0.60  |
| Storage Area                        | A = 87 m2 at 2.0 m height  | A = 29 m2 at 2.0 m height   |
| (9) Lime Dissolving Tank            |  |   |
| pH Control                          | Hydrated Lime (Ca(OH)2)<br>containing 72 % CaO   | Hydrated Lime (Ca(OH)2)<br>containing 72 % CaO  |
| Criteria                            | Dosage Rate :  | Dosage Rate : 5-30 mg-solid Lime/l Requirement   10.4 mg/l   (PreS-30, PostS-20 mg/l)   |
| Dosage Amount<br>Coagulant Solution | Wt = 1,733 kg-Alum/day (Max dosage)<br>V = 16.3 cu m/day   | Wt = 578 kg-Alum/day (Max dosage)<br>V = 5.4 cu m/day   |
| Solution Tank<br>Dimension          | Square         4 units           L m         x W         m x D m         x units           2.0         2.5         4 | Square 2 units L m x W m x D m x units 2.0 2.0 2.5 2  |
| Total Volume<br>Retention Time      | V = 40.0 cu m<br>T = 58.8 hours  | V = 20.0 cu m<br>T = 88.2 hours   |
| Storage                             | Period         30 days           Bulk s. g.         0.40   | Period 30 days<br>Bulk s. g. 0.40   |
| Storage Area                        | A = 65 m2 at 2.0 m height  | A = 22 m2 at 2.0 m height   |

Appendix 6.2 Sri Lanka - Kandy Water Supply Project
Capacity Calculation for Katugastota Treatment Plant Q=110,000 cu m/day

| Ta   | Y-4-1 G                               | First Characteristics  |
|--|---------------------------------------|--|
| Item To The Total Control of t | Total System                          | First Stage  |
| (10) Chlorination Equipme  |                                       |  |
| Injection Point  | at the Inlet of Clear Water Reservoir | at the Inlet of Clear Water Reservoir  |
|  | and outlet of Sedimentation Basin     | and outlet of Sedimentation Basin  |
|  |                                       |  |
| Туре   | Liquid Chlorine (900 kg-cylinder)     | Liquid Chlorine (900 kg-cylinder)  |
| 1,700  | Enquire Chieffite (700 kg 0) hilder)  | Diquid Orbot the (200 Mg o) miles)   |
|  |                                       |  |
| Criteria   | Dosage Rate: 7.0 mg-Cl/l              | Dosage Rate: 7.0 mg-Cl/l   |
| 1  | (Prel.0-5.0                           | 0, Post1.0-5.0) (Pre1.0-5.0, Post1.0-5.0)  |
| ì  | Average 3.0 mg/l (Pre2.               | 2.0, Post1.0 mg/l) Average 3.0 mg/l (Pre2.0, Post1.0 mg/l)   |
|  |                                       |  |
| Dosage Amount  | Wt = 347 kg- Cl gas/day               | Wt = 116 kg- Cl gas/day  |
| Dosage Amount  | , , ,                                 | 0 0 2  |
|  | or 14 kg- Cl gas/hour                 | or 5 kg- Cl gas/hour   |
| 1  |                                       |  |
| Chlorinator  | Vacuum Type                           | Vacuum Type  |
| No. of unit  | 3 units                               | 1 units  |
|  | (excl. 1 unit stand-by)               | (excl. 1 unit stand-by)  |
| Rate   | 4.81 kg/hour/unit                     | 4.81 kg/hour/unit  |
| 1  |                                       | ě .  |
| Operation Rate   | 60 percent                            | 60 percent   |
| Capacity   | 8 kg/hour/unit                        | 8 kg/hour/unit   |
|  |                                       |  |
| Storage  | Period 30 days                        | Period 30 days   |
| Storage Area   | A = 24 m2 as                          | 2.0 m2/container $A = 9 m2$ as 2.0 m2/container  |
| (11) Backwash Wastewate  | r Storage Tank                        | ·  |
| Retention Time   | . ~                                   | 1 hours  |
| Tablematin Amic  | 1 110000                              |  |
| Deal-set Water   | 3/0 - 1 1/5 - 3/61/                   | $\nabla u u v v v v v v v v v v v v v v v v v $  |
| Backwash Water   | Vs + Vb = 249 cu.m/filter             | rumit  |
| l  |                                       |  |
| Required Volume  | 1 filters 249 cu.m                    | l filters 249 cu.m   |
| 1  |                                       |  |
| No.  | N = 2 units                           | N = 2 units  |
|  |                                       |  |
| Dimension  | Lm xWm xDm mxN                        | units Lm xWm xDm mxN units   |
|  | 14.0 6.0 3.00                         | 2 14.0 6.0 3.00 2  |
|  | 14.0 0.0 3.00                         | 2 14.0 0.0 5.00 2  |
|  |                                       |  |
| Total Volume   | v = 504 cu m                          | v = 504 cu m   |
|  |                                       |  |
| Frequency of Wash  | Once a day = 12 filters/day           | Once a day = 4 filters/day   |
| (12) Sludge Lagoon   | So = 5.81 ton-DS/day                  | So = 1.94 ton-DS/day   |
| ' ' '  | 1                                     | , and the second |
|  | Water Contents in Sludge Lagoon       | Water Contents of Drained Sludge   |
|  | The Coments in Single Lagons          | (with wash-out water)  |
| 1  |                                       |  |
| 1  | w = 70.0 %                            | w = 70.0 %   |
| 1  |                                       |  |
| Sludge Amount  | Total $v = 7.074$ cu.m/year           | Total v = 2,358 cu.m/year  |
| 1  | So = 2,122 ton-DS/yea                 | ear So = 707 ton-DS/year   |
| 1  | j                                     |  |
| Required Volume  | v = 7,074 cum                         | v = 2,358 cu m   |
| Required volume  | 7,074 62111                           | 7 2,550 Cu III   |
| n  |                                       |  |
| Dimension  | , ~                                   | unit for stand-by Rectangular 1 units + 1 unit for stand-by  |
| 1  | Lm xW mxDm xunits                     | Lm x W mx Dm x units   |
| 1  | 70.0 35.0 1.0                         | 4 70.0 35.0 1.0 2  |
| 1  |                                       |  |
| 1  | 7 250                                 | 0.450  |
| Total Volume   | v = 7,350 cu m                        | v = 2.450  cu m  |

| 02 | Intake and Water Treatment Plant Hydraulic Calculations |
|----|---|
|    |   |
|    |   |
|    |   |
|    |   |

Intake Facilities Water Level (0.5m settling soil at 1nlet channel)

| Quantity | Duty    | R.W.L.(m) |        | G.W.L. P.C.W.L. |        | Remark                                  |  |
|----------|---------|-----------|--------|-----------------|--------|---|--|
| Q=1.0    | 1 unit  | LLWL      | 437.60 | 436.87          | 436.59 | Bottom Level is 434.06m(no soil)        |  |
|          |         | LLWL      | 437.60 | 436.78          | 436.40 | Sedimentation Level is 435.06m(h=1.0m)  |  |
|          |         | LLWL      | 437.60 | 436.47          | 435.94 | Sedimentation Level is 436.00m(h=1.94m) |  |
|          |         | LWL       | 438.30 | 437.54          | 437.36 | Sedimentation Level is 436.00m(h=1.94m) |  |
|          |         | HWL       | 440.74 | 440.18          | 440.12 | Sedimentation Level is 436.00m(h=1.94m) |  |
| Q=1.0    | 2 units | LLWL      | 437.60 | 437.11          | 437.03 | Bottom Level is 434.06m(no soil)        |  |
|          |         | LLWL      | 437.60 | 437.09          | 437.01 | Sedimentation Level is 435.06m(h=1.0m)  |  |
|          | }       | LLWL      | 437.60 | 437.01          | 436.93 | Sedimentation Level is 436.00m(h=1.94m) |  |
|          | 1       | LWL       | 438.30 | 437.80          | 437.75 | Sedimentation Level is 436.00m(h=1.94m) |  |
|          |         | HWL       | 440.74 | 440.29          | 440.27 | Sedimentation Level is 436.00m(h=1.94m) |  |

Note: R.W.L.: River Water Level

G.W.L.: Grit Chamber Water Level P.C.W.L.: Pump Chamber Water Level

| Intake fac          | ilities               | water                    | loss                 | (River         | water le                  | evel +43        | 87.6m)           |                        | 2 unit duty                            |            |
|---------------------|-----------------------|--------------------------|----------------------|----------------|---------------------------|-----------------|------------------|------------------------|--|------------|
| 1 River Wate<br>L.L | er Level<br>W.L.      |                          |                      | 437.600        | m                         |                 |                  |                        |  |            |
| 2 Intake Flo        | w & Ver               | ositv                    |                      |                |                           |                 |                  |                        |  |            |
| Q1=                 |                       |                          |                      | 38500          | m3/day=                   | 0.44            | 6                | m3/sec                 |  |            |
| Q2=                 |                       |                          |                      |                | m3/day=                   | 0.89            | 1                | m3/sec                 |  |            |
| Q3=                 |                       |                          |                      |                | m3/day=                   | 1.33            | 7                | m3/sec                 |  |            |
| 3 Bar Screen        | n Loss                |                          | B=<br>H=<br>b=<br>t= | 12.5           | m<br>mm<br>mm             | ( 37<br>(Bottom | .5 *44=<br>Level | 1.650 m)<br>436.500 m) | Including Sed. Depth                   | h=0.50m    |
|                     |                       |                          | θ=                   | 70             |                           | (0 1 1          | 3.7 IO           | 0.779402.3             |  |            |
|                     |                       |                          | V=<br>**             | 0.368          |                           | (Q= 1.3         | 57 72=           | 0.668403)              |  |            |
|                     |                       |                          | H=                   | 0.003          |                           |                 |                  | OUT :                  | 427 200 1                              | 0.800 -7   |
| Thr                 | rerfore               |                          | hl=                  | 0.300          | m                         |                 |                  | (WL+<br>(Bottom Level  | 437.300 m, depth<br>436.500 m) settlin | 0.800 m)   |
| 4 Head loss         | of Intake             | e gate                   |                      |                |                           |                 |                  | (Bottom Ecver          | 450.500 M) scians                      | g 30H 0.5H |
| Din                 | nension (             | of gate; 1<br>=v2/(2*g   |                      | 500            |                           |                 |                  |                        |  |            |
| who                 | ere                   | A=1.5m                   | ı*Hm*                | 2=             | 2.4                       | 4 m2 : Sec      | tional area      | (H=0.80 m)             |  |            |
|                     |                       | Q=<br>v=Q/A=<br>g=<br>C= | :                    | 0.557          | m3/sec<br>m/sec<br>m/sec2 |                 |                  |                        |  |            |
|                     |                       | h4=                      |                      | 0.0440         |                           | = 0.0           | 50 m             | (WL+                   | 437.250 m, depth                       | 0.750 m)   |
|                     |                       | **                       |                      | 0.0110         |                           | - 0.0.          | 20 III           | (Bottom Level          | 436.500 m)                             | 0.750 24,  |
| 5 Rubbish R         | Remover               |                          | B=<br>H=<br>b=<br>t= | 3              | m<br>mm<br>mm             | (Bottom         | 20 *44=<br>Levei | 0.880 m)<br>436.500 m) |  |            |
|                     |                       |                          | θ =<br>V=            | 70             |                           | (0- 12          | 27 12-           | 0.449403.)             |  |            |
|                     |                       |                          | V=<br>H=             | 2.025<br>0.028 |                           | (Q= 1.3         | )                | 0.668403 )             |  |            |
| Thr                 | rerfore               |                          | h2=                  | 0.028          |                           |                 |                  | (WL+                   | 437.150 m, depth                       | 0.650 m)   |
|                     |                       |                          |                      |                |                           |                 |                  | (Bottom Level          |  | ŕ          |
| 6 Head loss         | in the ch             | annel                    |                      |                |                           |                 |                  |                        |  |            |
| QI:                 | =                     | 0.668                    | <b>m</b> 3/se        | ec             | : Water fl                | low of 1 tro    | ough             | (Q= 1.337 /2=          | 0.668)                                 |            |
| Infl                | low secti             | onal area                |                      |                |                           |                 |                  |                        |  |            |
|                     | D.+***                |                          |                      | • • •          |                           |                 |                  |                        |  |            |
|                     | B*H=                  |                          | D-                   | 1.30           |                           |                 |                  |                        |  |            |
| who                 | еге                   |                          | B=<br>H≃             | 2.00<br>0.65   |                           |                 |                  |                        |  |            |
|                     |                       |                          | 11-                  | 0.03           | ш                         |                 |                  |                        |  |            |
|                     | locity<br>a-b)=Q1/    | 'A=                      |                      | 0.51           | m/sec                     |                 |                  |                        |  |            |
| •                   | draulic ra<br>A/(B+H* |                          |                      | 0.394          | m                         |                 |                  |                        |  |            |
| Ro                  | ughness               | coefficier               | nt<br>n=             | 0.015          |                           |                 |                  |                        |  |            |
| Hea                 | ad losses             | are calcu                | ılated ı             | using Man      | ning Form                 | ula.            |                  |                        |  |            |
| h=r                 | n^2*L*v               | ^2/R^(4/3<br>where       |                      | L=             | 26.0                      | 0 m             |                  |                        |  |            |
|                     |                       | h3=                      |                      | 0.00536        | = 0.010                   | 0 т             |                  | (WL+<br>(Bottom Level  | 437.140 m, depth<br>436.500 m)         | 0.640 m)   |

Diameter of holes and number of holes;  $\phi 100@300\times300$ 

| Head loss h=v2/(2 | *g*C^2)    |              |                  |               |                |
|-------------------|------------|--------------|------------------|---------------|----------------|
| where A=3.14/4*I  | D^2*(a*b)= | 1.554 m2     | : Sectional area |               |                |
|                   | D=         | 100 mmdia.   |                  |               |                |
|                   | a=         | 18 pieces    |                  |               |                |
|                   | b=         | Il pieces    | (Bottom Level    | 434.060 m=    | 434.06 + 0.00) |
|                   | Q==        | 0.668 m3/sec |                  | (Q= 1.337 /2= | 0.668)         |
|                   | v=Q/A=     | 0.43 m/sec   |                  |               |                |
|                   | g=         | 9.8 m/sec2   |                  |               |                |
|                   | C=         | 0.6          |                  |               |                |
|                   | h5=        | 0.026  m =   | 0.030 m          |               |                |
|                   |            |              |                  |               |                |

#### 8 Grit chamber water level

437.110 m

(Bottom Level

(WL+

0.668)

434.060 m)

437.040 m, depth

2.980 m)

#### 9 Head loss of diffusion wall

Diameter of holes and number of holes; \$\phi\$ 100@300×300

| Head loss h=v2/(2* | *g*C^2)    |              |                  |              |
|--------------------|------------|--------------|------------------|--------------|
| where A=3.14/4*[   | )^2*(a*b)= | 0.989 m2     | : Sectional area |              |
|                    | D=         | 100 mmdia.   |                  |              |
|                    | a=         | 18 pieces    |                  |              |
|                    | b=         | 7 pieces     | (Bottom Level    | 434.06 m)    |
|                    | Q=         | 0.668 m3/sec |                  | (Q=1.337 /2= |
|                    | v=Q/A=     | 0.68 m/sec   |                  |              |
|                    | g==        | 9.8 m/sec2   |                  |              |
|                    | Č=         | 0.6          |                  |              |

0.070 m

10 Head loss of Intake gate

h5=

| Dimension of gate; 1500×1500     |
|----------------------------------|
| Head loss $h=v^2/(2*\sigma*C^2)$ |

 $0.065 \ m$ 

|     | Head loss b | =v2/(2*g | *C^2)   |              |                        |               |                  |          |
|-----|-------------|----------|---------|--------------|------------------------|---------------|------------------|----------|
|     | where       | А=1.5п   | n*Hm*2= | 4            | .8 m2 : Sectional area | (H=1.60 m)    |                  |          |
|     |             | Q≕       |         | 0.668 m3/sec |                        | (Q= 1.337 /2= | 0.668)           |          |
|     |             | v=Q/A=   | =       | 0.139 m/sec  |                        |               |                  |          |
|     |             | g≖       |         | 9.8 m/sec2   |                        |               |                  |          |
|     |             | C=       |         | 0.6          |                        |               |                  |          |
| h6= | 0.0027      | 5 m      | =       | 0.010 m      |                        | (WL+          | 437.030 m, depth | 3.870 m) |
|     |             |          |         |              |                        | (Bottom Level | 433.160 m)       |          |

<sup>11</sup> Conveyance Pump chamber water level

437.030 m

| Intake fa  | cilities w              | vater loss (R                     | liver water lev   | vel +437.6m)                            |                       | 2 unit duty                             |                       |
|------------|-------------------------|-----------------------------------|-------------------|---|-----------------------|---|-----------------------|
|            | Vater Level<br>L.L.W.L. |                                   | 437.600 m         |   |                       |   |                       |
| 2 Intake l | Flow & Vere             | osity                             |                   |   |                       |   |                       |
|            | Q1=                     | -                                 | 38500 m3/day=     | 0.446                                   | m3/sec                |   |                       |
|            | Q2=                     |                                   | 77000 m3/day=     | 0.891                                   | m3/sec                |   |                       |
| (          | Q3=                     |                                   | 115500 m3/day=    | 1.337                                   | m3/sec                |   |                       |
| 3 Bar Scr  | een Loss                | B=                                | 2.00 m            | ( 37.5 *44=                             | 1.650 m)              |   |                       |
| J Dai Sci  | CCH LOSS                | H=                                | 1.10 m            | (Bottom Level                           | 436.500 m)            | Including Sed. Depth h                  | n=0.50m               |
|            |                         | b=                                | 37.5 mm           | (                                       | ,                     |   |                       |
|            |                         | t=                                | 12.5 mm           |   |                       |   |                       |
|            |                         | $\theta =$                        | 70 °              |   |                       |   |                       |
|            |                         | V=                                | 0.368 m/s         | (Q= 1.337 /2=                           | 0.668403)             |   |                       |
|            |                         | H=                                | 0.003 m           |   |                       |   |                       |
|            | Threrfore               | h1=                               | 0.300 m           |   | (WL+<br>(Bottom Level | 437.300 m, depth<br>436.500 m) settling | 0.800 m)<br>soil 0.5m |
| 4 Head Id  | oss of Intake           | gate                              |                   |   |                       |   |                       |
|            |                         | of gate; 1500×15<br>=v2/(2*g*C^2) | 500               |   |                       |   |                       |
|            | where                   | A=1.5m*Hm*2                       | ?= 2.4            | m2 : Sectional area                     | (H=0.80 m)            |   |                       |
|            |                         | Q=                                | 1.337 m3/sec      |   |                       |   |                       |
|            |                         | v=Q/A=                            | 0.557 m/sec       |   |                       |   |                       |
|            |                         | g=                                | 9.8 m/sec2        |   |                       |   |                       |
|            |                         | C=<br>h4=                         | 0.6<br>0.0440 m   | = 0.050 m                               | (WL+                  | 437.250 m, depth                        | 0.750 m)              |
|            |                         | 114-                              | 0.0440 щ          | - 0.000 m                               | (WLT<br>(Bottom Level |   | 0.750 m)              |
| 5 Rubbis   | h Remover               | B≔                                | 2.00 m            | ( 20 *44=                               | 0.880 m)              | 450.500 III)                            |                       |
| 5 1(45016) |                         | H=                                | 0.75 m            | (Bottom Level                           | 436.500 m)            |   |                       |
|            |                         | b=                                | 20.0 mm           | (====================================== | ,                     |   |                       |
|            |                         | t=                                | 3 mm              |   |                       |   |                       |
|            |                         | $\theta =$                        | 70 °              |   |                       |   |                       |
|            |                         | V=                                | 2.025 m/s         | (Q= 1.337 /2=                           | 0.668403)             |   |                       |
|            |                         | H=                                | 0.028 m           |   |                       |   |                       |
|            | Threrfore               | h2=                               | 0.100 m           |   | (WL+                  | 437.150 m, depth                        | 0.650 m)              |
| 6 Head lo  | oss in the ch           | annel                             |                   |   | (Bottom Level         | 436.500 m)                              |                       |
| (          | Q1=                     | 0.668 m3/sec                      | : Water fl        | low of 1 trough                         | (Q= 1.337 /2=         | 0.668)                                  |                       |
| 1          | Inflow section          | onal area                         |                   |   |                       |   |                       |
|            | A=B*H=                  |                                   | 1.30 m2           |   |                       |   |                       |
|            | where                   | B=                                | 2.00 m            |   |                       |   |                       |
|            | n nero                  | H=                                | 0.65 m            |   |                       |   |                       |
|            |                         |                                   |                   |   |                       |   |                       |
| 7          | Velocity                |                                   |                   |   |                       |   |                       |
| 7          | V(a-b)=Q1/2             | <b>4</b> =                        | 0.51 m/sec        |   |                       |   |                       |
| 1          | Hydraulic ra            | dine                              |                   |   |                       |   |                       |
|            | R=A/(B+H*               |                                   | 0.394 m           |   |                       |   |                       |
|            | (                       | -,                                |                   |   |                       |   |                       |
| 1          | Roughness o             | oefficient                        |                   |   |                       |   |                       |
|            |                         | n=                                | 0.015             |   |                       |   |                       |
| Ī          | Head losses             | are calculated u                  | sing Manning Forn | nula.                                   |                       |   |                       |
| 1          | h=n^2*L*v^              | 2/R^(4/3)                         |                   |   |                       |   |                       |
| •          | ,                       |                                   | = 26.0            | ) m                                     |                       |   |                       |
|            |                         |                                   |                   |   |                       |   | _                     |
|            |                         | h3=                               | 0.00536 = 0.010   | ) m                                     | (WL+<br>(Bottom Level | 437.140 m, depth<br>436.500 m)          | 0.640 m)              |

Diameter of holes and number of holes;  $\phi$  100@300×300

Head loss  $h=v2/(2*g*C^2)$ 

| 11000 1000 11 12 (2 8 0 2) |              |   |
|----------------------------|--------------|---|
| where A=3.14/4*D^2*(a*b)=  | 1.130 m2     | : Sectional area                              |
| D=                         | 100 mmdia.   |   |
| a=                         | 18 pieces    |   |
| b=                         | 8 pieces     | (Sedimentation Level 435.060 m= 434.06 + 1.0) |
| Q=                         | 0.668 m3/sec | (Q= 1.337 /2= 0.668 )                         |
| v=Q/A=                     | 0.59 m/sec   |   |
| g=                         | 9.8 m/sec2   |   |
| C=                         | 0.6          |   |
| h5=                        | 0.050  m =   | 0.050 m                                       |

#### 8 Grit chamber water level

437.090 m

#### 9 Head loss of diffusion wall

Diameter of holes and number of holes;  $\phi 100@300\times300$ 

Head loss  $h=v2/(2*g*C^2)$ 

| where A= | =3.14/4*D^2*(a*b)= | 0.989 m2     | : Sectional area |               |                  |          |
|----------|--------------------|--------------|------------------|---------------|------------------|----------|
|          | D≕                 | 100 mmdia.   |                  |               |                  |          |
|          | a=                 | 18 pieces    |                  |               |                  |          |
|          | b≕                 | 7 pieces     | (Bottom Level    | 434.06 m)     |                  |          |
|          | Q≕                 | 0.668 m3/sec |                  | (Q= 1.337 /2= | 0.668)           |          |
|          | v=Q/A=             | 0.68 m/sec   |                  |               |                  |          |
|          | g=                 | 9.8 m/sec2   |                  |               |                  |          |
|          | C=                 | 0.6          |                  |               |                  |          |
| h5=      | 0.065  m =         | 0.070 m      |                  | (WL+          | 437.020 m, depth | 2.960 m) |
|          |                    |              |                  | (Bottom Level | 434.060 m)       |          |

#### 10 Head loss of Intake gate

h6=

Dimension of gate; 1500×1500 Head loss h=v2/(2\*\alpha\*C^2)

| Head loss r | ı=v <i>z/(z</i> ≖g | (TU12) |                         |               |                  |          |
|-------------|--------------------|--------|-------------------------|---------------|------------------|----------|
| where       | A=1.5m             | *Hm*2= | 4.8 m2 : Sectional area | (H=1.60  m)   |                  |          |
|             | Q=                 |        | 0.668 m3/sec            | (Q= 1.337 /2= | 0.668)           |          |
|             | v=Q/A=             |        | 0.139 m/sec             |               |                  |          |
|             | g==                |        | 9.8 m/sec2              |               |                  |          |
|             | C=                 |        | 0.6                     |               |                  |          |
| 0.00275     | ī m.               | =      | 0.010 m                 | (WL+          | 437.010 m, depth | 3.850 m) |
|             |                    |        |                         | (Bottom Level | 433.160 m)       |          |

#### 11 Conveyance Pump chamber water level

437.010 m

| Intake facilities                        | water loss                                   | (River water l                                   | evel +437.6m)                |                            | 2 unit duty                               |                      |
|--|--|--|------------------------------|----------------------------|---|----------------------|
| 1 River Water Level<br>L.L.W.L.          |  | 437.600 m  |                              |                            |   |                      |
| 2 Intake Flow & Ver<br>Q1=<br>Q2=<br>Q3= | rosity                                       | 38500 m3/day=<br>77000 m3/day=<br>115500 m3/day= | 0.446<br>0.891<br>1.337      | m3/sec<br>m3/sec<br>m3/sec |   |                      |
| 3 Bar Screen Loss                        | B=<br>H=<br>b=<br>t=<br>θ=                   | 2.00 m<br>1.10 m<br>37.5 mm<br>12.5 mm<br>70 °   | ( 37.5 *44=<br>(Bottom Level | 1.650 m)<br>436.500 m)     | Including Sed. Depth h=                   | 0.50m                |
|  | V=<br>H=                                     | 0.368 m/s<br>0.003 m                             | (Q= 1.337 /2=                | 0.668403)                  |   |                      |
| Threrfore                                | h1=  | 0.300 m  |                              | (WL+<br>(Bottom Level      | 437.300 m, depth<br>436.500 m) settling s | 0.800 m)<br>oil 0.5m |
| 4 Head loss of Intak                     |  |  |                              |                            |   |                      |
|  | of gate; 1500×<br>=v2/(2*g*C^2)<br>A=1.5m*Hm | )  | 4 m2 : Sectional area        | (H= 0.80 m)                |   |                      |
| ***************************************  | Q=<br>v=Q/A=<br>g=<br>C=                     | 1.337 m3/sec<br>0.557 m/sec<br>9.8 m/sec2<br>0.6 |                              | (22 0.00 2.0)              |   |                      |
|  | h4=  | 0.0440 m   | = 0.050 m                    | (WL+<br>(Bottom Level      | 437.250 m, depth<br>436.500 m)            | 0.750 m)             |
| 5 Rubbish Remover                        | B=<br>H=<br>b=<br>t=<br>θ=                   | 2.00 m<br>0.75 m<br>20.0 mm<br>3 mm<br>70 °      | ( 20 *44=<br>(Bottom Level   | 0.880 m)<br>436.500 m)     | ·   |                      |
| Threrfore                                | V=<br>H=<br>h2=                              | 2.025 m/s<br>0.028 m<br>0.100 m                  | (Q= 1.337 /2=                | 0.668403)<br>(WL+          | 437.150 m, depth                          | 0.650 m)             |
| 6 Head loss in the cl                    | hannel                                       |  |                              | (Bottom Level              |   | ·                    |
| Q1=                                      | 0.668 m3/s                                   | sec : Water f                                    | low of 1 trough              | (Q= 1.337 /2=              | 0.668)                                    |                      |
| Inflow sect                              | ional area                                   |  |                              |                            |   |                      |
| A=B*H=<br>where                          | B=<br>H=                                     | 1.30 m2<br>2.00 m<br>0.65 m                      |                              |                            |   |                      |
| Velocity<br>V(a-b)=Q1                    | /A=  | 0.51 m/sec                                       |                              |                            |   |                      |
| Hydraulic r<br>R=A/(B+H                  |  | 0.394 m  |                              |                            |   |                      |
| Roughness                                | coefficient<br>n=                            | 0.015  |                              |                            |   |                      |
| Head losse                               | s are calculated                             | using Manning For                                | mula.                        |                            |   |                      |
| h=n^2*L*v                                | ^2/R^(4/3)<br>where                          | L= 26.   | 0 m                          |                            |   |                      |
|  | h3=  | 0.00536 = 0.01                                   | 0 m                          | (WL+<br>(Bottom Level      | 437.140 m, depth<br>436.500 m)            | 0.640 m)             |

```
Diameter of holes and number of holes; $\phi$ 100@300×300
  Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                    0.707 m2
                                                    : Sectional area
                    D=
                                      100 mmdia.
                    a=
                                       18 pieces
                                                                                           434.06 + 1.94)
                    b=
                                        5 pieces
                                                    (Sedimentation Level
                                                                           436.000 m=
                    Q=
                                    0.668 m3/sec
                                                                         (Q=1.337 /2=
                                                                                            0.668)
                                     0.95 m/sec
                    v=Q/A=
                    g≕
C=
                                       9.8 m/sec2
                                       0.6
                    h5≃
                                    0.127 m
                                                         0.130 m
8 Grit chamber water level
                                                                437.010 m
9 Head loss of diffusion wall
  Diameter of holes and number of holes; \phi 100@300×300
  Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                    0.989 m2
                                                    : Sectional area
                    D=
                                      100 mmdia.
                                       18 pieces
                    a=
                                        7 pieces
                    b=
                                                                            434.06 m)
                                                    (Bottom Level
                    Q=
                                     0.668 m3/sec
                                                                         (Q=1.337 /2=
                                                                                            0.668)
                    v=Q/A=
                                     0.68 m/sec
                                       9.8 m/sec2
                                       0.6
  h5=
              0.065 m
                                    0.070 m
                                                                         (WL+
                                                                                          436.940 m, depth
                                                                                                                  2.880 m)
                                                                                          434.060 m)
                                                                         (Bottom Level
10 Head loss of Intake gate
         Dimension of gate; 1500×1500
         Head loss h=v2/(2*g*C^2)
         where
                    A=1.5m*Hm*2=
                                                4.8 m2 : Sectional area
                                                                         (H=1.60 m)
                    Q=
                                    0.668 m3/sec
                                                                         (Q= 1.337 /2=
                                                                                            0.668)
                    v=Q/A=
                                    0.139 m/sec
                                       9.8 m/sec2
                                       0.6
                                    0.010 m
  h6=
            0.00275 m
                                                                         (WL+
                                                                                          436.930 m, depth
                                                                                                                  3.770 m)
```

(Bottom Level

433.160 m)

| Intake facilities                        | water loss                      | (River water l                                   | evel +438.3m)                |                                   | 2 unit duty                               |                       |
|--|---------------------------------|--|------------------------------|-----------------------------------|---|-----------------------|
| 1 River Water Level<br>H.W.L.            |                                 | 438.300 m  |                              |                                   |   |                       |
| 2 Intake Flow & Ver<br>Q!=<br>Q2=<br>Q3= | rosity                          | 38500 m3/day=<br>77000 m3/day=<br>115500 m3/day= | 0.891                        | m3/sec<br>m3/sec<br>m3/sec        |   |                       |
| 3 Bar Screen Loss                        | B=<br>H=<br>b=<br>t=<br>θ=      | 2.00 m<br>1.80 m<br>37.5 mm<br>12.5 mm<br>70 °   | ( 37.5 *44=<br>(Bottom Level | 1.650 m)<br>436.500 m)            | Including Sed. Depth h=                   | 0.50m                 |
|  | V=<br>H=                        | 0.225 m/s<br>0.001 m                             | (Q= 1.337 /2=                | 0.668403)                         |   |                       |
| Threrfore                                | hl=                             | 0.300 m  |                              | (WL+<br>(Bottom Level             | 438.000 m, depth<br>436.500 m) settling s | 1.500 m)<br>soil 0.5m |
| 4 Head loss of Intak                     | of gate; 1500×                  | 1500   |                              |                                   |   |                       |
|  | =v2/(2*g*C^2<br>A=1.5m*Hm<br>Q= | )<br>*2= 3.3<br>1.337 m3/sec                     | 3 m2 : Sectional area        | (H= 1.10 m)                       |   |                       |
|  | v=Q/A=<br>g=<br>C=              | 0.405 m/sec<br>9.8 m/sec2<br>0.6                 | 0.020                        | ANT .                             | 427.070 Joseph                            | 1.470 \               |
| 5 Rubbish Remover                        | h4=<br>B=                       | 0.0233 m<br>2.00 m                               | = 0.030 m<br>( 20 *44=       | (WL+<br>(Bottom Level<br>0.880 m) | 437.970 m, depth<br>436.500 m)            | 1.470 m)              |
| J Russian Romover                        | H=<br>b=<br>t=<br>θ=            | 1.47 m<br>20.0 mm<br>3 mm<br>70 °                | (Bottom Level                | 436.500 m)                        |   |                       |
| Threrfore                                | V=<br>H=<br>h2=                 | 1.033 m/s<br>0.007 m<br>0.100 m                  | (Q= 1.337 /2=                | 0.668403)<br>(WL+                 | 437.870 m, depth                          | 1.370 m)              |
| 6 Head loss in the cl                    | annel                           |  |                              | (Bottom Level                     | 436.500 m)                                |                       |
| Q1=                                      | 0.668 m3/s                      | sec : Water f                                    | low of 1 trough              | (Q= 1.337 /2=                     | 0.668)                                    |                       |
| Inflow sect                              | ional area                      |  |                              |                                   |   |                       |
| A=B*H=<br>where                          | H=                              | 2.74 m2<br>2.00 m<br>1.37 m                      |                              |                                   |   |                       |
| Velocity<br>V(a-b)=Q1/                   | 'A=                             | 0.24 m/sec                                       |                              |                                   |   |                       |
| Hydraulic r<br>R=A/(B+H                  |                                 | 0.578 m  |                              |                                   |   |                       |
| Roughness                                | coefficient<br>n=               | 0.015  |                              |                                   |   |                       |
| Head losses                              | are calculated                  | using Manning For                                | mula.                        |                                   |   |                       |
| h=n^2*L*v                                | ^2/R^(4/3)<br>where             | L= 26.   | 0 m                          |                                   |   |                       |
|  | h3=                             | 0.00072 = 0.00                                   | 0 m                          | (WL+<br>(Bottom Level             | 437.870 m, depth<br>436.500 m)            | 1.370 m)              |

Diameter of holes and number of holes;  $\phi$  100@300×300

Head loss  $h=v2/(2*g*C^2)$ 

| 11044 1055 11 12 (2 | . 5 🔾 -/     |            |   |                  |            |                |
|---------------------|--------------|------------|---|------------------|------------|----------------|
| where $A=3.14/4*$   | D^2*(a*b)=   | 0.989 m2   |   | : Sectional area |            |                |
|                     | D==          | 100 mmdia. |   |                  |            |                |
|                     | a=           | 18 pieces  |   |                  |            |                |
|                     | b=           | 7 pieces   |   | (Bottom Level    | 436.000 m= | 434.06 + 1.94) |
| Q=                  | 0.668 m3/sec |            |   | (Q= 1.337 /2=    | 0.668)     |                |
|                     | v=Q/A=       | 0.68 m/sec |   |                  |            |                |
|                     | g=           | 9.8 m/sec2 |   |                  |            |                |
|                     | C==          | 0.6        |   |                  |            |                |
|                     | h5=          | 0.065 m    | = | 0.070 m          |            |                |
|                     |              |            |   |                  |            |                |

#### 8 Grit chamber water level

437.800 m

## 9 Head loss of diffusion wall

Diameter of holes and number of holes; \$\phi\$ 100@300×300

Head loss h=v2/(2\*g\*C^2)

| where A= | =3.14/4*D^2*(a*b)= | 1.413 m2     | : Sectional area |               |                  |          |
|----------|--------------------|--------------|------------------|---------------|------------------|----------|
|          | D=                 | 100 mmdia.   |                  |               |                  |          |
|          | a=                 | 18 pieces    |                  |               |                  | •        |
|          | b=                 | 10 pieces    | (Bottom Level    | 434.06 m)     |                  |          |
|          | Q <del>=</del>     | 0.668 m3/sec |                  | (Q= 1.337 /2= | 0.668)           |          |
|          | v=Q/A=             | 0.47 m/sec   |                  |               |                  |          |
|          | g=                 | 9.8 m/sec2   |                  |               |                  |          |
|          | C=                 | 0.6          |                  |               |                  |          |
| h5=      | 0.032  m =         | 0.040 m      |                  | (WL+          | 437.760 m, depth | 1.760 m) |
|          |                    |              |                  | (Bottom Level | 436.000 m)       |          |

## 10 Head loss of Intake gate

Dimension of gate; 1500×1500 Head loss h=v2/(2\*g\*C^2)

|     | nead loss. | п-лт/(т. Б | ( 2)    |             |                         |               |                  |          |
|-----|------------|------------|---------|-------------|-------------------------|---------------|------------------|----------|
|     | where      | A=1.5n     | 1*Hm*2= | =           | 4.8 m2 : Sectional area | (H= 1.60 m)   |                  |          |
|     |            | Q=         |         | 0.668 m3/se | С                       | (Q= 1.337 /2= | 0.668)           |          |
|     |            | v=Q/A=     | =       | 0.139 m/sec |                         |               |                  |          |
|     |            | g≔         |         | 9.8 m/sec   | 2                       |               |                  |          |
|     |            | C=         |         | 0.6         |                         |               |                  |          |
| h6= | 0.0027     | 5 m        | =       | 0.010 m     |                         | (WL+          | 437.750 m, depth | 4.590 m) |
|     |            |            |         |             |                         | (Bottom Level | 433.160 m)       |          |

#### 11 Conveyance Pump chamber water level

437.750 m

| Intake facilities             | water loss                       | (River water l       | evel +440.74m)        |                       | 2 unit duty                               |                   |
|-------------------------------|----------------------------------|----------------------|-----------------------|-----------------------|---|-------------------|
| 1 River Water Level<br>H.W.L. |                                  | 440.740 m            |                       |                       |   |                   |
| 2 Intake Flow & Ver           | rosity                           |                      |                       |                       |   |                   |
| Q1=                           |                                  | 38500 m3/day=        | 0.446                 | m3/sec                |   |                   |
| Q2=                           |                                  | 77000 m3/day=        | 0.891                 | m3/sec                |   |                   |
| Q3=                           |                                  | 115500 m3/day=       | 1.337                 | m3/sec                |   |                   |
| 3 Head loss of Inlet          | Orifice                          |                      |                       |                       |   |                   |
| where                         | A=a*b=<br>a=                     | 11 m2<br>6 m         | : Sectional area      |                       |   |                   |
|                               | a-<br>b=                         | 1.9 m                | (Sedimentation Level  | 436.500 m=            | 436.000 + 0.5)                            |                   |
|                               | Q=                               | 0.668 m3/sec         | (Q= 1.337 /2=         | 0.668403)             | 450.000 1 0.5 )                           |                   |
|                               | v=Q/A=                           | 0.06 m/sec           | (Q= 1.551 12=         | 0.000105 )            |   |                   |
|                               | g=                               | 9.8 m/sec2           |                       |                       |   |                   |
|                               | Č=                               | 0.6                  |                       |                       |   |                   |
|                               | h5=                              | 0.0005 m =           | 0.000 m               | (WL+<br>(Bottom Level | 440.740 m, depth<br>436.500 m) settling s | 4.240<br>oil 0.5m |
| 4 Bar Screen Loss             | B=                               | 2.00 m               | ( 37.5 *44=           | 1.650 m)              | 430.500 M) bening 0                       | on visin          |
|                               | H=                               | 4.24 m               | (Sedimentation Level  |                       |   |                   |
|                               | b=                               | 37.5 mm              | •                     | ·                     |   |                   |
|                               | t=                               | 12.5 mm              |                       |                       |   |                   |
|                               | $\theta =$                       | 70 °                 |                       |                       |   |                   |
|                               | V=                               | 0.096 m/s            | (Q= 1.337 /2=         | 0.668403)             |   |                   |
|                               | H=                               | 0.000 m              |                       |                       |   |                   |
| Threrfore                     | h1=                              | 0.300 m              |                       | (WL+<br>(Bottom Level | 440.440 m, depth<br>436.500 m)            | 3.940 m)          |
| 5 Head loss of Intak          | e gate                           |                      |                       | (Dottoin Level        | 430.300 m)                                |                   |
| Head loss b                   | of gate; 1500×1<br>=v2/(2*g*C^2) | )                    |                       |                       |   |                   |
| where                         | A=1.5m*Hm*                       |                      | 3 m2 : Sectional area | (H=1.10 m)            |   |                   |
|                               | Q=                               | 1.337 m3/sec         |                       |                       |   |                   |
|                               | v=Q/A=                           | 0.405 m/sec          |                       |                       |   |                   |
|                               | g=                               | 9.8 m/sec2           |                       |                       |   |                   |
|                               | C=<br>h4=                        | 0.6<br>0.0233 m      | = 0.030 m             | OIT I                 | 440 410 345                               | 3.910 m)          |
|                               | 114—                             | 0.0233 m             |                       | (WL+<br>(Bottom Level | 440.410 m, depth<br>436.500 m)            | 3.910 m)          |
| 6 Rubbish Remover             | B=                               | 2.00 m               | ( 20 *44=             | 0.880 m)              |   |                   |
|                               | H=                               | 3.91 m               | (Bottom Level         | 436.500 m)            |   |                   |
|                               | b=                               | 20.0 mm              |                       |                       |   |                   |
|                               | t=                               | 3 mm                 |                       |                       |   |                   |
|                               | θ =                              | 70 °                 | (0- 1 227 /2-         | 0.660402.)            |   |                   |
|                               | V=<br>H=                         | 0.389 m/s<br>0.001 m | (Q= 1.337 /2=         | 0.668403)             |   |                   |
| Threrfore                     | h2=                              | 0.100 m              |                       | (WL+                  | 440.310 m, depth                          | 3.810 m)          |
| 7 Head loss in the cl         |                                  | 0.100 m              |                       | (Bottom Level         | 436.500 m)                                | 3.810 m)          |
|                               |                                  |                      |                       |                       |   |                   |
| Q1=                           | 0.668 m3/s                       | ec : Water fl        | ow of 1 trough        | (Q= 1.337 /2=         | 0.668)                                    |                   |
| Inflow secti                  | ional area                       |                      |                       |                       |   |                   |
| A=B*H=                        |                                  | 7.62 m2              |                       |                       |   |                   |
| where                         | B=                               | 2.00 m               |                       |                       |   |                   |
|                               | H=                               | 3.81 m               |                       |                       |   |                   |
| Velocity                      |                                  |                      |                       |                       |   |                   |
| V(a-b)=Q1/                    | 'A=                              | 0.09 m/sec           |                       |                       |   |                   |
| Hydraulic r                   | adius                            |                      |                       |                       |   |                   |
| R=A/(B+H                      |                                  | 0.792 m              |                       |                       |   |                   |

12 Conveyance Pump chamber water level

```
Roughness coefficient
                                     0.015
         Head losses are calculated using Manning Formula.
         h=n^2*L*v^2/R^4(4/3)
                                  L=
                                                26.0 m
                     where
                                                                                                                    3.810 m)
                     h3=
                                   0.00006 = 0.000 \text{ m}
                                                                           (WL+
                                                                                           440.310 m, depth
                                                                                            436.500 m)
                                                                           (Bottom Level
 8 Head loss of diffusion wall
  Diameter of holes and number of holes; $\phi$ 100@300×300
  Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                                     : Sectional area
                                     2.120 m2
                     D=
                                       100 mmdia.
                     a=
                                        18 pieces
                                                                             436.000 m=
                                                                                             434.06 + 1.94)
                     b=
                                        15 pieces
                                                     (Bottom Level
                     Q=
                                     0.668 m3/sec
                                                                           (Q= 1.337 /2=
                                                                                              0.668)
                     v=Q/A=
                                      0.32 m/sec
                     g==
                                       9.8 m/sec2
                     C=
                                       0.6
                     h5=
                                     0.014 m
                                                          0.020 m
 9 Grit chamber water level
                                                                  440.290 m
10 Head loss of diffusion wall
  Diameter of holes and number of holes; \phi 100@300×300
  Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                     2.543 m2
                                                     : Sectional area
                     D=
                                       100 mmdia.
                                        18 pieces
                     a=
                     b=
                                        18 pieces
                                                     (Bottom Level
                                                                              434.06 m)
                                     0.668 m3/sec
                                                                           (Q= 1.337 /2=
                                                                                               0.668)
                     Q=
                                      0.26 m/sec
                     v=Q/A=
                                        9.8 m/sec2
                     g==
                                       0.6
                     C=
  h5=
               0.010 m
                                     0.010 \ m
                                                                           (WL+
                                                                                            440.280 m, depth
                                                                                                                    6.220 m)
                                                                           (Bottom Level
                                                                                            434.060 m)
11 Head loss of Intake gate
         Dimension of gate; 1500×1500
         Head loss h=v2/(2*g*C^2)
                     A=1.5m*Hm*2=
         where
                                                  4.8 m2 : Sectional area
                                                                           (H=1.60 \text{ m})
                                                                           (Q= 1.337 /2=
                                                                                               0.668)
                     Q=
                                     0.668 m3/sec
                                     0.139 m/sec
                                       9.8 m/sec2
                     C=
                                       0.6
                                                                                                                     7.110 m)
  h6≔
             0.00275 \ m
                                     0.010 m
                                                                           (WL+
                                                                                            440.270 m, depth
```

433.160 m)

(Bottom Level

440.270 m

| Intake facilities                 | water loss                             | (River water   | level +437.6m)               |                        | 1 unit duty                    |          |
|-----------------------------------|--|--|------------------------------|------------------------|--------------------------------|----------|
| 1 River Water Level<br>L.L.W.L.   |  | 437.60 m   |                              |                        |                                |          |
| 2 Intake Flow & Ver<br>Q1=<br>Q2= | osity                                  | 38500 m3/day=<br>77000 m3/day=   | = 0.891                      | m3/sec<br>m3/sec       |                                |          |
| Q3=                               |  | 115500 m3/day=   | = 1.337                      | m3/sec                 |                                |          |
| 3 Bar Screen Loss                 | B=<br>H=<br>b=<br>t=<br>θ=<br>V=<br>H= | 2.00 m<br>1.10 m<br>37.5 mm<br>12.5 mm<br>70 °<br>0.737 m/s<br>0.011 m | ( 37.5 *44=<br>(Bottom Level | 1.650 m)<br>436.500 m) |                                | =0.50m   |
| Threrfore                         | hl=                                    | 0.300 m  |                              | (WL+                   | 437.300 m, depth               | 0.800 m) |
| 4 Head loss of Intake             | e gate                                 |  |                              | (Bottom Level          | 436.500 m) settling            | sou v.sm |
|                                   | of gate; 1500×                         |  |                              |                        |                                |          |
| Head loss h<br>where              | =v2/(2*g*C^2<br>A=1.5m*Hm              |  | .2 m2 : Sectional area       | (H=0.80 m)             |                                |          |
|                                   | Q=<br>v=Q/A=<br>g=                     | 1.337 m3/sec<br>1.114 m/sec<br>9.8 m/sec2                              |                              | (== 0.00 ==)           |                                |          |
|                                   | C=<br>h4=                              | 0.6<br>0.1759 m  | = 0.180 m                    | (WL+<br>(Bottom Level  | 437.120 m, depth<br>436.500 m) | 0.620 m) |
| 5 Rubbish Remover                 | B=<br>H=<br>b=<br>t=<br>θ =<br>V=      | 2.00 m<br>0.62 m<br>20.0 mm<br>3 mm<br>70 °<br>2.450 m/s               | ( 20 *44=<br>(Bottom Level   | 0.880 m)<br>436.500 m) | ·                              |          |
| Threrfore                         | H=<br>h2=                              | 0.041 m<br>0.100 m   |                              | (WL+<br>(Bottom Level  | 437.020 m, depth<br>436.500 m) | 0.520 m) |
| 6 Head loss in the ch             | nannel                                 |  |                              | (BORDIN ECVE)          | 430.300 M)                     |          |
| Q1=                               | 1.337 m3/s                             | sec : Water  | flow of 1 trough             |                        |                                |          |
| Inflow secti                      | onal area                              |  |                              |                        |                                |          |
| A=B*H=                            |  | 1.04 m2  |                              |                        |                                |          |
| where                             | B=<br>H=                               | 2.00 m<br>0.52 m   |                              |                        |                                |          |
| Velocity<br>V(a-b)=Q1/            | 'A=                                    | 1.29 m/sec   |                              |                        |                                |          |
| Hydraulic r. R=A/(B+H*            |  | 0.342 m  |                              |                        |                                |          |
| Roughness                         | coefficient<br>n=                      | 0.015  |                              |                        |                                |          |
| Head losses                       | are calculated                         | using Manning Fo   | rmula.                       |                        |                                |          |
| h=n^2*L*v                         | ^2/R^(4/3)<br>where                    | L= 26  | 5.0 m                        |                        |                                |          |
|                                   | h3=                                    | 0.04040 = 0.0  | 40 <b>m</b>                  | (WL+<br>(Bottom Level  | 436.980 m, depth<br>436.500 m) | 0.480 m) |

```
Diameter of holes and number of holes; \phi 100@300×300
 Head loss h=v2/(2*g*C^2)
 where A=3.14/4*D^2*(a*b)=
                                    1.554 m2
                                                    : Sectional area
                                      100 mmdia.
                    D=
                                       18 pieces
                    a=
                                                                           434.060 m=
                                                                                            434.06 + 0.00)
                    b=
                                       11 pieces
                                                    (Bottom Level
                    Q=
                                     1.337 m3/sec
                                     0.86 m/sec
                                      9.8 m/sec2
                                      0.6
                    h5=
                                    0.105 m
                                                         0.110 m
8 Grit chamber water level
                                                                436.870 m
9 Head loss of diffusion wall
  Diameter of holes and number of holes; $\phi$ 100@300×300
 Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                    0.989 m2
                                                    : Sectional area
                    D=
                                      100 mmdia.
                    a=
                                       18 pieces
                                        7 pieces
                                                                            434.060 m)
                    h=
                                                    (Bottom Level
                                     1.337 m3/sec
                    Q=
                    v=Q/A=
                                      1.35 m/sec
```

#### 10 Head loss of Intake gate

h5=

Dimension of gate; 1500×1500 Head loss h=v2/(2\*g\*C^2) where A=1.5m\*Hm\*2=

g= C=

0.259 m

4.8 m2 : Sectional area (H=1.60 m)Q= 1.337 m3/sec v=Q/A= 0.279 m/sec 9.8 m/sec2 Ċ= 0.6 3.430 m) 0.01099 m 0.020 m (WL+ 436.590 m, depth h6= 433.160 m) (Bottom Level

9.8 m/sec2

0.6

0.260 m

11 Conveyance Pump chamber water level

436.590 m

(WL+

(Bottom Level

2.550 m)

436.610 m, depth

434.060 m)

| Intake facilities                        | water loss                                   | (River water  | level +437.6m)                         |                            | 1 unit duty                             |                       |
|--|--|---|--|----------------------------|---|-----------------------|
| 1 River Water Level<br>L.L.W.L.          |  | 437.600 m   |  |                            |   |                       |
| 2 Intake Flow & Ver<br>Q1=<br>Q2=<br>Q3= | rosity                                       | 38500 m3/day=<br>77000 m3/day=<br>115500 m3/day=            | 0.891                                  | m3/sec<br>m3/sec<br>m3/sec |   |                       |
| 3 Bar Screen Loss                        | B=<br>H=<br>b=<br>t=<br>θ=<br>V=             | 2.00 m<br>1.10 m<br>37.5 mm<br>12.5 mm<br>70 °<br>0.737 m/s | ( 37.5 *44=<br>(Bottom Level           | 1.650 m)<br>436.500 m)     | Including Sed. Depth h=                 | =0.50m                |
| Threrfore                                | H=<br>h1=                                    | 0.011 m<br>0.300 m  |  | (WL+<br>(Bottom Level      | 437.300 m, depth<br>436.500 m) settling | 0.800 m)<br>soil 0.5m |
| 4 Head loss of Intak                     | e gate                                       |   |  |                            |   |                       |
| Head loss h                              | of gate; 1500×<br>=v2/(2*g*C^2)<br>A=1.5m*Hm | )   | 2                                      | (II- 0 00)                 |   |                       |
| where                                    | Q=<br>v=Q/A=<br>g=<br>C=                     | 1.337 m3/sec<br>1.114 m/sec<br>9.8 m/sec2<br>0.6            | 2 m2 : Sectional area                  | (H= 0.80 m)                |   |                       |
|  | h4=  | 0.1759 m  | = 0.180 m                              | (WL+<br>(Bottom Level      | 437.120 m, depth<br>436.500 m)          | 0.620 m)              |
| 5 Rubbish Remover                        | B=<br>H=<br>b=<br>t=<br>θ=<br>V=             | 2.00 m<br>0.62 m<br>20.0 mm<br>3 mm<br>70 °<br>2.450 m/s    | ( 20 *44 <del>=</del><br>(Bottom Level | 0.880 m)<br>436.500 m)     | 150.550 III)                            |                       |
| Threrfore                                | H=<br>h2=                                    | 0.041 m<br>0.100 m  |  | (WL+                       | 437.020 m, depth                        | 0.520 m)              |
| 6 Head loss in the ch                    | nannel                                       |   |  | (Bottom Level              | 436.500 m)                              |                       |
| Q1=                                      | 1.337 m3/s                                   | sec : Water 1   | flow of 1 trough                       |                            |   |                       |
| Inflow secti                             | ional area                                   |   |  |                            |   |                       |
| A=B*H=<br>where                          | B=<br>H=                                     | 1.04 m2<br>2.00 m<br>0.52 m                                 |  |                            |   |                       |
| Velocity<br>V(a-b)=Q1/                   | 'A=  | 1.29 m/sec  |  |                            |   |                       |
| Hydraulic r. R=A/(B+H*                   |  | 0.342 m   |  |                            |   |                       |
| Roughness                                | coefficient<br>n=                            | 0.015   |  |                            |   |                       |
| Head losses                              | are calculated                               | using Manning Fo  | rmula.                                 |                            |   |                       |
| h=n^2*L*v                                | ^2/R^(4/3)<br>where                          | L= 26   | .0 m                                   |                            |   |                       |
|  | h3=  | 0.04040 = 0.04  | 90 m                                   | (WL+<br>(Bottom Level      | 436.980 m, depth<br>436.000 m)          | 0.980 m)              |

```
Diameter of holes and number of holes; $\phi$ 100@300×300
   Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                     1.130 m2
                                                     : Sectional area
                    D=
                                      100 mmdia.
                     a=
                                        18 pieces
                                         8 pieces
                     b=
                                                     (Sedimentation Level
                                                                            435.060 m=
                                                                                            434.06 + 1.0)
                                     1.337 m3/sec
                     Q=
                                      1.18 m/sec
                     v=Q/A=
                     g=
C=
                                       9.8 m/sec2
                                       0.6
                    h5=
                                     0.198 m
                                                          0.200 \ m
 8 Grit chamber water level
                                                                436.780 m
 9 Head loss of diffusion wall
   Diameter of holes and number of holes; $\phi$ 100@300×300
  Head loss h=v2/(2*g*C^2)
   where A=3.14/4*D^2*(a*b)=
                                    0.848 m2
                                                     : Sectional area
                    D=
                                      100 mmdia.
                     a==
                                        18 pieces
                                        6 pieces
                     b=
                                                    (Bottom Level
                                                                            434.060 m)
                     Q=
                                     1.337 m3/sec
                                      1.58 m/sec
                     v=Q/A=
                                       9.8 m/sec2
                                       0.6
               0.352 m
  h5=
                                     0.360 m
                                                                          (WL+
                                                                                          436.420 m, depth
                                                                                                                  2.360 m)
                                                                          (Bottom Level
                                                                                           434.060 m)
10 Head loss of Intake gate
         Dimension of gate; 1500×1500
         Head loss h=v2/(2*g*C^2)
         where
                     A=1.5m*Hm*2=
                                                 4.8 m2 : Sectional area
                                                                        (H=1.60 m)
                     Q=
                                    1.337 m3/sec
                     v=Q/A=
                                    0.279 m/sec
                                       9.8 m/sec2
                                       0.6
  h6=
            0.01099 m
                                    0.020 m
                                                                          (WL+
                                                                                          436.400 m, depth
                                                                                                                  3.240 m)
                                                                                           433.160 m)
                                                                         (Bottom Level
```

11 Conveyance Pump chamber water level

436.400 m

| Intake facilities                        | water loss                                     | (River water                                     | level +437.6m)               |                            | I unit duty                             |                       |
|--|--|--|------------------------------|----------------------------|---|-----------------------|
| 1 River Water Level<br>L.L.W.L.          | l  | 437.60 m   |                              |                            |   |                       |
| 2 Intake Flow & Ver<br>Q1=<br>Q2=<br>Q3= | rosity   | 38500 m3/day=<br>77000 m3/day=<br>115500 m3/day= | 0.891                        | m3/sec<br>m3/sec<br>m3/sec |   |                       |
| 3 Bar Screen Loss                        | B=<br>H=<br>b=<br>t=                           | 2.00 m<br>1.10 m<br>37.5 mm<br>12.5 mm           | ( 37.5 *44=<br>(Bottom Level | 1.650 m)<br>436.500 m)     | Including Sed. Depth ha                 | =0.50m                |
| Threrfore                                | θ =<br>V=<br>H=<br>h1=                         | 70 °<br>0.737 m/s<br>0.011 m<br>0.300 m          |                              | (WL+<br>(Bottom Level      | 437.300 m, depth<br>436.500 m) settling | 0.800 m)<br>soil 0.5m |
| 4 Head loss of Intak                     | e gate   |  |                              |                            |   |                       |
|  | of gate; 1500×1<br>=v2/(2*g*C^2)<br>A=1.5m*Hm= | )  | 2 m2 : Sectional area        | (H=0.80 m)                 |   |                       |
| ·· <del>····</del>                       | Q=<br>v=Q/A=<br>g=                             | 1.337 m3/sec<br>1.114 m/sec<br>9.8 m/sec2        |                              | (2 333 2)                  |   |                       |
|  | C=<br>h4=                                      | 0.6<br>0.1759 m                                  | = 0.180  m                   | (WL+<br>(Bottom Level      | 437.120 m, depth<br>436.500 m)          | 0.620 m)              |
| 5 Rubbish Remover                        | H=<br>b=<br>t=<br>θ =                          | 2.00 m<br>0.62 m<br>20.0 mm<br>3 mm<br>70 °      | ( 20 *44=<br>(Bottom Level   | 0.880 m)<br>436.500 m)     |   |                       |
| Threrfore                                | V=<br>H=<br>h2=                                | 2.450 m/s<br>0.041 m<br>0.100 m                  |                              | (WL+<br>(Bottom Level      | 437.020 m, depth<br>436.500 m)          | 0.520 m)              |
| 6 Head loss in the cl                    | hannel   |  |                              | (DORUM LEVER               | 430.300 My                              |                       |
| Q1=                                      | 1.337 m3/s                                     | ec : Water f                                     | llow of 1 trough             |                            |   |                       |
| Inflow sect                              | ional area                                     |  |                              |                            |   |                       |
| A=B*H=<br>where                          | B=<br>H=                                       | 1.04 m2<br>2.00 m<br>0.52 m                      |                              |                            |   |                       |
| Velocity<br>V(a-b)=Q1                    | /A=  | 1.29 m/sec                                       |                              |                            |   |                       |
| Hydraulic r<br>R=A/(B+H                  |  | 0.342 m  |                              |                            |   |                       |
| Roughness                                | coefficient<br>n=                              | 0.015  |                              |                            |   |                       |
| Head losses                              | s are calculated                               | using Manning For                                | rmula.                       |                            |   |                       |
| h=n^2*L*v                                | ^2/R^(4/3)<br>where                            | L= 26.   | 0 m                          |                            |   |                       |
|  | h3=  | 0.04040 = 0.04                                   | -0 m                         | (WL+<br>(Bottom Level      | 436.980 m, depth<br>436.500 m)          | 0.480 m)              |

```
Diameter of holes and number of holes; $\phi$ 100@300×300
  Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                     0.707 m2
                                                     : Sectional area
                     D=
                                      100 mmdia.
                     a=
                                        18 pieces
                                                                                            434.06 + 1.94)
                                         5 pieces
                                                     (Sedimentation Level
                                                                            436.000 m=
                     b=
                     Q=
                                     1.337 m3/sec
                     v=Q/A=
                                      1.89 m/sec
                     g=
C≔
                                       9.8 m/sec2
                                       0.6
                     h5=
                                     0.507 m
                                                          0.510 m
8 Grit chamber water level
                                                                 436.470 m
9 Head loss of diffusion wall
  Diameter of holes and number of holes; $\phi$ 100@300×300
  Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                     0.707 m2
                                                     : Sectional area
                    D=
                                       100 mmdia.
                                        18 pieces
                     a≕
                                         5 pieces
                     b=
                                                     (Bottom Level
                                                                            434.060 m)
                                     1.337 m3/sec
                     Q=
                                      1.89 m/sec
                     v=Q/A=
                                       9.8 m/sec2
                     g≕
                                       0.6
                                                                          (WL+
                                                                                           435.960 m, depth
                                                                                                                    1.900 m)
  h5=
               0.507 m
                                     0.510 m
                                                                                           434.060 m)
                                                                          (Bottom Level
10 Head loss of Intake gate
         Dimension of gate; 1500×1500
         Head loss h=v2/(2*g*C^2)
```

4.8 m2 : Sectional area

11 Conveyance Pump chamber water level

0.01099 m

Q= v=Q/A=

A=1.5m\*Hm\*2=

1.337 m3/sec

0.279 m/sec 9.8 m/sec2 0.6

0.020 m

where

h6=

435.940 m

(H=1.60 m)

(Bottom Level

435.940 m, depth

433.160 m)

2.780 m)

(WL+

| Intake fac                        | ilities w                      | ater los                              | ss (River                                   | water 1                           | eve.     | l +438.3m)                |                                    |      | 1 unit duty                             |                       |
|-----------------------------------|--------------------------------|---------------------------------------|---|-----------------------------------|----------|---------------------------|------------------------------------|------|---|-----------------------|
| 1 River Wat<br>L.V                | er Level<br>V.L.               |                                       | 438.300                                     | m                                 |          |                           |                                    |      |   |                       |
| 2 Intake Flo<br>Q1:<br>Q2:<br>Q3: | =                              | ity                                   | 77000                                       | m3/day=<br>m3/day=<br>m3/day=     |          | 0.446<br>0.891<br>1.337   | m3/sec<br>m3/sec<br>m3/sec         |      |   |                       |
| 3 Bar Screen                      | n Loss                         | B=<br>H=<br>b=<br>t=<br>θ<br>V=<br>H= | = 1.80<br>= 37.5<br>12.5<br>= 70<br>= 0.450 | m<br>mm<br>mm<br>°<br>m/s         | (<br>(Bo | 37.5 *44=<br>ttom Level . | 1.650 i<br>436.500 i               |      | Including Sed. Depth h                  | =0.50m                |
|                                   | rerfore                        | h I                                   | = 0.300                                     | m                                 |          |                           | (WL+<br>(Bottom Le                 | vel  | 438.000 m, depth<br>436.500 m) settling | 1.500 m)<br>soil 0.5m |
| 4 Head loss                       | of intake g                    |                                       | 0×1500                                      |                                   |          |                           |                                    |      |   |                       |
|                                   | ad loss h≏v<br>ere A<br>C<br>v |                                       | ^2)<br>m=<br>1.337<br>0.810                 | 1.65<br>m3/sec<br>m/sec<br>m/sec2 | 5 m2     | : Sectional area          | a (H= 1.10 s                       | m)   |   |                       |
|                                   | Ċ                              | :=<br>4=                              | 0.6<br>0.0930                               |                                   | =        | 0.100 m                   | (WL+                               |      | 437.900 m, depth                        | 1.400 m)              |
| 5 Rubbish R                       | lemover .                      | B=<br>H-<br>b=<br>t=<br>θ<br>V-       | = 1.40<br>= 20.0<br>3<br>= 70               | mm<br>mm                          | (<br>(Bo | 20 *44=<br>ttom Level     | (Bottom Le<br>0.880 1<br>436.500 1 | m)   | 436.500 m)                              |                       |
| Thr                               | rerfore                        | H=<br>h2                              |   |                                   |          |                           | (WL+<br>(Bottom Le                 | evel | 437.800 m, depth<br>436.500 m)          | 1.300 m)              |
| 6 Head loss                       | in the char                    | mel                                   |   |                                   |          |                           | (Bettom Be                         | .,   | 150.500 му                              |                       |
| QI                                | =                              | 1.337 m                               | 3/sec                                       | : Water f                         | low o    | f 1 trough                |                                    |      |   |                       |
| Inf                               | low section                    | al area                               |   |                                   |          |                           |                                    |      |   |                       |
| A=<br>wh                          | B*H≔<br>ere                    | B=<br>H=                              | = 2.00                                      |                                   |          |                           |                                    |      |   |                       |
|                                   | locity<br>a-b)=Q1/A=           | =                                     | 0.51  | m/sec                             |          |                           |                                    |      |   |                       |
|                                   | draulic radi<br>A/(B+H*2)      |                                       | 0.565                                       | m                                 |          |                           |                                    |      |   |                       |
| Rot                               | ughness co                     | efficient<br>n=                       | = 0.015                                     |                                   |          |                           |                                    |      |   |                       |
| Hea                               | ad losses aı                   | re calculat                           | ed using Ma                                 | nning For                         | mula.    |                           |                                    |      |   |                       |
| h=r                               | n^2*L*v^2<br>v                 | /R^(4/3)<br>where                     | L=  | 26.                               | 0 m      |                           |                                    |      |   |                       |
|                                   | Ь                              | 3=                                    | 0.00331                                     | = 0.00                            | 0 m      |                           | (WL+<br>(Bottom Le                 | evel | 437.800 m, depth<br>436.500 m)          | 1.300 m)              |

```
Diameter of holes and number of holes; $\phi$ 100@300×300
 Head loss h=v2/(2*g*C^2)
                                    0.989 m2
 where A=3.14/4*D^2*(a*b)=
                                                    : Sectional area
                    D=
                                      100 mmdia.
                    a=
                                       18 pieces
                                        7 pieces
                                                                           436.000 m=
                                                                                            434.06 + 1.94)
                    b=
                                                    (Sedimentation Level
                                    1.337 m3/sec
                    Q=
                    v=Q/A=
                                     1.35 m/sec
                    g=
C=
                                      9.8 m/sec2
                                      0.6
                    h5=
                                    0.259 m
                                                         0.260 \ m
8 Grit chamber water level
                                                                437.540 m
9 Head loss of diffusion wall
 Diameter of holes and number of holes; \phi 100@300×300
 Head loss h=v2/(2*g*C^2)
  where A=3.14/4*D^2*(a*b)=
                                    1.272 m2
                                                    : Sectional area
                    D=
                                      100 mmdia.
                                       18 pieces
                    a=
                                        9 pieces
                    b=
                                                                           434.060 m)
                                                    (Bottom Level
                    Q=
                                    1.337 m3/sec
                    v=Q/A=
                                     1.05 m/sec
                                      9.8 m/sec2
                    g=
                    C=
                                      0.6
  h5=
              0.157 m
                                    0.160 m
                                                                         (WL+
                                                                                          437.380 m, depth
                                                                                                                   3.320 m)
                                                                                           434.060 m)
                                                                         (Bottom Level
```

## 10 Head loss of Intake gate

Dimension of gate; 1500×1500 Head loss  $h=v2/(2*g*C^2)$ A=1.5m\*Hm\*2= 4.8 m2 : Sectional area (H= 1.60 m) where 1.337 m3/sec v=Q/A=0.279 m/sec 9.8 m/sec2 0.6 437.360 m, depth 0.01099 m (WL+ 4.200 m) h6= 0.020 m (Bottom Level 433.160 m)

11 Conveyance Pump chamber water level

437.360 m

| Intake facilities                        | water loss  | (River water l   | evel +440.74m)               |                            | 1 unit duty                               |                       |
|--|---|--|------------------------------|----------------------------|---|-----------------------|
| 1 River Water Level<br>H.W.L.            |   | 440.740 m  |                              |                            |   |                       |
| 2 Intake Flow & Ver<br>Q1=<br>Q2=<br>Q3= | rosity  | 38500 m3/day=<br>77000 m3/day=<br>115500 m3/day=                       | 0.446<br>0.891<br>1.337      | m3/sec<br>m3/sec<br>m3/sec |   |                       |
| 3 Head loss of Inlet                     | Orifice   | 110000 m3/day-   | 1.331                        | morsec                     |   |                       |
| where                                    | A=a*b=  | 11 m2  | : Sectional area             |                            |   |                       |
|  | a=<br>b==<br>Q=<br>v=Q/A=   | 6 m<br>1.9 m<br>1.337 m3/sec<br>0.12 m/sec                             | (Sedimentation Level         | 436.500 m=                 | 436.000 #######                           |                       |
|  | g=<br>C=<br>h5=   | 9.8 m/sec2<br>0.6<br>0.0019 m =  | 0.000 m                      | (WL+<br>(Bottom Level      | 440.740 m, depth<br>436.500 m)            | 4.240 m)              |
| 4 Bar Screen Loss                        | B=<br>H=<br>b=<br>t=<br>V=<br>V=<br>H=                                | 2.00 m<br>4.24 m<br>37.5 mm<br>12.5 mm<br>70 °<br>0.191 m/s<br>0.001 m | ( 37.5 *44=<br>(Bottom Level | 1.650 m)<br>436.50 m)      |   |                       |
| Threrfore                                | hl=   | 0.300 m  |                              | (WL+<br>(Bottom Level      | 440.440 m, depth<br>436.500 m) settling s | 3.940 m)<br>soil 0.5m |
| 5 Head loss of Intak                     | e gate  |  |                              | (2011)                     |   |                       |
|  | of gate; 1500×:<br>=v2/(2*g*C^2)<br>A=1.5m*Hm=<br>Q=<br>v=Q/A=<br>g== | )  | 5 m2 : Sectional area        | (H=1.10 m)                 |   |                       |
|  | C=<br>h4=   | 0.6<br>0.0930 m  | = 0.100 m                    | (WL+<br>(Bottom Level      | 440.340 m, depth<br>436.500 m)            | 3.840 m)              |
| 6 Rubbish Remover                        | B=<br>H=<br>b=<br>t=<br>θ=<br>V=                                      | 2.00 m<br>3.84 m<br>20.0 mm<br>3 mm<br>70 °<br>0.396 m/s               | ( 20 *44=<br>(Bottom Level   | 0.880 m)<br>436.500 m)     |   |                       |
| Threrfore                                | H=<br>h2=   | 0.001 m<br>0.100 m   |                              | (WL+<br>(Bottom Level      | 440.240 m, depth<br>436.500 m)            | 3.740 m)              |
| 7 Head loss in the ch                    | nannel  |  |                              | •                          | ·   |                       |
| Q1=                                      | 1.337 m3/s  | ec : Water fl  | ow of 1 trough               |                            |   |                       |
| Inflow secti                             | ional area  |  |                              |                            |   |                       |
| A=B*H=<br>where                          | B=<br>H=  | 7.48 m2<br>2.00 m<br>3.74 m  |                              |                            |   |                       |
| Velocity<br>V(a-b)=Q1/                   | 'A=   | 0.18 m/sec   |                              |                            |   |                       |
| Hydraulic r<br>R=A/(B+H                  |   | 0.789 m  |                              |                            |   |                       |

12 Conveyance Pump chamber water level

```
Roughness coefficient
                                     0.015
         Head losses are calculated using Manning Formula.
         h=n^2*L*v^2/R^4(4/3)
                     where
                                  L=
                                                 26.0 m
                     h3 =
                                   0.00026
                                             = 0.000 \text{ m}
                                                                            (WL+
                                                                                            440.240 m, depth
                                                                                                                     3.740 m)
                                                                            (Bottom Level
                                                                                             436.500 m)
 8 Head loss of diffusion wall
   Diameter of holes and number of holes; \phi 100@300×300
   Head loss h=v2/(2*g*C^2)
   where A=3.14/4*D^2*(a*b)=
                                      2.120 m2
                                                      : Sectional area
                     D=
                                        100 mmdia.
                                         18 pieces
                     a=
                                         15 pieces
                                                      (Sedimentation Level
                                                                              436.000 m=
                                                                                              434.06 + 1.94)
                                      1.337 m3/sec
                                       0.63 m/sec
                     g=
C=
                                        9.8 m/sec2
                                        0.6
                     h5=
                                      0.056 m
                                                           0.060 m
 9 Grit chamber water level
                                                                  440.180 m
10 Head loss of diffusion wall
   Diameter of holes and number of holes; $\phi$ 100@300×300
   Head loss h=v2/(2*g*C^2)
   where A=3.14/4*D^2*(a*b)=
                                      2.543 m2
                                                      : Sectional area
                     \mathbf{D} =
                                        100 mmdia.
                     a=
                                         18 pieces
                                         18 pieces
                                                                              434.060 m)
                     b=
                                                      (Bottom Level
                                      1.337 m3/sec
                                       0.53 m/sec
                                        9.8 m/sec2
                                        0.6
                                                                                             440.140 m, depth
                                      0.040 m
                                                                            (WL+
                                                                                                                      6.080 m)
   h5=
               0.039 m
                                                                            (Bottom Level
                                                                                             434.060 m)
11 Head loss of Intake gate
         Dimension of gate; 1500×1500
         Head loss h=v2/(2*g*C^2)
         where
                     A=1.5m*Hm*2=
                                                  4.8 m2 : Sectional area (H= 1.60 m)
                                      1.337 m3/sec
                     Q=
                     v=O/A=
                                      0.279 m/sec
                                        9.8 m/sec2
                     g==
                                        0.6
                     C=
             0.01099 m
                                      0.020 m
                                                                            (WL+
                                                                                             440.120 m, depth
                                                                                                                      6.960 m)
   h6=
```

(Bottom Level

440.120 m

433.160 m)

|--|

| St.No.         | S.D.   | A.D.    | G.L.         | Pipe Dia. | H.G.    | W.L.L. | W.L.   | Min.soil Coverage         | A.D. of L.S. | Remark                     |     |
|----------------|--------|---------|--------------|-----------|---------|--------|--------|---------------------------|--------------|----------------------------|-----|
|                | (m)    | (m)     | (m)          | (mm)      |         | (m)    | (m)    | of Pipe (m)               | (m)          | <u> </u>                   |     |
| Balancing Tank |        |         | (HWL+476.00) |           |         |        |        |                           |              | Balancing Tank             |     |
| 28-22.00       | 0.00   | 0.00    | 475.00       | 1000      | 0.00048 | 0.000  | 475.99 | -0.99                     | 537.14       | Loss etc. 0.008 m          |     |
| 28+0.00        | 22.00  | 22.00   | 472.69       | 0001      | 0.00048 | 0.011  | 475.98 | -3.29                     | 559.14       |                            |     |
| 30+0.00        | 41.67  | 63.67   | 472.60       | 1000      | 0.00048 | 0.020  | 475.96 | -3.36                     | 600.81       |                            |     |
| 41+0.00        | 179.50 | 243.17  | 475.42       | 1000      | 0.00048 | 0.086  | 475.88 | -0.46                     | 780.31       |                            |     |
| 50+0.00        | 118.52 | 361.69  | 477.60       | 1000      | 0.00048 | 0.057  | 475.82 | 1.78                      | 898.83       | l                          |     |
| 51+0.00        | 41.00  | 402.69  | 477.48       | 1000      | 0.00048 | 0.020  | 475.80 | 20 00 00 00 00 00 00 1.68 | 939.83       | [                          |     |
| 53+7.00        | 45.80  | 448.49  | 475.26       | 1000      | 0.00048 | 0.022  | 475.78 | -0.52                     | 985.63       |                            |     |
| 67+0.00        | 273.32 | 721.81  | 468.09       | 800       | 0.00141 | 0.385  | 475.39 | -7.30                     | 1258.95      | l                          |     |
| 76+0.00        | 67.50  | 789.31  | 455.62       | 800       | 0.00141 | 0.095  | 475.30 | -19.68                    | 1326.45      | Valve Loss etc. 11.07067 m |     |
| 86+0.00        | 95.40  | 884.71  | 461.15       | 800       | 0.00141 | 0.135  | 475.16 | +14.01                    | 1421.85      |                            |     |
| 105+0.00       | 186.60 | 1071.31 | 446.50       | 800       | 0.00141 | 0.263  | 474.90 | -28.40                    | 1608.45      |                            |     |
| 105+85.00      | 91.00  | 1162.31 | (HWL+451.82) | 800       | 0.00141 | 0.128  | 463.70 | -11.88                    | 1696.45      | Distribution Chamber       |     |
|                |        |         | 446.50       |           |         | ĺĺ     |        |                           |              | Horizontal Pipe distance   | 3 τ |
| ļ              |        |         |              |           |         | i      |        |                           |              | Valve Loss etc. 11.07067 m |     |
|                |        |         |              |           |         |        |        | 23.371                    |              |                            |     |

2.Phase 2

| St.No.         | S.D.   | A.D.    | G.L.         | Pipe Dia. | H.G.    | W.L.L. | W.L.   | Min.soil Coverage | A.D. of L.S. | Remark                                |     |
|----------------|--------|---------|--------------|-----------|---------|--------|--------|-------------------|--------------|---------------------------------------|-----|
|                | (m)    | (m)     | (m)          | (mm)      |         | (zz)   | (m)    | of Pipe (m)       | (m)          |                                       |     |
| Balancing Tank |        |         | (HWL+476.00) |           |         |        |        |                   |              | Balancing Tank                        |     |
| 28-22.00       | 0.00   | 0.00    | 475.00       | 1000      | 0.00172 | 0.000  | 476.00 | -1.00             | 537.14       | Loss etc. 0.033 tn                    |     |
| 28+0.00        | 22.00  | 22.00   | 472.69       | 1000      | 0.00172 | 0.638  | 475.96 | -3.27             | 559.14       |                                       |     |
| 30+0.00        | 41.67  | 63.67   | 472.60       | 1000      | 0.00172 | 0.072  | 475.89 | -3.29             | 600.81       |                                       |     |
| 41+0.00        | 179.50 | 243.17  | 475.42       | 1000      | 0.00172 | 0.309  | 475.58 | -0.16             | 780.31       |                                       |     |
| 50+0.00        | 118,52 | 361.69  | 477,60       | 1000      | 0.00172 | 0.204  | 475.38 | 2.22              | 898.83       |                                       |     |
| 51+0.00        | 41.00  | 402.69  | 477.48       | 1000      | 0.00172 | 0.071  | 475.31 | 2.17              | 939.83       |                                       |     |
| 53+7.00        | 45,80  | 448.49  | 475.26       | 1000      | 0.00172 | 0.079  | 475.23 | 0.03              | 985.63       |                                       |     |
| 67+0.00        | 273.32 | 721.81  | 468.09       | 800       | 0.00510 | 1.394  | 473.83 | -5.74             | 1258.95      |                                       |     |
| 76+0.00        | 67.50  | 789.31  | 455.62       | 800       | 0.00510 | 0.344  | 466.22 | -10.60            | 1326.45      | Valve Loss etc. 7.274753 m            |     |
| 86+0.00        | 95.40  | 884.71  | 461.15       | 800       | 0.00510 | 0.487  | 465.73 | -4.58             | 1421.85      |                                       |     |
| 105+0.00       | 186.60 | 1071.31 | 446.50       | 800       | 0.00510 | 0.952  | 464.78 | -18.28            | 1608.45      |                                       |     |
| 105+85.00      | 91.00  | 1162.31 | (HWL+451.82) | 800       | 0.00510 | 0.464  | 451.72 | 0.10              | 1696.45      | Distribution Chamber                  |     |
|                |        | i       | 446.50       |           |         |        | i      |                   |              | Horizontal Pipe distance              | 3 : |
|                |        | [       |              |           |         |        |        |                   |              | Valve Loss etc. 12.59775 m            |     |
|                |        |         |              |           |         | •      |        | 24.317            |              | · · · · · · · · · · · · · · · · · · · |     |

| St.No.         | S.D.   | A.D.    | G.L.         | Pipe Dia. | H.G.    | W.L.L. | W.L.   | Min.soil Coverage | A.D. of L.S. | Remark                     |
|----------------|--------|---------|--------------|-----------|---------|--------|--------|-------------------|--------------|----------------------------|
|                | (m)    | (m)     | (m)          | (mm)      |         | (m)    | (m)    | of Pipe (m)       | (m)          |                            |
| Balancing Tani | 4      |         | (HWL+476.00) | 1         |         |        |        |                   |              | Balancing Tank             |
| 28-22.00       | 0.00   | 0.00    | 475.00       | 1000      | 0.00364 | 0.000  | 475.93 | -0.93             | 537.14       | Loss etc. 0.074 m          |
| 28+0.00        | 22.00  | 22.00   | 472.69       | 1000      | 0.00364 | 0.080  | 475.85 | -3.16             | 559.14       |                            |
| 30+0.00        | 41.67  | 63.67   | 472.60       | 1000      | 0.00364 | 0.152  | 475.69 | -3.09             | 600.81       |                            |
| 41+0.00        | 179.50 | 243.17  | 475.42       | 1000      | 0.00364 | 0.653  | 475.04 | 0.38              | 780.31       |                            |
| 50+0.00        | 118.52 | 361.69  | 477.60       | 1000      | 0.00364 | 0.431  | 474,61 | 2.99              | 898.83       |                            |
| 51+0.00        | 41.00  | 402.69  | 477.48       | 1000      | 0.00364 | 0.149  | 474.46 | 3.02              | 939.83       |                            |
| 53+7.00        | 45.80  | 448.49  | 475.26       | 1000      | 0.00364 | 0.167  | 474.29 | 0.97              | 985.63       |                            |
| 67+0.00        | 273.32 | 721.81  | 468.09       | 800       | 0.01079 | 2.949  | 471.34 | -3.25             | 1258.95      |                            |
| 76+0.00        | 67.50  | 789.31  | 455.62       | 800       | 0.01079 | 0.728  | 467.48 | -11.86            | 1326.45      | Valve Loss etc. 3.132 m    |
| 86+0.00        | 95.40  | 884.71  | 461.15       | 800       | 0.01079 | 1.029  | 466.45 | -5.30             | 1421.85      |                            |
| 105+0.00       | 186.60 | 1071.31 | 446.50       | 800       | 0.01079 | 2.013  | 464.44 | -17.94            | 1608.45      |                            |
| 105+85.00      | 91.00  | 1162,31 | (HWL+451.82) | 800       | 0.01079 | 0.982  | 451.68 | 0.14              | 1696.45      | Distribution Chamber       |
|                |        |         | 446.50       |           |         | I      |        |                   |              | Horizontal Pipe distance   |
|                | 1      |         |              |           |         |        |        | 23.497            |              | Valve Loss etc. 11.77611 m |

(110000\*1.05\*(1/3)) (110000\*1.05\*(2/3)) (110000\*1.05)

0.446 m3/s 0.891 m3/s 1.337 m3/s

Phasel Phase2 Phase3 Q1= Q2= Q3= Pipe Friction Factor c=

38500 m3/d = 77000 m3/d = 115500 m3/d =

Note

St.No.: Station Number
S.D.: Single Distance
A.D.: Accumulated Distance
G.L.: Ground Level
H.G.: Hydraulic Gradient
W.L.L.: Water Level Loss
H.W.L.: Hydraulic Water Level
H.P.: Hydrodynamic Pressure
A.D. of L.S.: Accumulate Distance of Longitudinal Section

2-22

Water Treatment Inlet valve cavitation Incase of using butterfly valve)

1.Total flow

Phase1 Q1= 38500 m3/d = 1604 m3/h (110000\*1.05\*(1/3)) Phase2 Q2= 77000 m3/d = 3208 m3/h (110000\*1.05\*(2/3)) Phase3 Q3= 115500 m3/d = 4813 m3/h (110000\*1.05)

2. Water level

 Balancing tank HWL
 476.000 m

 Balancing tank LWL
 474.980 m

 Inlet water level of Distribution Chamber
 451.680 m

 Valve No.2 center level
 454.199 m
 (455.62-1.0-0.842/2)

 Valve No.3 level
 445.079 m
 (446.5-1.0-0.842/2)

3. Valve Diameter and flow velocity

| Valve Diameter (mm) | Flow    | velosity (m/ | sec)   |
|---------------------|---------|--------------|--------|
|                     | Phase 1 | Phase2       | Phase3 |
| 300                 | 6.31    | 12.61        | 18.92  |
| 350                 | 4.63    | 9.27         | 13.90  |
| 400                 | 3.55    | 7.10         | 10.64  |
| 500                 | 2.27    | 4,54         | 6.81   |
| 600                 | 1.58    | 3.15         | 4.73   |
| 700                 | 1.16    | 2.32         | 3.48   |
| 800                 | 0.89    | 1.77         | 2.66   |

#### 4.Phase3

| Inlet Loss         | (Diameter | 1000 mm). f= | 0.5        | V(Q3)=   | 1.70 m/s       | h=    | 0.074 m | Subtotal<br>0.074 m |
|--------------------|-----------|--------------|------------|----------|----------------|-------|---------|---------------------|
| Reducer Loss       | (Diameter | 800 600 n    | ım), f=    | 0        | V(Q3)= 2.66 m  | /s h= | 0.000 m | Subtotal            |
| Valve 1 Loss       | (Diameter | 600 mm), f=  | 2.58 (60°) | V(Q3)=   | 4.73 m/s       | h=    | 2.945 m | 3.132 m             |
| Orifice 1 Loss     | (Diameter | 600 mm), f=  | 0          | a/A=1    | V(Q3)= 4.73 m. | /sh≔  | 0.000 m | i i                 |
| Reducer Loss       | (Diameter | 800 600 n    | ım), f=    | 0.5      | V(Q3)= 2.66 m  | /s h= | 0.187 m |                     |
| Reducer Loss       | (Diameter | 800 600 п    | un). f=    | 0        | V(Q3)= 2.66 m  | /s h= | 0.000 m | Subtotal            |
| Valve 2 Loss       | (Diameter | 600 mm), f=  | 5.6 (53°)  | V(Q3)=   | 4.73 m/s       | h=    | 6.392 m | 11.776 m            |
| Orifice 2 Loss     | (Diameter | 600 mm), f≕  | 4.24       | a/A=0.70 | V(Q3)= 4.73 m  | /s h= | 4.836 m |                     |
| Reducer Loss       | (Diameter | 800 600 п    | ım)⊾f≔     | 0.5      | V(Q3)= 2.66 m  | /sh≕  | 0.187 m | i I                 |
| Outlet Loss        | (Diameter | 800 mm), f≕  | 1.0        | V(Q3)≃   | 2.66 m/s       | h=    | 0.361 m |                     |
| Pipe Friction Loss | (Diameter | 1000 mm), I= | 0.00364    | L=       | 448.49 m       | h=    | 1.633 m | Subtotal            |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.01079    | L=       | 340.82 m       | h=    | 3.677 m | 9.334 m             |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.01079    | L=       | 313.00 m       | h=    | 3.377 m |                     |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.01079    | L=       | 60.00 m        | h=    | 0.647 m | ļ j                 |

Q=1.0

Total h= 24.316 m where c= 100 Q3= 115500 m3/d= 1.337 m3/sec

#### 1 Cavitation coefficient and opening degree of valve No.1

Cavitation coefficient

ρ =(H2+10)/(H1-H2) H1= 16

where H1= 16.417 m :Hydrostatic head of upstream of valve H2= 13.471 m :Hydrostatic head of downstream of valve

 $\Delta$  H=H1-H2= 2.95 m :Head loss of valve

ρ=(H2+10)/(H1-H2)= 7.97 (>2.5-3.0) No Cavitation OK

Capacity coefficient (Cv)

Cv=1.167\*Q3\*(G/\(\Delta\)P)^0.5

where Q3= 4813 m3/h (110000\*1.05/24)

G= 10.0 m3/m2 (1kg/cm2)

 $\Delta P = 3 \text{ m}^3/\text{m}^2 : \text{H1-H2} = 2.95 \text{ m}$ 

Cv=1.167\*Q3\*(G/\Delta P)^0.5= 10347

Opening degree of valve

. θ = 60°

2-23

2 Orifice No.1 (No need Orifice)

where  $\rho = (H2+10)/(H1-H2+(V^2)/2/g))$ V = H1 = 13.472 m :Hydrostatic head of upstream of valve H2 = 13.471 m :Hydrostatic head of downstream of valve

 $\Delta$  H=H1-H2= 0.001 m :Head loss of valve

3 Cavitation coefficient and opening degree of valve No.2 (600mm)

Cavitation coefficient

 $\rho = (H2+10)/(H1-H2)$ 

where H1= 19.028 m :Hydrostatic head of upstream of valve H2= 12.635 m :Hydrostatic head of downstream of valve

 $\Delta$  H=H1-H2= 6.39 m :Head loss of valve

 $\rho = (H2+10)/(H1-H2)=$  3.54 (>2.5-3.0) No Cavitation OK

Capacity coefficient (Cv)

Cv=1.167\*Q3\*(G/ΔP)^0.5

where Q3= 4813 m3/h (110000\*1.05/24)

G= 10.0 m3/m2 (1kg/cm2) Δ P= 6.39 m3/m2 :H1-H2= 6.39 m

Cv=1.167\*Q3\*(G/ΔP)^0.5= 7024

Opening degree of valve

5

4 Orifice No.2

 $\rho = (H2+10)/(H1-H2+(V^2/2/g))$ 

where HI= 12.636 m :Hydrostatic head of upstream of valve H2= 7.799 m :Hydrostatic head of downstream of valve

 $\Delta$  H=H1-H2= 4.84 m :Head loss of valve

Distribution Chamber water level 451.683 m (476.000 - 24.317) >451.680 m

#### 5.Phase2

| Inlet Loss         | (Diameter | 1000 mm), f= | 0.5       | V(Q3)=  | 1.14 m/s        | h=    | 0.033 m | Subtotal |
|--------------------|-----------|--------------|-----------|---------|-----------------|-------|---------|----------|
| İ                  |           |              |           |         |                 |       |         | 0.033 m  |
| Reducer Loss       | (Diameter | 800 600      | mm), f=   | 0       | V(Q3)= 1.77 m   | /s h= | 0.000 m | Subtotal |
| Valve 1 Loss       | (Diameter | 600 mm), f=  | 2.8 (59°) | V(Q3)=  | 3.15 m/s        | h=    | 1.418 m | 7.275 m  |
| Orifice I Loss     | (Diameter | 600 mm), f=  | 11.40     | a/A=0.6 | V(Q3)= 3.15 m   | /s h≕ | 5.774 m |          |
| Reducer Loss       | (Diameter | 800 600      | mm). f=   | 0.5     | V(Q3)= 1.77 m   | /s h= | 0.083 m | Į l      |
| Reducer Loss       | (Diameter | 800 600      | mm)、f≔    | 0       | V(Q3)= 1.77 m   | /sh≕  | 0.000 m | Subtotal |
| Valve 2 Loss       | (Diameter | 600 mm), f=  | 13 (31°)  | V(Q3)=  | 3.15 m/s        | h=    | 6.581 m | 12.598 m |
| Orifice 2 Loss     | (Diameter | 600 mm), f=  | 11.40     | a/A=0.6 | V(Q3)= 3.15 m   | /s h= | 5.774 m | ; t      |
| Reducer Loss       | (Diameter | 800 600      | mm)、f=    | 0.5     | V(Q3) = 1.77  m | /s h= | 0.083 m | }        |
| Outlet Loss        | (Diameter | 800 mm), f=  | 1.0       | V(Q3)=  | 1.77 m/s        | h=    | 0.160 m | J        |
| Pipe Friction Loss | (Diameter | 1000 mm), I= | 0.00172   | L=      | 448.49 m        | h≕    | 0.771 m | Subtotal |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.0051    | L=      | 340.82 m        | h=    | 1.738 m | 4.411 m  |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.0051    | L≒      | 313.00 m        | h=    | 1.596 m | 1        |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.0051    | L=      | 60.00 m         | h≕    | 0.306 ш | <u> </u> |
| - Tr. 1            |           | 1 24217      |           |         |                 |       |         |          |

Total h= 24.317 m
where c= 100
Q2= 77000 m3/d= 0.891 m3/sec

1 Cavitation coefficient and opening degree of valveNo.1

Cavitation coefficient

 $\rho = (H2+10)/(H1-H2)$ 

where H1= 19.259 m :Hydrostatic head of upstream of valve
H2= 17.841 m :Hydrostatic head of downstream of valve
Δ H=H1-H2= 1.42 m :Head loss of valve

ρ=(H2+10)/(H1-H2)= 19.63 (>2.5-3.0) No Cavitation OK

Capacity coefficient (Cv)

Cv=1.167\*Q3\*(G/ \( \Delta \) P)^0.5

here Q2= 3208 m3/h (110000\*1.05\*(2/3)/24)

G= 10.0 m3/m2 (1kg/cm2)

 $\Delta P = 1 \text{ m}^3/\text{m}^2$  :H1-H2= 1.42 m

Cv=1.167\*Q3\*(G/\Delta P)^0.5= 9941

Opening degree of valve

*θ* = 59°

2 Orifice No.1  $\rho = (H2+10)/(H1-H2+(V^2/2/g))$ 

where H1= 17.841 m :Hydrostatic head of upstream of valve H2= 12.067 m :Hydrostatic head of downstream of valve  $\Delta$  H=H1-H2= 5.77 m :Head loss of valve

3 Cavitation coefficient and opening degree of valveNo.2 (600mm)

Cavitation coefficient

 $\rho = (H2+10)/(H1-H2)$ 

where H1= 19.508 m :Hydrostatic head of upstream of valve
H2= 12.927 m :Hydrostatic head of downstream of valve

 $\Delta$  H=H1-H2= 6.58 m :Head loss of valve

 $\rho = (H2+10)/(H1-H2)=$  3.48 (>2.5-3.0) No Cavitation OK

Capacity coefficient (Cv)

Cv=1.167\*Q3\*(G/ΔP)^0.5

where Q2= 3208 m3/h (110000\*1.05\*(2/3)/24)

G= 10.0 m3/m2 (1kg/cm2) Δ P= 6.58 m3/m2 :H1-H2= 6.58 m

 $Cv=1.167*Q3*(G/\Delta P)^0.5=$  4615

Opening degree of valve

θ= 31°

**0**∸ 5.

4 Orifice No.2

 $\rho = (H2+10)/(H1-H2+(V^2/2/g))$ 

where H1= 12.927 m :Hydrostatic head of upstream of valve H2= 7.153 m :Hydrostatic head of downstream of valve  $\Delta$  H=H1-H2= 5.77 m :Head loss of valve

Distribution Chamber water level 451.683 m (476.000 - 24.317) >451.680 m

#### 6.Phase1

| Inlet Loss         | (Diameter | 1000 mm), f= | 0.5       | V(Q3)=     | 0.57 m/s        | h=         | 0.008 m  | Subtotal<br>0.008 m |
|--------------------|-----------|--------------|-----------|------------|-----------------|------------|----------|---------------------|
| Reducer Loss       | (Diameter | 800 600      | mm)、f=    | 0          | V(Q3)= 0.89 n   | o/s h=     | 0.000 m  | Subtotal            |
| Valve 1 Loss       | (Diameter | 600 mm), f=  | 7 (49°)   | V(Q3)==    | 1.58 m/s        | h=         | 0.892 m  | 12.009 m            |
| Orifice 1 Loss     | (Diameter | 600 mm), f=  | 87.12     | a/A=0.4    | V(Q3) = 1.58  m | ı/s h=     | 11.096 m | l l                 |
| Reducer Loss       | (Diameter | 800 600      | mm)、f=    | 0.5        | V(Q3) = 0.89  m | ı/sh≕      | 0.021 m  | l i                 |
| Reducer Loss       | (Diameter | 800 600      | mm)、f=    | 0          | V(Q3)= 0.89 n   | 1/s h=     | 0.000 m  | Subtotal            |
| Valve 2 Loss       | (Diameter | 600 mm), f=  | 8.6 (47°) | V(Q3)=     | 1.58 m/s        | <b>h</b> ≕ | 1.095 m  | 11.071 m            |
| Orifice 2 Loss     | (Diameter | 600 mm), f=  | 77.84     | a/A=0.41   | V(Q3)≈ 1.58 n   | 1/s h=     | 9.915 m  | l - {               |
| Reducer Loss       | (Diameter | 800 600      | mm)、f≔    | 0.5        | V(Q3)= 0.89 n   | 1/s h=     | 0.021 m  | 1                   |
| Outlet Loss        | (Diameter | 800 mam), f≔ | 1.0       | V(Q3)=     | 0.89 m/s        | h=         | 0.040 m  | <b>إ</b>            |
| Pipe Friction Loss | (Diameter | 1000 mm), I= | 0.00048   | L=         | 448.49 m        | h=         | 0.215 m  | Subtotal            |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.00141   | L=         | 340.82 m        | h=         | 0.481 m  | 1.222 m             |
| Pipe Friction Loss | (Diameter | 800 mm), I≕  | 0.00141   | L=         | 313.00 m        | h=         | 0.441 m  | 1 1                 |
| Pipe Friction Loss | (Diameter | 800 mm), I=  | 0.00141   | <b>L</b> = | 60.00 m         | h≃         | 0.085 m  | ]                   |
| Total              |           | h= 24.309    | m         | -          |                 |            |          |                     |

where c= 100 Q2= 38500 m3/d= 0.446 m3/sec

1 Cavitation coefficient and opening degree of valve No.1 (600mm)

Cavitation coefficient

where

 $\rho = (H2+10)/(H1-H2)$ 

H1= 21.097 m :Hydrostatic head of upstream of valve H2= 20.204 m :Hydrostatic head of downstream of valve

 $\Delta$  H=H1-H2= 0.89 m :Head loss of valve

 $\rho$ =(H2+10)/(H1-H2)= 33.84 (>2.5-3.0) No Cavitation OK

Capacity coefficient (Cv)

Cv=1.167\*Q3\*(G/\Delta P)^0.5

where QI = 1604 m3/h (110000\*1.05\*(1/3)/24)

G= 10.0 m3/m2 (1kg/cm2)

 $\Delta P = 0.89 \text{ m}^3/\text{m}^2 : \text{H}^3 - \text{H}^2 = 0.89 \text{ m}^3$ 

 $Cv=1.167*Q3*(G/\Delta P)^0.5=$  6266

Opening degree of valve

θ = 49°

2 Orifice No.1

 $\rho = (H2+10)/(H1-H2+(V^2/2/g))$ 

where H1= 20.205 m :Hydrostatic head of upstream of valve H2= 9.109 m :Hydrostatic head of downstream of valve

Δ H=H1-H2= 11.10 m :Head loss of valve

3 Cavitation coefficient and opening degree of valve No.2 (600mm)

Cavitation coefficient

ρ =(H2+10)/(H1-H2) H1= 17. H2= 16. :Hydrostatic head of upstream of valve :Hydrostatic head of downstream of valve where 17.767 m 16.672 m

 $\Delta$  H=H1-H2= 1.10 m :Head loss of valve

 $\rho = (H2+10)/(H1-H2)=$ 24.34 (>2.5-3.0) No Cavitation OK

Capacity coefficient (Cv)

where (110000\*1.05\*(1/3)/24)

Cv=1.167\*Q3\*(G/ΔP)^0.5 Q1= 1604 m3/h (11000 G= 9.102 m3/m2 (1kg/cm2)

Δ P= 1.10 m3/m2 :H1-H2=

Cv=1.167\*Q3\*(G/\Delta P)^0.5= 5396

Opening degree of valve

47° θ—

4 Orifice No.2

ρ =(H2+10)/(H1-H2+(V^2/2/g)) H1= 16.672 --16.672 m :Hydrostatic head of upstream of valve where H2= 6.757 m :Hydrostatic head of downstream of valve

Δ H=H1-H2= 9.92 m :Head loss of valve

Distribution Chamber water level 451.690 m (476.000 -24.310) >451.680 m Pressure Dissipation with orifice and cavitations coefficient Cavitations

Phase 3

Q3= 115500

m3/d=

1.337 m3/s

Proposed Orifice No.2 Diameter

| Orifice Dia. | Pipe Dia. | Coefficient | Flow velocity   | Flow velocity      |            |        |         |      |        |                       |      |      |
|--------------|-----------|-------------|-----------------|--------------------|------------|--------|---------|------|--------|-----------------------|------|------|
| d (mm)       | D (mm)    | d/D         | in Pipe V (m/s) | in Orifice V (m/s) | β =(d/D) 2 |        | a       | Δħσ  | k      | Δω≃Δh <sub>o</sub> *k | . ₹。 | σc   |
| 420          | 600       | 0.7         | 4.73            | 9.65               | 0.4900     | 0.6953 | 0.13847 | 9.83 | 0.4917 | 4.836                 | 4.24 | 2.31 |

| ſ |        |       |           | Ca   | Cavitation Coefficient |                    |    |  |  |  |
|---|--------|-------|-----------|------|------------------------|--------------------|----|--|--|--|
| ı | Hl     | H2    | V^2/(2*g) | K0   | K0 (without V^2/(2*g)) | 1                  |    |  |  |  |
|   | 12.636 | 7.799 | 1.142     | 2.98 | 3.68                   | σc<=K <sub>0</sub> | OK |  |  |  |

Phase 2

Q2=

77000

m3/d=

0.891 m3/s

Proposed Orifice No.1 & No.2 Diameter

| 1 | Orifice Dia. | Pipe Dia. | Coefficient | Flow velocity   | Flow velocity      |                   |        |         |                 |        |                       |       | 1    |
|---|--------------|-----------|-------------|-----------------|--------------------|-------------------|--------|---------|-----------------|--------|-----------------------|-------|------|
|   | d (mm)       | D (mm)    | d/D         | in Pipe V (m/s) | in Orifice V (m/s) | $\beta = (d/D)^2$ | α      | a       | Δh <sub>o</sub> | k      | Δω=Δh <sub>0</sub> *k | ξ.    | σο   |
| ı | 360          | 600       | 0.6         | 3.15            | 8.76               | 0.3600            | 0.6490 | 0.10174 | 9.29            |        | 5.774                 | 11.38 | 1.98 |
| 1 | 360          | 600       | 0.6         | 3.15            | 8.76               | 0.3600            | 0.6490 | 0.10174 | 9.29            | 0.6212 | 5.774                 | 11.38 | 1.98 |

| 1      |        |           | Ca   | Ì                      |        |     |
|--------|--------|-----------|------|------------------------|--------|-----|
| Hl     | H2     | V^2/(2*g) | K0   | K0 (without V^2/(2*g)) | 1      |     |
| 17.841 | 12.067 | 0.507     | 3.51 | 3.82                   | 1      |     |
| 12.927 | 7.153  | 0.507     | 2.73 | 2.97                   | σc<=K₀ | QK. |

Phase 1

Qt=

38500

m3/d=

0.446 m3/s

Proposed Orifice No.1 & No.2 Diameter

| Orifice Dia. | Pipe Dia. | Coefficient | Flow velocity   | Flow velocity      |            |        |         |                 |        |                       |       |      |
|--------------|-----------|-------------|-----------------|--------------------|------------|--------|---------|-----------------|--------|-----------------------|-------|------|
| d (mm)       | D (mm)    | d/D         | in Pipe V (m/s) | in Orifice V (m/s) | β =(d/D) 2 | α      | a       | Δh <sub>o</sub> | k      | Δω=Δh <sub>o</sub> *k | ξņ    | σc   |
| 240          | 600       | 0.4         | 1.58            | 9.85               | 0.1600     | 0.6063 | 0.04522 | 13.48           | 0.8231 | 11.096                | 87.47 | 1.32 |
| 246          | 600       | 0.41        | 1.58            | 9.38               | 0.1681     | 0.6074 | 0.04751 | 12.17           | 0.8147 | 9.915                 | 78.16 | 1.35 |

木理条件キャビテーション係数

| H!     | H2    | V^2/(2*g) | K <sub>o</sub> | V^2/(2*g) 含まず |                    |    |
|--------|-------|-----------|----------------|---------------|--------------------|----|
| 20.205 | 9.109 | 0.127     | 1.70           | 1.72          | σc<=K <sub>0</sub> | OK |
| 16.672 | 6.757 | 0.127     | 1.67           | 1.69          | σc<=K <sub>0</sub> | OK |

## 14.Balancing Tank Inlet Weir

1 Inlet weir loss

h=(Q/(1.84\*b))^(2/3)

here Q= b= 1.337 m3/sec 6.10 m (110000\*1.05/86400)

h=(Q/(1.84\*b))^(2/3)=

0.242 m

4 Water loss

The water level of inlet channel is

476.540 m (0.242)

The height of the inlet weir is

476.300 m

The water level at the Balancing tank is

476.000 m (Weir top level - 0.30 m)

```
Overflow water level is
                                                     476.980 m
                                                                       (
                                                                                 476.7000
                                                                                              +0.276)
 Overflow weir top level is
                                                     476.7000
 Overflow weir loss is
                                                        0.276
 Overflow Pipe Center Level at Blowoff Point
                                                      458.000 m
1 Overflow weir loss
            h=(Q/(1.84*b))^(2/3)
            where
                        Q=
                                            1.337 m3/sec
                                                              (110000*1.05/86400)
                        b=
                                                              (2.5*2)
                                               5 m
            h=(Q/(1.84*b))^(2/3)=
                                            0.276 m
  The water level at the downstream of the weir is
                                                                    476.400 m in consideration of an allowance of
      0.300 m.
1 Overflow pipe loss
                        (Diameter
                                              600 mm), f=
                                                                         0.5
                                                                                                   4.73 m/s
                                                                                                                         0.571 m
  Inlet Loss
                                                                                                                  h=
                                              600 mm).f=
  22.5°Bend Loss
                                                                                                                         0.171 m
                        (Diameter
                                                                        0.15
                                                                                                   4.73 m/s
                                                                                                                  ħ=
                                              600 mm). f=
                        (Diameter
  22.5°Bend Loss
                                                                                                   4.73 m/s
                                                                                                                         0.171 m
                                                                        0.15
                                                                                                                  h=
  45°Bend Loss
                        (Diameter
                                              600 mm), f=
                                                                        0.21
                                                                                                   4.73 m/s
                                                                                                                  b=
                                                                                                                         0.242 m
  22.5°Bend Loss
                        (Diameter
                                              600 mm), f=
                                                                        0.15
                                                                                                   4.73 m/s
                                                                                                                         0.171 m
  22.5°Bend Loss
                        (Diameter
                                              600 mm), f=
                                                                                                   4.73 m/s
                                                                        0.15
                                                                                                                  h=
                                                                                                                         0.171 m
  45°Bend Loss
                        (Diameter
                                              600 mm), f=
                                                                                                                         0.242 m
                                                                        0.21
                                                                                                   4.73 m/s
                                                                                                                  h=
                                                                                                                         0.228 m
  90°Bend Loss
                        (Diameter
                                              600 mm), f=
                                                                                                                  h=
                                                                        0.20
                                                                                                   4.73 m/s
  Outlet Loss
                        (Diameter
                                              600 mm), f=
                                                                         1.0
                                                                                                   4.73 m/s
                                                                                                                  \mathbf{h} =
                                                                                                                         1.142 m
  Pipe Friction Loss
                        (Diameter
                                              600 mm). I=
                                                                    0.03673
                                                                                                  59.20 m
                                                                                                                         2.174 m
            Total
                                                        5.283 m
                                      h≕
                                1.337 m3/sec
            Q=
C≖
                                                  (110000*1.05/86400)
  where
                                  110
                                                                    471.110
  The water level at the Blow off site is
                                                                               m(476.400
                                                                                                - 5.290)
```

Phase3

> 458.0000

17. Hydraulic Calculation of Overflow from Balancing Tank

Outside Stream Bottom Level

| No.     | Distance | Accumulate   | Bottom       | Bottom Level  | Proposed Channel | Ground    | Existing Bottom | Existing Bottom | I         | Average   |
|---------|----------|--------------|--------------|---------------|------------------|-----------|-----------------|-----------------|-----------|-----------|
|         | (m)      | Distance (m) | Gradient (%) | Diferance (m) | Bottom Level (m) | Level (m) | Level (m)       | Gradient (%)    | Depth (m) | Depth (m) |
| 1       |          |              |              |               | 457.600          | 458.50    | 458.00          | ,               | 0.90      |           |
| 2       | 20       |              | 3.65         | 0.073         | 457.527          | 459.00    | 457.75          | 12.5            | 1.47      | 23.7      |
| 3       | 20       |              | ****         | 0.073         | 457.100          | 458.00    | 457.50          | 12.5            | 0.90      | 23.7      |
| 4       | 20       |              | 3.65         | 0.073         | 455.100          | 456.00    | 455.50          | 100.0           | 0.90      | 18.0      |
| 5       | 20       |              | 3.65         | 0.073         | 453.600          | 454.50    | 454.00          | 75.0            | 0.90      | 18.0      |
| 6       | 20       |              | 3.65         | 0.073         | 452.100          | 453.00    | 452.50          | 75.0            | 0.90      | 18.0      |
| 7       | 20       |              | 3.65         | 0.073         | 452,027          | 453.00    | 452.50          | 0.0             | 0.97      | 18.7      |
| . 8     | 20       |              | 3.65         | 0.073         | 449.100          | 450.00    | 449.50          | 150.0           | 0.90      | 18.7      |
| 9       | 20       |              | 3.65         | 0.073         | 449,400          | 450.30    | 449.40          | 5.0             | 0.90      | 18.0      |
| 01      | 20       | 180          | 3.65         | 0.073         | 448.900          | 449.80    | 449.30          | 5.0             | 0.90      | 18.0      |
| 11      | 20       | 200          | 3.65         | 0.073         | 448.400          | 449.30    | 448.80          | 25.0            | 0.90      | 18.0      |
| 12      | 20       | 220          | 3.65         | 0.073         | 448.100          | 449.00    | 448.50          | 15.0            | 0.90      | 18.0      |
| 13      | 20       | 240          | 3.65         | 0.073         | 446.100          | 447.00    | 446,25          | 112.5           | 0.90      | 18.0      |
| 14      | 20       | 260          | 3.65         | 0.073         | 446.100          | 447,00    | 446.23          | 1.0             | 0.90      | 18,0      |
| 15      | 20       | 280          | 3.65         | 0.073         | 445.800          | 446.70    | 446.20          | 1.5             | 0.90      | 18.0      |
| 16      | 20       | 300          | 3.65         | 0.073         | 444,700          | 445.60    | 445.10          | 55.0            | 0.90      | 18.0      |
| 17      | 20       | 320          |              | 0.073         | 444,300          | 445.20    | 444.70          | 20.0            | 0.90      | 18.0      |
| 17+5000 | 5        | 325          | 3.65         | 0.01825       | 441.500          | 444.50    | 444.00          | 140.0           | 3.00      | 9.7       |
| 18      | 15       | 340          |              | 0.05475       | 441.445          | 446.00    | 443.90          | 6.7             | 4,55      | \$6.7     |
| 19      | 20       | 360          | 3.65         | 0.073         | 441.372          | 446.00    | 443.70          | 10.0            | 4.63      | 91.8      |
| 20      | 20       | 380          | 3.65         | 0.073         | 441.299          | 444.00    | 443.50          | 10.0            | 2.70      | 73.3      |
| 21      | 20       | 400          | 3.65         | 0.073         | 441.226          | 444.00    | 443.50          | 0.0             | 2.77      | \$4.7     |
| 22      | 20       | 420          | 3.65         | 0.073         | 441.153          | 443.00    | 442.50          | 50.0            | 1.85      | 46.2      |
| 23      | 20       | 440          | 3.65         | 0.073         | 441.080          | 443.00    | 442.50          | 0.0             | 1.92      | 37.7      |
| 24      | 22       | 462          | 3.65         | 0.0803        | 441.000          | 442.00    | 441.50          | 45.5            | 1.00      | 32. i     |
| verage  |          |              |              |               |                  |           |                 |                 | <b>\</b>  | 1.522     |

Note:

1.Existing Bottom Level are assumed above mentioned formula.

Existing Bottom Level = Existing Ground Level - 0.5m

Proposed Channel Bottom Level = (Existing Ground Level - 0.9m) >= Bottom Level Diference (No.1 - 17+5000)

## 1.Receiving well

1 Receiving well inlet channel water level (6 units) 451.680 m I Baffle wall loss Q= 1.375 m3/sec= 118800 m3/day (110000\*(1.05+0.03)) h=v^2/(2\*g\*c^2) 1.88 m2 : Opening area 3.14/4\*0.1^2\*(15\*16) where 0.73 m/sec v= 9.8 m/sec2 g≖ c= 0.6 Baffle wall loss h=v^2/(2\*g\*c^2)= 0.075 m 2 Receiving well water level 451.600 m 1 Overflow weir loss (6 line duty)  $h=(Q/(1.84*B))^{2/3}$ 0.229 m3/sec= 19800 m3/day (110000\*(1.05+0.03)/6) where Q= B= 2.0 m Overflow weir loss  $h=(Q/(1.84*B))^{2/3}$ 0.157 The height of the overflow weir is accordingly 451.440 m( 451.600 -0.160).

1

```
2.Mixing Well
    1 Design G Value
      a) Canp's Proposition
           GT Value
                  GT Value=
                                     23,000 ~
                                                           25,000
                  G=(23,000\sim25,000)/(40\sim100) =
                                                                                                       625 sec-1
                                                                             230 ~
      b) Dr. Tanpo
                  G=(1000/verg)^0.5
           where
                                    0.00898 cm2/sec at 25°C
                  verg=
                                        334 sec-1
                  G=
      c) Japanese Standard
                  G=(g*h/(v*T))^0.5
                  where
                                                 0.50~
                                                             0.60 m
                                                                                  : Head loss at cone
                               h=
                                                    9.8 m/s2
                               g=
                                                0.00898 cm2/sec
                               Τ=
                                                     60 sec
                  G=(g*h/(v*T))^0.5=
                                                  302~
                                                             330 sec-1
      Therefore, design G Value is 330 sec-1.
    2 Required Head loss for mixing chamber
                  h = G^2 + \mu *V/(\rho *Q*g)
                               G=
                                                                 : Design G value
                                                    330 sec-1
                                              0.000898 kg/m/sec : Coefficient of viscosity of water at 25°C
                               \mu =
                                \rho =
                                                 0.9971 g/cm2 at 25℃
                               g=
                                                    980 cm/sec2
                                              25500000 cm3
                                                                          =26m3: Volume of mixing chamber
                                                (2.50m* 3.00m*
                                                                          3.40m) Retention time
                                                                                                            2 minute
                                                 459000 cm3/sec
                                                                     =39655m3/d: Design flow rate
                  h= G^2 * \mu *V/(\rho *Q*g)=
                                                  55.60 cm =
                                                                               60 cm
    3 Overflow weir loss (6 line duty)
                  h=(Q/(1.84*b))^(2/3)
                  where
                               Q=
                                                  0.229 m3/sec (110000*(1.05+0.03)/6/86400)
                               b=-
                                                   2.00 m
                  h=(Q/(1.84*b))^(2/3)=
                                                  0.157 m
    4 Water loss
          The water level of Receiving well is
                                                          451.600 m
                                                            0.160 m (0.157)
          The water loss of upstream of the weir is
          The water loss of downstream of the weir is
                                                            0.940 m.
          Therefore the water loss (total) is
                                                            1.100 m
          The height of the overflow weir is accordingly
                                                                         451.440 m
                                                                                                 (451.600-
                                                                                                                0.160)
```

450.500 m

The water level at the downstream of the weir (mixing chamber) is

# 3. Connection Pipe between Mixing chamber and Flocculation basin 1. Connection Pipe between Mixing chamber and Flocculation basin No.1

|   | water              | level  |  |   |   |  | 450.470 m   |  |  |
|---|--------------------|--|--|---|---|--|---|--|--|
| Outlet pipe loss  |                    |  |  |   |   |  |   |  |  |
| Inlet Loss  |                    | (Diameter  | 700  | ) mm), f≔   | 0.5   | V≔   | 0.60 m/s  | h=   | 0.0  |
| Valve Loss  |                    | (Diameter  | 700  | mm), f=   | 0.1   | V=   | 0.60 m/s  | h=   | 0.0  |
| 45°Bend Loss  |                    | (Diameter  | 700  | ) mm), f=   | 0.25  | V≕   | 0.60 m/s  | h=   | 0.0  |
| 45°Bend Loss  |                    | (Diameter  | 700  | mm), f=   | 0.25  | V=   | 0.60 m/s  | h=   | 0.0  |
| 90°Bend Loss  |                    | (Diameter  | 700  | ) mm), f=   | 0.23  | V=   | 0.60 m/s  | h=   | 0.0  |
| 90°Bend Loss  |                    | (Diameter  | 700  | mm), f=   | 0.23  | V=   | 0.60 m/s  | h=   | 0.0  |
| 90°Bend Loss  |                    | (Diameter  | 700  | ) mm), f=   | 0.23  | V=   | 0.60 m/s  | h=   | 0.0  |
| 45°Bend Loss  |                    | (Diameter  | 700  | mm), f=   | 0.25  | V=   | 0.60 m/s  | h=   | 0.0  |
| 45°Bend Loss  |                    | (Diameter  | 700  | mm), f=   | 0.25  | V=   | 0.60 m/s  | <u>h</u> =   | 0.0  |
| 45°Bend Loss  |                    | (Diameter  | 700  | mm), f=   | 0.25  | V=   | 0.60 m/s  | h=   | 0.0  |
| 45°Bend Loss  |                    | (Diameter  | . 700  | ) mm), f=   | 0.25  |  | 0.60 m/s  | h=   | 0.0  |
| 90°Bend Loss  |                    | (Diameter  |  | mm), f=   | 0.23  |  | 0.60 m/s  | h=   | 0.0  |
| 90°Bend Loss  |                    | (Diameter  |  | mm), f=   | 0.23  |  | 0.60 m/s  | h=   | 0.0  |
| Outlet Loss   |                    | (Diameter  |  | mm), f=   | 1.0   |  | 0.60 m/s  | h=   | 0.0  |
| Pipe Friction Los   | SS                 | (Diameter  |  | ) mm), I=   | 0.00066   |  | 64.96 m   | h=   | 0.0  |
| -   | Total              |  | h=   | 0.122   | m,  |  |   |  |  |
| where   | C=                 | 110  |  |   |   |  |   |  |  |
|   | Q=                 | 19800  | m3/d=  | 0.229   | m3/sec  | (110000*(1.6   | 05+0.03)/6)   |  |  |
|   |                    |  |  |   |   |  |   |  |  |
| nnection Pipe bet   | tween l            | Mixing cham  | iber and I   | Flocculation  | n basin NO.   | 3  |   |  |  |
| nnection Pipe bet<br>Mixing chamber   |                    |  | iber and I   | Flocculation  | n basin N0.   | 3  | 450.480 m   |  |  |
| Mixing chamber  |                    |  | aber and }   | Flocculation  | n basin N0.   | 3  | 450.480 m   |  |  |
| Mixing chamber  Outlet pipe loss  |                    | level  |  |   |   |  |   | h=   | 0.0  |
| Mixing chamber Outlet pipe loss Inlet Loss  |                    | level (Diameter  | 700  | mm), f=   | 0.5   | V=   | 0.60 m/s  | h=<br>h=   |  |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss   |                    | (Diameter<br>(Diameter   | 700<br>700   | mm), f=<br>mm), f=  | 0.5<br>0.1  | V=<br>V=   | 0.60 m/s<br>0.60 m/s  | h=   | 0.0  |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss  |                    | (Diameter<br>(Diameter<br>(Diameter  | 700<br>700<br>700  | mm), f=<br>mm), f=<br>mm), f=   | 0.5<br>0.1<br>0.25  | V=<br>V=<br>V=   | 0.60 m/s<br>0.60 m/s<br>0.60 m/s  | h=<br>h=   | 0.0<br>0.0   |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss   |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 700<br>700<br>700<br>700   | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=  | 0.5<br>0.1<br>0.25<br>0.23  | V=<br>V=<br>V=<br>V=   | 0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s  | h=<br>h=<br>h=                                     | 0.0<br>0.0<br>0.0  |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss   |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 700<br>700<br>700<br>700<br>700                                    | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f=   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23  | V=<br>V=<br>V=<br>V=   | 0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s  | h=<br>h=<br>h=<br>h=                               | 0.0<br>0.0<br>0.0  |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss   |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 700<br>700<br>700<br>700<br>700<br>700                             | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f=   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.23  | V=<br>V=<br>V=<br>V=<br>V=                                     | 0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s  | h=<br>h=<br>h=<br>h=                               | 0.0<br>0.0<br>0.0<br>0.0   |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss  |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 700<br>700<br>700<br>700<br>700<br>700<br>700                      | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f=   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.23  | V=<br>V=<br>V=<br>V=<br>V=<br>V=                               | 0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s<br>0.60 m/s  | h=<br>h=<br>h=<br>h=<br>h=                         | 0.0<br>0.0<br>0.0<br>0.0<br>0.0                                    |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss   |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700               | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f=   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.23<br>0.25<br>0.25  | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=                         | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s  | h=<br>h=<br>h=<br>h=<br>h=<br>h=                   | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                             |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss  |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700               | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f=   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.23<br>0.25<br>0.25  | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=                         | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s                                     | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=             | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                      |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss  |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700        | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f=   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25  | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=                   | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s                            | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=       | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                      |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 90°Bend Loss                                 |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700        | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f=   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25<br>0.25  | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=             | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s                            | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=       | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0               |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 90°Bend Loss  |                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700 | mm), f= | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25<br>0.25<br>0.25                                | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=       | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s                   | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=       | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 90°Bend Loss Outlet Loss Outlet Loss                      | water              | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700 | mm), f= | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25<br>0.25<br>0.25<br>0.23                        | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V= | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s          | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss  | water              | (Diameter (Diame | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700 | mm), f=         | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25<br>0.25<br>0.25<br>0.23<br>0.23<br>0.00066     | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V= | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s                   | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=       | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss                    | water              | (Diameter (Diame | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700 | mm), f= | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25<br>0.25<br>0.25<br>0.23<br>0.23<br>0.00066     | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V= | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s          | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss where | water  ss Total C= | (Diameter (Diame | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700 | mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= mm), f= 0.136   | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25<br>0.25<br>0.23<br>0.23<br>1.0<br>0.00066<br>m | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>L= | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0        |
| Mixing chamber Outlet pipe loss Inlet Loss Valve Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 45°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss 90°Bend Loss where | water              | (Diameter (Diame | 700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700<br>700 | mm), f=         | 0.5<br>0.1<br>0.25<br>0.23<br>0.23<br>0.25<br>0.25<br>0.25<br>0.25<br>0.23<br>0.23<br>1.0<br>0.00066<br>m | V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V=<br>V= | 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s 0.60 m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 |

3

## 3. Connection Pipe between Mixing chamber and Flocculation basin N0.6

The Inlet chamber water level of Flocculation basin is

| Mixing chamber   | r water | level     |             |          |             | 450.500 m  | ,          |             |
|------------------|---------|-----------|-------------|----------|-------------|------------|------------|-------------|
| Outlet pipe loss |         |           |             |          |             |            |            |             |
| Inlet Loss       |         | (Diameter | 700 mm), f≕ | 0.5      | V=          | 0.60 m/s   | h=         | $0.009 \ m$ |
| Valve Loss       |         | (Diameter | 700 mm), f= | 0.1      | V=          | 0.60 m/s   | h=         | 0.002 m     |
| 45°Bend Loss     |         | (Diameter | 700 mm), f≠ | 0.25     | V=          | 0.60 m/s   | h=         | 0.005 m     |
| 45°Bend Loss     |         | (Diameter | 700 mm), f= | 0.25     | V=          | 0.60 m/s   | h=         | 0.005 m     |
| 90°Bend Loss     |         | (Diameter | 700 mm), f= | 0.23     | V=          | 0.60 m/s   | h≓         | 0.004 m     |
| 45°Bend Loss     |         | (Diameter | 700 mm), f= | 0.25     | V=          | 0.60 m/s   | <b>h</b> = | 0.005 m     |
| 45°Bend Loss     |         | (Diameter | 700 mm), f= | 0.25     | V=          | 0.60 m/s   | h=         | 0.005 m     |
| 45°Bend Loss     |         | (Diameter | 700 mm), f= | 0.25     | V=          | 0.60 m/s   | h=         | 0.005 m     |
| 45°Bend Loss     |         | (Diameter | 700 mm), f= | 0.25     | V=          | 0.60 m/s   | h=         | 0.005 m     |
| 90°Bend Loss     |         | (Diameter | 700 mm), f= | 0.23     | V=          | 0.60 m/s   | h=         | 0.004 m     |
| 90°Bend Loss     |         | (Diameter | 700 mm), f= | 0.23     | V=          | 0.60 m/s   | h=         | 0.004 m     |
| Outlet Loss      |         | (Diameter | 700 mm), f= | 1.0      | V=          | 0.60 m/s   | h=         | 0.018 m     |
| Pipe Friction Lo | SS      | (Diameter | 700 mm), I= | 0.00066  | L=          | 122.86 m   | h≕         | 0.081 m     |
|                  | Total   | h=        | 0.152       | m        |             |            |            |             |
| where            | C=      | 110       |             |          |             |            |            |             |
|                  | Q=      | 19800 m   | 3/d= 0.229  | m3/sec ( | 110000*(1.0 | 5+0.03)/6) |            |             |
|                  |         |           |             |          |             |            |            |             |

450.340 m ( 450.500 -0.160) 4

#### 4.Flocculation Basin

Flocculation basin inlet channel water level

450.340 m

1 Head loss of Intake gate

Dimension of gate; 600×600 Head loss h=v2/(2\*g\*C^2)

Head loss h=v2/(2\*g\*C^2)
where A=0.6m\*0.6m= 0.36 m2 : Sectional area
Q= 0.229 m3/sec
v=Q/A= 0.637 m/sec
g= 9.8 m/sec2
C= 0.6
h= 0.05743 m = 0.060 m

Flocculation basin inlet water level

450.280 m

2 Required head loss for flocculation basin

h= 0.290 m (Confer Capacity calculation)

Flocculation basin outlet water level 449.990 m

3 Outlet Submerged weir loss

L=Q/(1.8\*(h1+1.4\*h2)\*h1^0.5) h2=Q/(2.52\*I.\*h1^0.5\h1/1.4

h2=Q/(2.52\*L\*h1^0.5)-h1/1.4

where Q= 0.229 m3/sec= 19800 m3/day (110000\*(1.05+0.03)/3/2)h1= 0.028 m

L= 11.0 m h2=Q/(2.52\*L\*h1^0.5)-h1/1.4= 0.029 m

The height of the overflow weir is accordingly 449.930 m (449.990 -0.030 -0.030).

The water level at the downstream of the weir (sedimentation basin) is 449.960 m

in consideration of an weir loss of 0.03 m (h1)

Treatment Capacity(m3/d/Unit)

39,600
Hydraulic Flocculation (Baffle Walls, Up and Down)

| Item   |   | Unit      | Symbol            | Nos. of Raws |        |        |            |           |        | Between Raws |              |                  |               |             |
|--------|---|-----------|-------------------|--------------|--------|--------|------------|-----------|--------|--------------|--------------|------------------|---------------|-------------|
| No.    | Descriptions  |           |                   | No. 1        | No. 2  | No. 3  | No. 4      | No. 5     | No. 6  | No.1&2       | No.2&3       | No.3&4           | No.4&5        | No.5&6      |
| i, Ger | ieral Descriptions                                  |           |                   | 5 6 B        |        |        |            |           |        |              |              |                  |               | <del></del> |
| l)     | Design capacity                                     | m3/d      | (Q)               | 19,800       | 19,800 | 19,800 | 19,800     | 19,800    | 19,800 | 19,800       | 19,800       | 19,800           | 19,800        | 19,800      |
| 2)     | Width of wall                                       | m         | (Ww)              | 1.100        | 1,100  | 1.500  | 1,500      | 2,300     | 2.300  | 0.965        | 0.965        | 0.965            | 0.965         | 0.965       |
| 3)     | No. of wall in one raw                              | -         | (Nw)              | 9.           | 9      | 9      | 9          | 9         | 9      | 1            | 1            | 1                |               | ī           |
| 4)     | Depth   | 137       |                   | 3.80         | 3.80   | 3,60   | 3.60       | 3.50      | 3.50   | 3.80         | 3.80         | 3.60             | 3.60          | 3.50        |
| 5)     | Length of raws                                      | m         |                   | 11.00        | 11.00  | 11.00  | 11,00      | 11.00     | 11.00  |              |              |                  |               |             |
| 2. Los | s of down flow                                      | a A Vag   | te eller ig       | 40000000     | 7.7    |        |            | 1         |        |              |              |                  |               |             |
| 1)     | Downflow depth                                      | m         | (Hb)              | 0.75         | 0.80   | 0.90   | 0.95       | 1.00      | 1.05   | 0.75         | 0.80         | 0,90             | 1.00          | 1.00        |
| 2)     | Downflow velocity                                   | m/s       | (vb)_             | 0.278        | 0.260  | 0,170  | 0.161      | 0.100     | 0.095  | 0,317        | 0.297        | 0.264            | 0.237         | 0,237       |
| 3)     | Downflow coefficent of friction loss                | •         | (fb)              | 3,5          | 3.5    | 3.5    | 3.5        | 3.5       | 3.5    | 3.5          | 3.5          | 3.5              | 3.5           | 3.5         |
| 4)     | No. of down flow in one raw                         |           |                   | 4            | 4      | 4      | . 4        | 4         | 4      | 1            | 1            | 1                |               | 1           |
| 5)_    | hb + 15/2/9.8*vb *no. of walls/2                    | m         |                   | 0.055        | 0.048  | 0.021  | * - 20.018 | 0.007     | 0,006  | 0.018        | H. 0016      | 0.012            | 0.010         | 0.010       |
| 3. Los | s of over flow                                      |           |                   |              |        |        |            |           |        |              |              |                  |               |             |
| 1)     | Overflow depth                                      | m         | (Ho)              | 0,75         | 0.80   | 0.90   | 0.95       | 1,00      | 1.05   |              |              |                  |               |             |
| 2)     | Oveflow velocity                                    | m/s       | (vo)              | 0,278        | 0.260  | 0.170  | 0.161      | 0,100     | 0.095  |              |              |                  |               |             |
| 3)     | Downflow coefficent of friction loss                |           | (fb)              | 1.0          | 1,0    | 1,0    | 1.0        | 1.0       | 1.0    |              |              |                  |               |             |
| 4)     | No. of down flow in one raw                         |           |                   | 5            | . 5    | . 5    | 5          | 5         | 5      |              |              |                  |               |             |
|        | no = vo/2/9.8*no. of walls/2                        | m         |                   | 0.020        | 0.017  | 0,007  | 0.007      | 0.003     | 0.002  |              |              |                  |               |             |
| 4. Los | s of friction                                       | \$4.5.54D | ricke in A        |              |        |        |            |           |        |              |              |                  |               |             |
| I)     | $R = W_{\mathbf{v}} * Lc_{i} 2/(W_{\mathbf{v}*Le})$ | m         | (R)               | 0.257        | 0.257  | 0.294  | 0.294      | 0.340     | 0.340  |              |              |                  |               |             |
| 2)     | n = roughness coefficient                           |           | _ (n)             | 0.015        | 0.015  | 0.015  | 0,015      | 0,015     | 0.015  |              | Width of wa  | 11               |               |             |
| 3)     | vc≃velocity   | m/s       | (vc)              | 0.216        | 0.216  | 0.158  | 0.158      | 0,103     | 0.103  |              | (11-0.15*9)/ | 10=              | 0.965         | m           |
| 4)     | $C^2 = 1/n^2 * R^{1/3}$                             |           | (C <sup>2</sup> ) | 2,826        | 2,826  | 2,954  | 2,954      | 3,102     | 3,102  |              |              |                  |               |             |
| 5)     | Length of ditch                                     | m         | (L <sub>D</sub>   | 10,0         | 10.0   | 10,0   | 10.0       | 10.0      | 10.0   |              |              |                  |               |             |
| 6)     | Length of wall                                      | m         | (L <sub>v)</sub>  | 30.500       | 30.000 | 27.000 | 26,500     | 25.000    | 24.500 |              |              |                  |               |             |
| 7)     | L = 1.1 + Lw  | m         | (L)               | 40.535       | 40.035 | 37.035 | 36,535     | 35.035    | 34.535 |              |              |                  |               |             |
| 8)     | hf ⇒ L n^2vc^2/R^(4/3)                              | m         |                   | 0.603        | 0.603  | 0.001  | . 0.001    | e + 0.000 | 0.000  |              |              |                  |               |             |
| 5. Tot | al Loss of Head                                     |           |                   |              |        | 10.00  | 4.0        |           |        | tan ara      |              | 10 E             |               | AND BY      |
|        | $H = h_1 + h_2 + h_3$                               | m         | 0.286             | 0.077        | 0.088  | 0.029  | 0.026      | 10.010    | 0.009  | 0.016        | 0.016        | 0.012.           | 0.010         | 0.010       |
| 6, G-v | alue  |           |                   |              |        |        |            |           |        | Total        |              | 4                |               |             |
| 1)     | Volume of raw                                       | m3        | (V)               | 45,98        | 45.98  | 59.40  | 59,40      | 88.55     | 88.55  | 387.860      | m3           | (TTL Volum       | e of Fllocula | tion Basin) |
| 2)     | Detention time                                      | mín       | (T)               | 3.34         | 3.34   | 4.32   | 4,32       | 6.44      | 6.44   | 28.2         | ուհո         | (TTL Detent      | ion Time)     |             |
| 3)     | Density of Water (at 25 degree)                     | kg/m3     | (م)               | 997,100      |        |        |            |           |        |              |              |                  |               |             |
| 4)     | Viscosity of Water (x 10-3)                         | kg/m/s    | (μ)               | 0.898        |        |        |            |           |        |              |              | Ave. Turbid      | ity=          | 37.0        |
| 5)     | Acceleration of Gravity                             | m/s2      | (g)               | 9.8          |        |        |            |           |        | Ave G        |              | GCS <sup>4</sup> |               | 2,685,805   |
| 6)     | G=(H·ρ·Q·g/(V·μ)) <sup>0,5</sup>                    | s-l       | (G)               | 71.9         | 67.5   | 41,7   | 39,0       | 23.8      | 16.0   | 42.9         |              |                  |               |             |
| 7)     | Gt value  |           |                   | 14,425       | 13,546 | 10,811 | 10,104     | 9,181     | 6,178  | 72,589       | (23,000 to 2 | 10,00)           |               |             |

| Item         | Descriptions                           | 1,,,   | Symbol                       | Nos. of Raws   |         |  |                          |                                       |                                 |  |  |
|--------------|--|--|------------------------------|--|---------|--|--------------------------|---------------------------------------|---------------------------------|--|--|
| No.          | Descriptions                           | Unit   |                              | No. 1  | No. 2   | No. 3                                  | No. 4                    | No. 5                                 | No. 6                           | No.1&  |  |
| . Wa         | er level of each baffle wall           |  |                              |  | 14.     | . ,                                    |                          |                                       |                                 | 1.1.1  |  |
| 1)           | Inlet water level (No.1 section)       | m  |                              | 450.280  | 450.185 | 450.102                                | 450.060                  | 450.024                               | 450.004                         |  |  |
| 2)           | No.2 section                           |  |                              | 450.276  | 450.182 | 450.100                                | 450.059                  | 450.024                               | 450.004                         |  |  |
| 3)           | No.3 section                           |  | 1                            | 450.262  | 450.169 | 450.095                                | 450.054                  | 450.022                               | 450.002                         | Ì  |  |
| 4)           | No.4 section                           |  | T                            | 450.258  | 450.166 | 450.093                                | 450.053                  | 450.022                               | 450.002                         |  |  |
| 5)           | No.5 section                           |  |                              | 450.244  | 450.153 | 450.088                                | 450.048                  | 450.020                               | 450.000                         | i  |  |
| 6)           | No.6 section                           |  |                              | 450.240  | 450.150 | 450.087                                | 450.047                  | 450.019                               | 450.000                         |  |  |
| 7)           | No.7 section                           |  |                              | 450.225  | 450.137 | 450.081                                | 450.042                  | 450.017                               | 449,998                         |  |  |
| 8)           | No.8 section                           |  | !                            | 450.221  | 450.134 | 450.080                                | 450.041                  | 450.017                               | 449.998                         |  |  |
| 9)           | No.9 section                           | -  |                              | 450.207  | 450.121 | 450.074                                | 450.036                  | 450.015                               | 449.996                         | Total  |  |
| 10)          | No.10 section                          | <del> </del>                                     | <u> </u>                     | 450.203  | 450.117 | 450.073                                | 450.035                  | 450.015                               | 449.995                         |  |  |
| 10)          | 1                                      |  | <del></del> -                | 0.0769   | 0.0678  | 0.0288                                 | 0.0259                   | 0.0099                                | 0.0090                          | 0.2  |  |
| ÚW.          | t<br>r Top-level of each baffle wall.  | l<br>Vitable de la                               |                              |  |         | ki i i i i i i i i i i i i i i i i i i |                          |                                       |                                 |  |  |
|              | Weir top level (No.1 section)          | i .  | 64909                        | 449.526  | 449.382 | 449.200                                | 449.109                  | 449.024                               | 448.954                         | <del> </del>                                     |  |
| 1)           | No.2 section                           | <del>                                     </del> | 1                            | 777.320  | 777.304 | T+7.200                                | 7+7.107                  | 717.UZ7                               | 770.734                         | ļ  |  |
| 2)           | <del></del>                            |  |                              | 440.500  | 440.266 | 440 103                                | 440 102                  | 440.022                               | 448.952                         |  |  |
| 3)           | No.3 section                           |  |                              | 449.508  | 449.366 | 449.193                                | 449.103                  | 449.022                               | 446.932                         | <del> </del>                                     |  |
| 4)           | No.4 section                           |  | -                            | 440 400  | 440.250 | 440 107                                | 440.007                  | 440.010                               | 110.050                         |  |  |
| 5)           | No.5 section                           | <del> </del>                                     | !                            | 449.490  | 449.350 | 449.187                                | 449.097                  | 449.019                               | 448.950                         | <del> </del>                                     |  |
| 6)           | No.6 section                           |  | <u> </u>                     | 440 471  | 440.224 | 440.100                                | 440.001                  | 440.017                               | 140.040                         |  |  |
| 7)           | No.7 section                           |  |                              | 449.471  | 449.334 | 449.180                                | 449.091                  | 449.017                               | 448.948                         | ļ  |  |
| 8)           | No.8 section                           | ļ  | <b>]</b>                     | 110 150  | 440.015 | 110 170                                | 142 225                  | 110.015                               | 110.015                         |  |  |
| 9)           | No.9 section                           | <b> </b>   | }                            | 449.453  | 449.317 | 449.173                                | 449.085                  | 449.015                               | 448.945                         |  |  |
| 10)          | No.10 section                          |  |                              |  |         |  |                          |                                       |                                 |  |  |
| 200-100      |  |  | naal Seliminise sektorise se |  |         |  | ANTONIO MONTO ANTAGAMBAN | De <b>Sta</b> fonklindere forkeritere | surround and the Deput Continue |  |  |
| 1 1000       | ance between Wall Top Level (451-100)  | n) and V   | veir Top I                   | April 19 Control of the Control of t |         |  |                          |                                       |                                 | ļ  |  |
| 1)           | Depth of weir top level (No.1 section) | <u> </u>   |                              | 1.574  | 1.718   | 1.900                                  | 1.991                    | 2.076                                 | 2.146                           |  |  |
| 2)           | No.2 section                           | ļ  | <u> </u>                     |  |         |  |                          |                                       |                                 |  |  |
| [3)          | No.3 section                           | <u> </u>   |                              | 1.592  | 1.734   | 1.907                                  | 1.997                    | 2.078                                 | 2.148                           | <u> </u>   |  |
| 4)           | No.4 section                           |  |                              |  |         |  |                          |                                       |                                 | <u> </u>   |  |
| 5)           | No.5 section                           |  | ·                            | 1.610  | 1.750   | 1.913                                  | 2.003                    | 2.081                                 | 2.150                           |  |  |
| 6)           | No.6 section                           |  |                              |  |         |  |                          |                                       |                                 |  |  |
| 7)           | No.7 section                           |  |                              | 1.629  | 1.766   | 1.920                                  | 2.009                    | 2.083                                 | 2.152                           |  |  |
| 8)           | No.8 section                           |  |                              |  |         |  |                          |                                       |                                 |  |  |
| 9)           | No.9 section                           | <u> </u>   |                              | 1.647  | 1.783   | 1.927                                  | 2.015                    | 2.085                                 | 2.155                           |  |  |
| 10)          | No.10 section                          |  |                              |  |         |  |                          |                                       |                                 |  |  |
|              |  |  |                              |  |         |  |                          |                                       |                                 |  |  |
| Ove          | rflow Depth                            |  | 110                          |  |         |  |                          |                                       | der east                        |  |  |
| 1)           | Overflow depth (No.1 section)          |  |                              | 0.754  | 0.803   | 0.901                                  | 0.951                    | 1.001                                 | 1.050                           |  |  |
| 2)           | No.2 section                           |  |                              |  |         |  |                          |                                       |                                 |  |  |
| 3)           | No.3 section                           | <u> </u>   |                              | 0.754  | 0.803   | 0.901                                  | 0.951                    | 1.001                                 | 1.050                           |  |  |
| 4)           | No.4 section                           |  |                              |  |         |  |                          |                                       |                                 |  |  |
| 5)           | No.5 section                           |  |                              | 0.754  | 0.803   | 0.901                                  | 0.951                    | 1.001                                 | 1.050                           |  |  |
|              | No.6 section                           | <b> </b>   |                              |  |         |  |                          |                                       |                                 |  |  |
| 6)           | No.7 section                           |  | <b> </b>                     | 0.754  | 0.803   | 0.901                                  | 0.951                    | 1.001                                 | 1.050                           | <del>                                     </del> |  |
| 6)<br>7)     |  | L  |                              |  |         |  |                          |                                       |                                 | <del> </del>                                     |  |
| 7)           |  |  |                              | ļ  | i       | [                                      |                          |                                       |                                 | ł.   |  |
| <del>'</del> | No.8 section<br>No.9 section           |  |                              | 0.754  | 0.803   | 0.901                                  | 0.951                    | 1.001                                 | 1.050                           |  |  |

#### 5. Sedimentation Basin

```
1 Sedimentation basin inlet water level
                                                                                      449.960 m
  Head loss of diffusion wall (No.1)
  Diameter of holes and number of holes; \phi100@300\times300
  Head loss h=v2/(2*g*C^2)
  where
                A1=3.14/4*D^2*(a*b)=
                                                            3.6738 m2
                                                                                : Sectional area
                 D=
                                       100 mmdia.
                a=
                                        13 pieces
                h=
                                        36 pieces
                 Q=
                                     0.229 m3/sec
                                                      (110000*(1.05+0.03)/86400/6)
                 v=Q/A=
                                    0.0624 m/sec
                                       9.8 m/sec2
                 g=
                 C=
                                       0.6
  h1=
                      0.00055 m
  Head loss of diffusion wall (No.2-4)
  Diameter of holes and number of holes; \phi100@300\times300
  Head loss h=v2/(2*g*C^2)
                A=3.14/4*D^2*(a*b)=
  where
                                               3.3912 m2
                                                                   : Sectional area
                D=
                                       100 mmdia.
                                        12 pieces
                a==
                b=
                                        36 pieces
                                     0.229 m3/sec
                                                      (110000*(1.05+0.03)/86400/6)
                 Q=
                v=Q/A=
                                    0.0676 m/sec
                                       9.8 m/sec2
                                       0.6
                      0.00065
                                               0.0019 m
  h2-4=
                                 *3units =
  Head loss of diffusion wall (No.5)
  Diameter of holes and number of holes; \phi100@300\times300
  Head loss h=v2/(2*g*C^2)
                A=3.14/4*D^2*(a*b)=
                                               3.6738 m2
                                                                   : Sectional area
  where
                D=
                                       100 mmdia.
                                        13 pieces
                b=
                                        36 pieces
                                     0.229 m3/sec
                                                      (110000*(1.05+0.03)/86400/6)
                0=
                v=Q/A=
                                    0.0624 m/sec
                                       9.8 m/sec2
                g==
                                       0.6
                      0.00055 m
 h5=
  Total head loss
                h=h1~h5=
                                   0.00304 =
                                                             0.000 m
  Sedimentation Basin Downstream Water Level
                                                                                      449.960 m
2 End Trough Bottom Level
                                                                                      449.700 m
                Water Level above Trough Orifice
                                                                          0.060 m
                Depth between orifice and Trough Bottom
                                                                          0.200 m
                                                                          0.260 m
                Trough Loss (Total)
 The water level at the downstream of the end trough is
                                                                                     449.450 m in consideration of an
      allowance of 0.25 m.
3 Intermediate trough bottom level
                                                                        449.700 m same as End Trough Bottom Level
4 Intermediate trough channel (Intermediate trough - End channel)
  Water Level at upstream of Intermediate Trough Channel
                                                                       449.700 m same as End Trough Bottom Level
 Head loss in the intermediated channel is calculated
  Q1=
                         0.023 m3/sec
                                                                                                      (20.4\%)
                                           : Water flow of I trough
 Q2=2Q1=
                        0.047 m3/sec
                                           : Water flow of 2 trough
                                                                                                      (40.7%)
 Inflow sectional area
 A(a-d)=B*H=
                                      0.15 m2
                                                      (Watrer Flow Area A= 0.060 m2)
  where
                B=
                                      0.50 m
```

8

H= 0.30 m (Watrer Depth h= 0.120 m)

Velocity

V(a-b)=Q1/A= V(b-c)=Q2/A= 0.39 m/sec

0.78 m/sec

Hydraulic radius

 $R(a-c)=A/(B+H^*2)=$ 0.136 m

Roughness coefficient

0.015

Head losses are calculated using Manning Formula.

 $h=n^2L^*v^2/R^4(4/3)$ 

10.0 m where L(a-b)= L(b-c)= 12.6 m

0.00485 = 0.005 m h(a-b)=

h(b-c)= 0.02445 = 0.025 m

I=n^2\*v^2/R^(4/3)

0.00049 I(a-b)= I(b-c)= 0.00194

Total head loss

0.030 m (0.030) h(a-c)=

Critical Water Depth at the end of Intermediated Channel

hc=( \alpha \*Qt^2/(g\*B^2))^(1/3)

速度エネルギーの補正係数 1.1 where  $\alpha =$ 

B= 0.4 m g= 9.8 m/s2

(0.099 m) at downstream  $hc=(\alpha *Qt^2/(g*B^2))^(1/3)=$ 0.100 m

0.130 m (0.130 m) at upstream ho=hc+h(a-c)

Bottom level at the end of the intermediated channel is 449.500

449,500 +0.100)449.600 m Accordingly, water level at the end of the intermediated channel is

(Water Depth is 0.130 m) Water level at the upstream of the intermediated channel is 449.630 m

449.450 m in consideration of an allowance of 0.15 m. The water level at the end channel is

```
Outflow Troough of Sedimentation Basin
1.End trough (Inlet from both side)
1.1.Load factor of end trough weir design criteria
                  Q=
                                       11733 m3/d
                                                         : Flow Rate (
                                                                                        59.3%)
                  n=
                                            8 pieces
                                                          : Number of trough
                  L=
                                            2 m
                                                          : Length of trough
                  Lf=
                                                         : Load factor (=<500m3/m/d)
                                         367 m3/m/d
1.2. Number of orifice holes per trough
        N=Qt/(C'*\pi/4*d^2*(2gh)^0.5)
                                       0.0170 m3/sec
                                                         : Collecting water amount per trough
                  Qt=
                  C'=
                                          0.6
                  d=
                                         0.03 \text{ mm}(\varphi 30\text{mm})
                                                                       : Orifice diameter
                                          9.8 m/sec2
                  g-
                                         0.06 m(60mm)
                                                                       : Overflow depth of oridice
                  h=
        N=Qt/(C'*\pi/4*d^2*(2gh)^0.5)=
                                                                    36 holes per each trough
                                                                    18 holes per each side of trough
        Interval between holes
                  In=L/(N/2)
                                          100 mm
                                                                (0.108 m)
1.3. Water level in the trough
        hc=(\alpha*Qt^2/(g*B^2))^(1/3)
        where
                                          1.1
                                                         : Suplementary factor of velocity energy
                  <u>α=</u>
                                          0.4 m
                                                         : Weir width
                                                                             (0.059 m) at downstream
        hc = (\alpha * Qt^2/(g*B^2))^(1/3) =
                                                   0.060 m
        ho=hc*3^{(1/2)}
                                                   0.100 m
                                                                             (0.104 m) at upstream
1.4.Load factor of trough weir
        O=
                   11733.33333 m3/d
                                              : Flow Rate (
                                                                             59.3%)
        n=
                              8 pieces
                                              : Number of trough per unit
        Le=
                             2.0 m
                                              : length of trough
                                              : Load factor (=<500m3/m/d)
                            367 m3/m/day
        Lf=
2.Intermediate trough (Inlet from one side )
2.1.Load factor of trough weir design criteria
                                        8067 m3/d
                                                                                        40.7%)
                  0=
                                                         : Flow Rate (
                  n=
                                            2 pieces
                                                         : Number of trough in one basin
                  L=
                                         11.0 m
                                                         : Length of trough
                  Lf=
                                                         : Load factor (=<500m3/m/d)
                                         500 m3/m/d
2.2. Number of orifice holes per 1/2trough
        N=Qt/(C'*\pi/4*d^2*(2gh)^0.5)
                                       0.0467 m3/sec
                  Qt=
                                                         : Collecting water amount per 1/2trough
                  C'=
                                          0.6
                                         0.03 mm(\phi30mm)
                                                                       : Orifice diameter
                  d≔
                                          9.8 m/sec2
                  g=
                                         0.06 m(60mm)
                                                                       : Overflow depth of oridice
        N=Qt/(C'*\pi/4*d^2*(2gh)^0.5)=
                                                                  102 holes per each trough
        Interval between holes
                  In=L/(N/2)
                                          100 mm
                                                               (0.108 m)
2.3. Water level in the trough
        hc=(\alpha*(1/2*Qt)^2/(g*B^2))^(1/3)
                                                         速度エネルギーの補正係数
        where
                                          1.1
                  B=
                                          0.4 m
                                                   0.070 m
                                                                             (0.073 m) at downstream
        hc=(\alpha*(1/2*Qt)^2/(g*B^2))^(1/3)=
        ho=hc*3^(1/2)
                                                   0.120 m
                                                                             (0.121 m) at upstream
2.4.Load factor of trough weir (one side inflow)
                                                                             40.7%)
        Q=
                   8066.666667 m3/d
                                              : Flow Rate (
                              2 pieces
                                              : Number of trough per unit
        n=
                                              : length of trough
        Le=
                             11 m
                            367 m3/m/day
```

: Load factor (=<500m3/m/d)

Lf=

```
6. Rapid Sand Filter (in case of four units duty)
                                                                               Phasel
     1 Water level at the upstream of the inflow channel of the filter
                                                                                              449.450 m
               Head loss in the channel is calculated under the conditions that four units are operated
               Q1 =
                                  0.458 m3/sec
                                                    : Total flow rate for 4 units of 1 system
                                                    : flow rate for 1 units during 4 units duty in 1 system
               Q2=Q1/4=
                                  0.115 m3/sec
               Inflow sectional area
                A(a-d)=B*H=
                                               2.17 m2
                            B=
                                               1.50 m
               where
                            H=
                                               1.45 m
                Velocity
                V(a-b)=3*Q2/A=
                                               0.11 m/sec
                V(b-c)=2*Q2/A=
                                               0.05 m/sec
                Hydraulic radius
                R(a-d)=A/(B+H*2)=
                                              0.494 m
                Roughness coefficient
                                  0.015
               n=
               Head losses are calculated using Manning Formula.
                h=n^2*L*v^2/R^(4/3)
                where
                            L(a-b)=
                                              33.95 m
                            L(b-c)=
                                                 9.3 m
                h(a-b)=
                                0.00022
                                                 = 0 \text{ m}
                                10000.0
                                                 =0 \text{ m}
               h(b-c)=
                Total head loss
               h(a-d)=
                                      0 m
                                                                                                          (449.450 - 0.000)
       Accordingly, water level at the downstream of inflow channel is
                                                                                   449.450 m
       Inlet channel bottom level is
                                           448.000 m
                                                                      449.450
                                                                                   - 1.450)
     2 Weir and inlet gate loss
              I Overflow weir loss
               h=(Q2/(1.84*b))^(2/3)
                                               0.80 m
                where
                            h=
               h=(Q2/(1.84*b))^{2/3}=
                                              0.182 m
                                                                       (0.190 m)
               The height of the overflow weir is accordingly
                                                                     449.260m
                                                                                 (449.450-
                                                                                                0.1901
       The water level at the downstream of the weir is
                                                                      448.960 m in consideration of an allowance
                      0.30 m.
       of
              2 Inlet gate loss
               h=v^2/(2*g*c^2)
                                               0.16 m2
                                                                  : Gate Area
                                                                                  (400mm×
                                                                                             400mm)
                where
                            A=
                                              0.115 m3/sec
                            Q2=
                            v=Q2/A=
                                               0.72 m/sec
                                                 9.8 m/sec2
                            g=
                            ç=
                                                 0.6
                                              0.073 m
                                                                        (0.080 m)
               h=v^2/(2*g*c^2)=
                Total loss h=
                                              0.255 m
       The water level at the downstream of the weir is
                                                                     448.880m
                                                                                  (448.960-
                                                                                                0.080)
     3 Inlet pipe loss
                            (Diameter
                                                                                                  0.91 m/s
       Inlet Loss
                                                400 mm), f=
                                                                           0.5
                                                                                    V(Q1)=
                                                                                                                           h=
                                                                                                                                   0.021 m
       Outlet Loss
                            (Diameter
                                                400 mm), f=
                                                                           1.0
                                                                                                  0.91 m/s
                                                                                                                           h=
                                                                                                                                   0.042 m
                                                                                    V(Q2)=
                                                                                                                                   0.002 m
       Pipe Friction Loss
                            (Diameter
                                                400 mm), I=
                                                                      0.00281
                                                                                                  0.70 \ m
                                                            0.065 m
                Total
                                                           (0.070 \text{ m})
       where
               Q2=
                                  0.115 m3/sec
                                    110
       The high water level of filter is
                                            448.810
                                                      m(448.880
                                                                       -0.070)
```

449.450 m

Head loss in the channel is calculated under the conditions that one unit is stopped its operation

```
and one unit is washed.
```

Q1= 0.458 m3/sec

: Total flow rate for 6 units of 1 system

Q2=Q1/4= : flow rate for 1 units during 4 units duty in 1 system 0.115 m3/sec

#### Inflow sectional area

| A(a-d)=B | *H= | 2.17 m2 |
|----------|-----|---------|
| where    | B=  | 1.50 m  |
|          | H=  | 1.45 m  |
|          |     |         |

#### Velocity

| V(a-b)=2*Q2/A= | 0.16 m/sec |
|----------------|------------|
| V(b-c)=Q2/A=   | 0.05 m/sec |
| V(c-d)=3*Q2/A= | 0.16 m/sec |
| V(d-e)=2*Q2/A= | 0.11 m/sec |
| V(e-f)=4*Q2/A= | 0.21 m/sec |
| V(f-g)=3*Q2/A= | 0.16 m/sec |
| V(g-h)=2*Q2/A= | 0.11 m/sec |
| V(h-i)=4*Q2/A= | 0.21 m/sec |
| V(I-j)=3*Q2/A= | 0.16 m/sec |
| V(j-k)=2*Q2/A= | 0.11 m/sec |
| V(k-l)=Q2/A=   | 0.05 m/sec |

Hydraulic radius

R(a-d)=A/(B+H\*2)=0.494 m

#### Roughness coefficient

0.015

Head losses are calculated using Manning Formula.

12.85 m

```
b=n^2*L*v^2/R^(4/3)
where
          L(a-b)=
```

|         | L(b-c)= | 8.25 m  |
|---------|---------|---------|
|         | L(c-d)= | 6.15 m  |
|         | L(d-e)= | 6.55 m  |
|         | L(e-f)= | 6.15 m  |
|         | L(f-g)= | 9.3 m   |
|         | L(g-h)= | 5.65 m  |
|         | L(h-i)= | 33.95 m |
|         | L(i-j)= | 9.3 m   |
|         | L(j-k)= | 17.8 m  |
|         | L(k-l)= | 9.3 m   |
| h(a-b)= | 0.00018 | = 0 m   |
|         |         |         |

| 0.00018 | = 0 m   |
|---------|---|
| 0.00001 | = 0  m  |
| 0.00009 | = 0  m  |
| 0.00004 | =0 m  |
| 0.00016 | =0  m   |
| 0.00013 | =0 m  |
| 0.00004 | = 0 m   |
| 0.00087 | =0 m  |
| 0.00013 | =0 m.   |
| 11000.0 | = 0 m   |
| 0.00001 | =0 m  |
|         | 0.00001<br>0.00009<br>0.00004<br>0.00016<br>0.00013<br>0.00004<br>0.00087<br>0.00013<br>0.00011 |

Total head loss

h(a-d)= 0.00179 = 0.000 m

Accordingly, water level at the inflow channel is ,449.450 m ( 449.450 - 0.000)

Inlet channel bottom level is 448.000 m 449.450 - 1.450)

```
2 Weir and inlet gate loss
        I Overflow weir loss
          h=(Q2/(1.84*b))^(2/3)
          where
                   b=
                                           0.80 \ m
          h=(Q2/(1.84*b))^(2/3)=
                                                                  (0.190 m)
                                          0.182 m
          The height of the overflow weir is accordingly
                                                               449.260m (449.450-
                                                                                         0.190)
          The water level at the downstream of the weir is
                                                                             448.960 m in consideration of an allowance
          of
                              0.30 m.
        2 Inlet gate loss
          h=v^2/(2*g*c^2)
                                           0.16 m2
                                                                            (400mm×
          where
                      A≃
                                                             : Gate Area
                                                                                        400mm)
                      Q2=
                                          0.115 m3/sec
                      v=Q2/A=
                                           0.72 m/sec
                                            9.8 m/sec2
                      g=
                      c=
                                            0.6
          h=v^2/(2*g*c^2)=
                                          0.073 m
                                                                  (0.080 m)
 The water level at the downstream of the gate is
                                                               448.880m
                                                                            (448.960-
                                                                                          0.080)
3 Inlet pipe loss
 Inlet Loss
                      (Diameter
                                           400 mm), f=
                                                                     0.5
                                                                              V(QI)=
                                                                                           0.91 m/s
                                                                                                                  h=
                                                                                                                          0.021 m
 Outlet Loss
                                           400 mm), f=
                                                                                           0.91 m/s
                                                                                                                          0.042 m
                      (Diameter
                                                                     1.0
                                                                              V(Q2)=
                                                                                                                  h=
 Pipe Friction Loss
                      (Diameter
                                           400 mm), I=
                                                                 0.00281
                                                                                            0.70 m
                                                                                                                          0.002 m
          Total
                                                      0.065 m
                                    h≕
                              0.115 m3/sec
 where
         Q2=
          C=
                                110
 The high water level of filter is
                                       448.810
                                                 m(448.880
                                                                 -0.070)
```

# 7.Rapid Sand Filter Outflow Water Level (in case of four units duty)

Phasel

Filtered water level (Outlet box) is

447.060 m.

| 1 | Filtered | outlet | pipe | 1055 |
|---|----------|--------|------|------|

| Inlet Lo | SS          | (Diameter    | 350 mm), f=   | 0.5               | $\mathbf{V}=$ | 1.19 m/s | h≔ | 0.036 m             |
|----------|-------------|--------------|---------------|-------------------|---------------|----------|----|---------------------|
| Valve    |             | (Diameter    | 350 mm), f=   | 0.1               | V=            | 1.19 m/s | h= | 0.007 m             |
| Outlet I | _oss        | (Diameter    | 350 mm), f=   | 1.0               | V=            | 1.19 m/s | h= | 0.072 m             |
| Pipe Fri | iction Loss | (Diameter    | 350 mm), I=   | 0.00539           | L=            | 2.50 m   | h= | $0.013  \mathrm{m}$ |
| •        | Total       | h=           | 0.128 a       | m                 |               |          |    |                     |
| where    | 0=          | 0.115 m3/sec | (110000*(1.05 | 5+003)/3/86400/4) |               |          |    |                     |

c= 0.115 m.5/sec

.05+0.0400/4)

The water level at upstream of weir (b=1.6m) is

446.930 m(447.060 - 0.

-0.130)

2 Overflow weir loss (in case of four units duty)

h=(Q/(1.84\*b))^(2/3)

where Q= 0.115 m3/sec (110000\*(1.05+0.03)/3/86400/4) b= 1.60 m h=(Q/(1.84\*b))^(2/3)= 0.115 m

The height of the overflow weir is

446.810 m same as surface level of filter media.

The water level at the downstream of the weir is

446.600 m in consideration of an allowance of

0.21 m.

3 Overflow weir loss (b=8.0m)

 $h=(Q/(1.84*b))^{2/3}$ 

where Q= 0.458 m3/sec (110000\*(1.05+0.03)/3/86400) b= 8.00 m h=(Q/(1.84\*b))^(2/3)= 0.099 m

The height of the overflow weir is

446.500 m(446.600 -0.100)

The water level at the downstream of the weir (filtered water effluent channel) is

446.030 m in consideration

of an allowance of

0.470 m.

# Rapid Sand Filter Outflow Water Level (in case of eight units duty)

Phase2

Filtered water level (Outlet box) is

447.060 m.

1 Filtered outlet pipe loss

| (Diameter    | 350 mm), f=                            | 0.5   | V=   | 1.19 m/s   | h=   | 0.036 m   |
|--------------|--|---|--|--|--|---|
| (Diameter    | 350 mm), f=                            | 0.1   | V=   | 1.19 m/s   | h=   | 0.007 m   |
| (Diameter    | 350 mm), f=                            | 1.0   | V=   | 1.19 m/s   | h≕   | 0.072 m   |
| ss (Diameter | 350 mm), l=                            | 0.00539   | L=   | 2.50 m   | h=   | 0.013 m   |
| h≕           | 0.128 n                                | n   |  |  |  |   |
| 0.115 m3/sec | (110000*(1.05                          | +003)/3/86400/4)  |  |  |  |   |
|              | (Diameter<br>(Diameter<br>ss (Diameter | (Diameter 350 mm), f= (Diameter 350 mm), f= ss (Diameter 350 mm), l= l h= 0.128 m | (Diameter 350 mm), f= 0.1<br>(Diameter 350 mm), f= 1.0<br>ss (Diameter 350 mm), I= 0.00539<br>h= 0.128 m | (Diameter 350 mm), f= 0.1 V= (Diameter 350 mm), f= 1.0 V= ss (Diameter 350 mm), l= 0.00539 L= 1 h= 0.128 m | (Diameter 350 mm), f= 0.1 V= 1.19 m/s<br>(Diameter 350 mm), f= 1.0 V= 1.19 m/s<br>ss (Diameter 350 mm), l= 0.00539 L= 2.50 m<br>h= 0.128 m | (Diameter 350 mm), f= 0.1 V= 1.19 m/s h= (Diameter 350 mm), f= 1.0 V= 1.19 m/s h= ss (Diameter 350 mm), l= 0.00539 L= 2.50 m h= 0.128 m |

Q= 0.115 m3/sec (110000\*(1.05+0..03)/3/86400/4) C= 110

The water level at upstream of weir (b=1.6m) is

446.930 m(447.060 -0.130)

2 Overflow weir loss (in case of eight units duty)

h=(Q/(1.84\*b))^(2/3)

where Q= 0.115 m3/sec (110000\*(1.05+0.03)/3/86400/4) b= 1.60 m h=(Q/(1.84\*b))^(2/3)= 0.115 m

The height of the overflow weir is

446.810 m same as surface level of filter media.

The water level at the downstream of the weir is

446.660 m in consideration of an allowance of

0.15 m.

3 Overflow weir loss (b=8.0m)

 $h=(Q/(1.84*b))^{2/3}$ 

where Q= 0.917 m3/sec (110000\*(1.05+0.03)/3\*2/86400) b= 8.00 m h=(Q/(1.84\*b))^(2/3)= 0.157 m

The height of the overflow weir is

446.500 m(446.660 - 0.160)

The water level at the downstream of the weir (filtered water effluent channel) is

446.020 m in consideration

of an allowance of

 $0.480 \ m.$ 

# Rapid Sand Filter Outflow Water Level (in case of four units duty)

The water level at the downstream of the weir (filtered water effluent channel) is

0.430 m.

of an allowance of

Phase3

446.070 m in consideration

447.060 m. Filtered water level (Outlet box) is I Filtered outlet pipe loss 1.19 m/s  $0.036 \ m$ Inlet Loss (Diameter 350 mm), f= 0.5 0.007 m V= 1.19 m/s Valve (Diameter 350 mm), f= 0.1h= 0.072 m 1.19 m/s Outlet Loss (Diameter 350 mm), f= 1.0 V= h≃ 0.00539 2.50 m 0.013 m Pipe Friction Loss (Diameter 350 mm), I= 0.128 m Total h= 0.115 m3/sec (110000\*(1.05+0..03)/3/86400/4) where Q= Č= 110 The water level at upstream of weir (b=1.6m) is 446.930 m( 447.060 -0.130) 2 Overflow weir loss (in case of four units duty) h=(Q/(1.84\*b))^(2/3) 0.115 m3/sec (110000\*(1.05+0.03)/3/86400/4) Q =where b= 1.60 m h=(Q/(1.84\*b))^(2/3)= 0.115 m 446.810 m same as surface level of filter media. The height of the overflow weir is 446.600 m in consideration of an allowance of The water level at the downstream of the weir is 0.21 m. 3 Overflow weir loss (b=8.0m)  $h=(Q/(1.84*b))^{2/3}$ Q== 0.458 m3/sec (110000\*(1.05+0.03)/3/86400) where 8.00 m b=  $h=(Q/(1.84*b))^{2/3}=$ 0.099 m The height of the overflow weir is 446.500 m( 446.600 -0.100)

# 8.Connection Pipe between Filter and Clear Water Reservoir 1.Connection Pipe between Filter(No.1+No.2) and Clear Water Reservoir(No.1-1)

| Filter Outlet   | t water level   |   |   |  |  |  | 446.030 m  | ~                    |                     |  |                                  |
|---|---|---|---|--|--|--|--|----------------------|---------------------|--|----------------------------------|
| Outlet pîpe   | loss  |   |   |  |  |  |  |                      |                     |  |                                  |
| Inlet Loss  |   | (Diameter   | 1000  | mm)、f=   | 0.5  | V=   | 1.17 m/s   |                      |                     | h=                                     | (                                |
| Tee Branch  |   | (Diameter   | 1000  | 1000   | mm), f=  | 0.99   | V=   | 1.17                 | m/s                 | h=                                     | (                                |
| Reducer   |   | (Diameter   | 1000  | 800  | mm), f=  | 0.00   | V=   | 0.58                 | m/s                 | h≃                                     | (                                |
| Tee Branch  |   | (Diameter   | 800   | 600  | mm), f=  | 0.05   | V=   | 0.91                 | m/s                 | h=                                     | (                                |
| Reducer   |   | (Diameter   | 800   | 600  | mm), f=  | 0.00   | V=   | 0.46                 | m/s                 | h=                                     | (                                |
| 90°Bend Lo  | oss   | (Diameter   | 600   | mm), f=  | 0.23   | V≃   | 0.81 m/s   |                      |                     | h=                                     | (                                |
| Valve Loss  |   | (Diameter   | 600   | mm), f=  | 0.30   | V=   | 0.81 m/s   |                      |                     | h=                                     | (                                |
| Outlet Loss   |   | (Diameter   | 600   | mm), f=  | 1.0  |  | 0.81 m/s   |                      |                     | h=                                     | (                                |
| Pipe Friction   | n Loss  | (Diameter   | 1000  | mm), I=  | 0.00152  | L=   | 8.75 m   |                      |                     | h=                                     | (                                |
| Pipe Friction   |   | (Diameter   |   | mm), I=  | 0.00125  |  | 7.60 m   |                      |                     | h=                                     | (                                |
| Pipe Frictio  |   | (Diameter   |   | mm), I=  | 0.00141  | L=   | 17.71 m  |                      |                     | h=                                     | (                                |
|   | Total   | •   | h=  | 0.205  |  |  |  |                      |                     |  |                                  |
| where   | C=  | 110   | •   | <del>-</del>   |  |  |  |                      |                     |  |                                  |
|   | Ql=   |   | m3/d=   | 0.229  | m3/sec   | (110000*(1   | .05+0.03)/6)   |                      |                     |  |                                  |
|   | Q2=   |   | m3/d=   |  |  |  | .05+0.03)/6*2)   |                      |                     |  |                                  |
|   | Q3=   |   | m3/d=   |  | m3/sec   |  | .05+0.03)/6*3)   |                      |                     |  |                                  |
|   | Q4=   |   | m3/d=   |  | m3/sec   |  | .05+0.03)/6*4)   |                      |                     |  |                                  |
|   | Q5=   |   | m3/d=   |  | m3/sec   |  | .05+0.03)/6*5)   |                      |                     |  |                                  |
|   | Q6=   | 118800  |   |  | m3/sec   | (110000*(1   |  |                      |                     |  |                                  |
|   |   | Clear Water R<br>on Filter(No   |   |  | lear Wate  | er Reservo   | 445.820 m (<br>ir(No.1-2)  |                      | 446.<br>Phase       |  | -0                               |
| nnection P  |   |   |   |  | lear Wate  | er Reservo   | `  |                      |                     |  | -0                               |
| nnection P  | ripe betwee   |   |   |  | lear Wate  | er Reservo   | ir(No.1-2)   |                      |                     |  | -0                               |
| nnection P Filter Outlet Outlet pipe  | ripe betwee   | en Filter(No  | o.1+No.:  | 2) and C   |  |  | ir(No.1-2)<br>446.030 m  |                      |                     | el                                     |                                  |
| nnection P Filter Outlet Outlet pipe Inlet Loss   | ripe between t water level  | en Filter(No  | 0.1+No.   | 2) and C<br>mm), f=  | 0.5  | V=   | ir(No.1-2) 446.030 m 1.17 m/s  |                      | Phase               | el<br>h=                               | (                                |
| nnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch  | ripe between t water level  | en Filter(No<br>(Diameter<br>(Diameter  | 1000<br>1000  | 2) and C  mm), f=  1000  | 0.5<br>mm), f=   | V=<br>0.99   | ir(No.1-2)  446.030 m  1.17 m/s V=   | 1.17                 | Phase               | el<br>h=<br>h=                         | ÷                                |
| nnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer  | ipe between twater level  | en Filter(No  (Diameter (Diameter (Diameter (Diameter   | 1000<br>1000<br>1000  | mm), f=<br>1000<br>800   | 0.5<br>mm), f=<br>mm), f=  | V=<br>0.99<br>0.00   | ir(No.1-2)  446.030 m  1.17 m/s V= V=  | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=                         | (                                |
| nnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch   | ipe between twater level  | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 1000<br>1000<br>1000<br>1000<br>800   | mm), f= 1000 800 600   | 0.5<br>mm), f=<br>mm), f=<br>mm), f=   | V=<br>0.99<br>0.00<br>0.90   | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  V=  | 1.17                 | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=                   | (<br>(                           |
| nnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss  | ipe between twater level  | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>1000<br>800<br>600  | mm), f= 1000 800 600 mm), f=   | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30   | V=<br>0.99<br>0.00<br>0.90<br>V=   | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  V=  0.81 m/s  | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=             | (<br>(<br>(                      |
| nnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss                                | ipe betwee<br>t water level<br>loss                                 | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>800<br>600  | mm), f= 1000 800 600 mm), f= mm), f=   | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0  | V=<br>0.99<br>0.00<br>0.90<br>V=<br>V=   | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  0.81 m/s 0.81 m/s   | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=             | ;<br>;<br>;<br>;                 |
| nnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction                  | ipe between twater level closs                                      | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>800<br>600<br>600   | mm), f= 1000 800 600 mm), f= mm), f= mm), I=   | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152                                       | V=<br>0.99<br>0.00<br>0.90<br>V=<br>V=<br>L=   | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  V=  0.81 m/s  0.81 m/s  5.75 m  | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=       | ()<br>()<br>()<br>()             |
| rnnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction   | ripe between t water level loss n Loss n Loss                       | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 1000<br>1000<br>1000<br>800<br>600<br>600<br>1000   | mm), f= 1000 800 600 mm), f= mm), f= mm), I= mm), I=                                     | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042                            | V=<br>0.99<br>0.00<br>0.90<br>V=<br>V=<br>L=<br>L=   | 1.17 m/s<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>3.00 m   | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=       | ()<br>()<br>()<br>()<br>()       |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction               | ripe between t water level loss n Loss n Loss n Loss n Loss         | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800   | mm), f= 1000 800 600 mm), f= mm), f= mm), I= mm), I= mm), I=                             | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00125                 | V=<br>0.99<br>0.00<br>0.90<br>V=<br>V=<br>L=<br>L=<br>L=   | 1.17 m/s<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>3.00 m<br>5.10 m   | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | ()<br>()<br>()<br>()<br>()       |
| rnnection P Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction   | ripe between t water level loss n Loss n Loss n Loss n Loss n Loss  | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800<br>600  | mm), f= 1000 800 600 mm), f= mm), f= mm), I= mm), I= mm), I= mm), I= mm), I=             | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00125<br>0.00141      | V=<br>0.99<br>0.00<br>0.90<br>V=<br>V=<br>L=<br>L=   | 1.17 m/s<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>3.00 m   | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=       | ()<br>()<br>()<br>()<br>()       |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction | t water level loss n Loss n Loss n Loss n Loss n Loss n Loss n Loss | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800   | mm), f= 1000 800 600 mm), f= mm), f= mm), I= mm), I= mm), I=                             | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00125<br>0.00141      | V=<br>0.99<br>0.00<br>0.90<br>V=<br>V=<br>L=<br>L=<br>L=   | 1.17 m/s<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>3.00 m<br>5.10 m   | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | ()<br>()<br>()<br>()<br>()       |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction               | n Loss n Loss n Loss n Loss n Loss n Loss n Loss Total C=           | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800<br>600  | mm), f= 1000 800 600 mm), f= mm), f= mm), I= mm), I= mm), I= 0.209                       | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00125<br>0.00141      | V=<br>0.99<br>0.00<br>0.90<br>V=<br>V=<br>L=<br>L=<br>L=<br>L=   | 1.17 m/s<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>3.00 m<br>5.10 m<br>6.01 m   | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | ()<br>()<br>()<br>()<br>()       |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction | n Loss n Loss n Loss n Loss n Loss n Loss C= Q1=                    | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800<br>600<br>h=  | mm), f= 1000 800 600 mm), f= mm), f= mm), I= mm), I= mm), I= 0.209                       | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00125<br>0.00141<br>m | V= 0.99 0.00 0.90 V= V= L= L= L= (110000*(1  | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  0.81 m/s  0.81 m/s  5.75 m  3.00 m  5.10 m  6.01 m  | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | ()<br>()<br>()<br>()<br>()       |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction | n Loss n Loss n Loss n Loss n Loss n Loss C= Q1= Q2=                | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter)<br>(Diameter)  | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800<br>600<br>h=  | mm), f= 1000 800 600 mm), f= mm), I= mm), I= mm), I= 0.209 0.229 0.458                   | 0.5<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00125<br>0.00141<br>m | V= 0.99 0.00 0.90 V= V= L= L= (110000*(1) (110000*(1)  | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  0.81 m/s  0.81 m/s  5.75 m  3.00 m  5.10 m  6.01 m  .05+0.03)/6) .05+0.03)/6*2)                                   | 1.17<br>0.58         | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | ()<br>()<br>()<br>()<br>()       |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction | n Loss n Loss n Loss n Loss n Loss n Loss C= Q1= Q2= Q3=            | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)   | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800<br>600<br>b=<br>m3/d=<br>m3/d=                            | mm), f= 1000 800 600 mm), f= mm), f= mm), I= mm), I= 0.209 0.458 0.688                   | 0.5 mm), f= mm), f= mm), f= 0.30 1.0 0.00152 0.00042 0.00125 0.00141 m m3/sec m3/sec m3/sec          | V= 0.99 0.00 0.90 V= V= L= L= (110000*(1 (110000*(1 (110000*(1 (110000*(1  | 1.17 m/s<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>3.00 m<br>5.10 m<br>6.01 m<br>0.05+0.03)/6)<br>0.05+0.03)/6*2)<br>0.05+0.03)/6*3)                | 1.17<br>0.58<br>0.91 | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | ()<br>()<br>()<br>()<br>()<br>() |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction | n Loss n Loss n Loss n Loss n Loss n Loss C= Q1= Q2= Q3= Q4=        | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(D | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800<br>600<br>h=<br>m3/d=<br>m3/d=<br>m3/d=                   | mm), f= 1000 800 600 mm), f= mm), I= mm), I= mm), I= 0.209 0.458 0.688 0.917             | 0.5 mm), f= mm), f= mm), f= 0.30 1.0 0.00152 0.00042 0.00125 0.00141 m m3/sec m3/sec m3/sec m3/sec   | V= 0.99 0.00 0.90 V= V= L= L= (110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(100000*(1000000*(1000000*(1000000*(100000*(100000*(100000*(100000*(1000000*(1000000*(10000*(100000*(100000*(100000*(100000*(100000*(100000*(10000*(10000*(100000*(100000*(100000*(100000*(100000*(100000*(100000*(10000*(100000*(100000*(100000*(10000*(10000*(10000*(100000*(10000*(10000*(10000*(10000*(10000*(10000*(10000*(10000*(1000 | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  0.81 m/s  0.81 m/s  5.75 m  3.00 m  5.10 m  6.01 m  .05+0.03)/6) .05+0.03/6*2) .05+0.03/6*3) .05+0.03/6*4)        | 1.17<br>0.58<br>0.91 | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | -0<br>()<br>()<br>()<br>()<br>() |
| Filter Outlet Outlet pipe Inlet Loss Tee Branch Reducer Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction | n Loss n Loss n Loss n Loss n Loss n Loss C= Q1= Q2= Q3=            | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(Diameter)<br>(D | 1000<br>1000<br>1000<br>800<br>600<br>1000<br>1000<br>800<br>600<br>h=<br>m3/d=<br>m3/d=<br>m3/d=<br>m3/d=<br>m3/d= | mm), f= 1000 800 600 mm), f= mm), I= mm), I= mm), I= 0.209 0.229 0.458 0.688 0.917 1.146 | 0.5 mm), f= mm), f= mm), f= 0.30 1.0 0.00152 0.00042 0.00125 0.00141 m m3/sec m3/sec m3/sec          | V= 0.99 0.00 0.90 V= V= L= L= (110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(1(110000*(100000*(1000000*(1000000*(1000000*(100000*(100000*(100000*(100000*(1000000*(1000000*(10000*(100000*(100000*(100000*(100000*(100000*(100000*(10000*(10000*(100000*(100000*(100000*(100000*(100000*(100000*(100000*(10000*(100000*(100000*(100000*(10000*(10000*(10000*(100000*(10000*(10000*(10000*(10000*(10000*(10000*(10000*(10000*(1000 | ir(No.1-2)  446.030 m  1.17 m/s  V=  V=  0.81 m/s  0.81 m/s  5.75 m  3.00 m  5.10 m  6.01 m  0.05+0.03)/6)  0.05+0.03/6*2)  0.05+0.03/6*3)  0.05+0.03/6*4) | 1.17<br>0.58<br>0.91 | Phase<br>m/s<br>m/s | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | ()<br>()<br>()<br>()<br>()       |

Phase1

|   | pe betwee   | n Filter(N   | o.1+No.   | 2) and C  | lear Wate  | er Reservo   | ir(No2-1)   | Pha                  | se2  |   |
|---|---|--|---|---|--|--|---|----------------------|--|---|
| Filter Outlet   | water level   |  |   |   |  |  | 446.020 m   | Ý.                   |  |   |
| Outlet pipe le  | os <b>s</b>   |  |   |   |  |  |   |                      |  |   |
| Inlet Loss  |   | (Diameter  | 1000  | mm), f=   | 0.5  | V=   | 1.17 m/s  |                      | h=   | 0.035 m   |
| Tee Branch  |   | (Diameter  | 1000  | 1000  | mm), f=  | 0.99   | V=  | 1.17 m/s             | h=   | 0.069 m   |
| Tee Branch  |   | (Diameter  | 1000  | 600   | mm), f=  | 1.20   | V=  | 0.58 m/s             | h=   | 0.021 m   |
| Valve Loss  |   | (Diameter  | 600   | mm), f=   | 0.30   | V=   | 0.81 m/s  |                      | h=   | 0.010 m   |
| Outlet Loss   |   | (Diameter  | 600   | mm), f=   | 1.0  | V=   | 0.81 m/s  |                      | h≃   | 0.033 m   |
| Pipe Friction   | Loss  | (Diameter  | 1000  | mm), I=   | 0.00152  | L=   | 5.75 m  |                      | h≂   | 0.009 m   |
| Pipe Friction   | Loss  | (Diameter  | 1000  | mm), I=   | 0.00042  | L=   | 20.90 m   |                      | h=   | 0.009 m   |
| Pipe Friction   | Loss  | (Diameter  | 600   | mm), I=   | 0.00141  | L=   | 6.01 m  |                      | <u>h</u> =                                   | 0.008 m   |
| -   | Total   | •  | h⇒  | 0.194   | m  |  |   |                      |  |   |
| where   | C=  | 110  |   |   |  |  |   |                      |  |   |
|   | Q1=   |  | m3/d=   | 0.229   | m3/sec   | (110000*(1   | .05+0.03)/6)  |                      |  |   |
|   | Q2=   |  | m3/d=   |   | m3/sec   |  | .05+0.03)/6*2)  |                      |  |   |
|   | Q3=   |  | m3/d=   |   | m3/sec   |  | .05+0.03)/6*3)  |                      |  |   |
|   | Q4=   |  | m3/d=   |   | m3/sec   |  | .05+0.03)/6*4)  |                      |  |   |
|   | Q5=   |  | m3/d=   |   | m3/sec   |  | .05+0.03)/6*5)  |                      |  |   |
|   | Q6=   | 118890   |   |   | m3/sec   | (110000*(1.  |   |                      |  |   |
|   | Qu-   | 110000   | DL5/U   | 1.575   | 1113/300   | (1100011)  | .03.0.03))  |                      |  |   |
| The Inlet was   | ter level of C                                      | lear Water R   | eservoir i  | · c   |  |  | 445.820 m (   | 44                   | 6.020  | -0.200)   |
| Filter Outlet   | water level   |  |   |   |  |  | 446.060 ш   |                      |  |   |
| Outlet pipe k   |   |  |   |   |  |  |   |                      |  |   |
|   | OSS   |  |   |   |  |  |   |                      |  |   |
| Inlet Loss  | OSS   | (Diameter  | 1000  | mm), f=   | 0.5  | V=   | 1.17 m/s  |                      | <u>h</u> =                                   | 0.035 m   |
| Inlet Loss Tee Branch   | oss   | (Diameter<br>(Diameter   | 1000<br>1000  | -   | 0.5<br>mm), f=   | V=<br>0.99   | 1.17 m/s<br>V=  | 1.17 m/s             |  |   |
|   | oss   | •  |   | 1000  |  |  |   | 1.17 m/s<br>0.58 m/s | h=   | 0.069 m   |
| Tee Branch  |   | (Diameter  | 1000  | 1000<br>600   | mm), f=  | 0.99   | V=  |                      | h=<br>h=                                     | 0.069 m<br>0.001 m  |
| Tee Branch<br>Tee Branch  |   | (Diameter<br>(Diameter   | 1000<br>1000  | 1000<br>600<br>1000   | mm), f=<br>mm), f=   | 0.99<br>0.05   | V=<br>V=  | 0.58 m/s             | h=<br>h=<br>h=                               | 0.069 m<br>0.001 m<br>0.014 m   |
| Tee Branch<br>Tee Branch<br>Tee Combine   |   | (Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>1000                                    | 1000<br>600<br>1000   | mm), f=<br>mm), f=<br>mm), f=  | 0.99<br>0.05<br>0.36   | V=<br>V=<br>V=  | 0.58 m/s             | h=<br>h=<br>h=                               | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m  |
| Tee Branch Tee Branch Tee Combine Tee Branch  |   | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 1000<br>1000<br>1000<br>1000<br>600                             | 1000<br>600<br>1000<br>600  | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=   | 0.99<br>0.05<br>0.36<br>1.20   | V=<br>V=<br>V=  | 0.58 m/s             | h=<br>h=<br>h=<br>h=                         | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m   |
| Tee Branch Tee Combine Tee Branch Valve Loss  | e   | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>1000<br>600                             | 1000<br>600<br>1000<br>600<br>mm), f=   | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30   | 0.99<br>0.05<br>0.36<br>1.20<br>V=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s  | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=                   | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m  |
| Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss  | e<br>Loss   | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000              | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=   | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0  | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s  | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=             | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m   |
| Tee Branch<br>Tee Combine<br>Tee Branch<br>Valve Loss<br>Outlet Loss<br>Pipe Friction   | e<br>Loss<br>Loss                                   | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter   | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000              | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=  | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042                            | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m  | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=       | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m   |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction   | Loss Loss Loss                                      | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000      | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=   | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152                                       | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=       | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.009 m                                  |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction               | Loss Loss Loss Loss Loss                            | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000      | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>mm), I=  | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00012                 | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction   | Loss Loss Loss Loss Loss                            | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter                  | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000      | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=   | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00012<br>0.000141     | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=<br>L=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction               | Loss Loss Loss Loss Loss Loss                       | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter                  | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000<br>1 | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>mm), I=  | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00012<br>0.000141     | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=<br>L=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction               | Loss Loss Loss Loss Loss Loss Total                 | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter  | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000<br>1 | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>mm), I=<br>0.237                                   | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00012<br>0.000141     | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>L=<br>L=<br>L=<br>L=   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m<br>6.01 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction               | Loss Loss Loss Loss Loss Loss Total C=              | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter)                 | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000<br>1 | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>0.237  | mm), f=<br>mm), f=<br>mm), f=<br>mm), f=<br>0.30<br>1.0<br>0.00152<br>0.00042<br>0.00012<br>0.00011<br>m | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=<br>L=<br>(110000*(1.  | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction               | Loss Loss Loss Loss Loss Loss Total C= Q1=          | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>110<br>19800<br>39600                   | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000<br>1 | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>0.237<br>0.229<br>0.458                            | mm), f= mm), f= mm), f= mm), f= 0.30 1.0 0.00152 0.00042 0.00012 0.000141 m m3/sec                       | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=<br>(110000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.01000*(1.010000*(1.01000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000*(1.010000 | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m<br>6.01 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction               | Loss Loss Loss Loss Loss Loss Coss Total C= Q1= Q2= | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>110<br>19800<br>39600<br>59400          | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000<br>1 | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>0.237<br>0.229<br>0.458<br>0.688                   | mm), f= mm), f= mm), f= mm), f= 0.30 1.0 0.00152 0.00042 0.00012 0.000141 m m3/sec m3/sec                | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=<br>(110000*(1.<br>(110000*(1.<br>(110000*(1.  | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m<br>6.01 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction Pipe Friction | Loss Loss Loss Loss Loss Loss Ce Q1= Q2= Q3=        | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>110<br>19800<br>39600<br>59400<br>79200 | 1000<br>1000<br>1000<br>1000<br>600<br>600<br>1000<br>1000<br>1 | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>0.237<br>0.229<br>0.458<br>0.688<br>0.917          | mm), f= mm), f= mm), f= mm), f= 0.30 1.0 0.00152 0.00042 0.00012 0.000141 m m3/sec m3/sec m3/sec         | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=<br>(110000*(1.<br>(110000*(1.<br>(110000*(1.<br>(110000*(1.   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m<br>6.01 m   | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.035 m<br>0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.009 m<br>0.001 m<br>0.001 m |
| Tee Branch Tee Branch Tee Combine Tee Branch Valve Loss Outlet Loss Pipe Friction Pipe Friction Pipe Friction Pipe Friction               | Loss Loss Loss Loss Loss Total C= Q1= Q2= Q3= Q4=   | (Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>(Diameter<br>110<br>19800<br>39600<br>59400<br>79200 | 1000<br>1000<br>1000<br>1000<br>600<br>1000<br>1000<br>1000     | 1000<br>600<br>1000<br>600<br>mm), f=<br>mm), f=<br>mm), I=<br>mm), I=<br>mm), I=<br>0.237<br>0.229<br>0.458<br>0.688<br>0.917<br>1.146 | mm), f= mm), f= mm), f= mm), f= 0.30 1.0 0.00152 0.00042 0.00012 0.000141 m m3/sec m3/sec m3/sec m3/sec  | 0.99<br>0.05<br>0.36<br>1.20<br>V=<br>V=<br>L=<br>L=<br>L=<br>(110000*(1.<br>(110000*(1.<br>(110000*(1.<br>(110000*(1.   | V=<br>V=<br>V=<br>V=<br>0.81 m/s<br>0.81 m/s<br>5.75 m<br>20.90 m<br>6.20 m<br>8.00 m<br>6.01 m<br>0.05+0.03)/6)<br>0.05+0.03)/6*2)<br>0.05+0.03)/6*3)<br>0.05+0.03)/6*5) | 0.58 m/s             | h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h=<br>h= | 0.069 m<br>0.001 m<br>0.014 m<br>0.047 m<br>0.010 m<br>0.033 m<br>0.009 m<br>0.001 m<br>0.001 m                       |

# 5. Connection Pipe between Filter(No.1+No.2+No.3) and Clear Water Reservoir(No.3-1) Phase3

| Filter Outlet | water level    |               |           |         |         |              | 446.080 m    |          |      |         |
|---------------|----------------|---------------|-----------|---------|---------|--------------|--------------|----------|------|---------|
| Outlet pipe l | oss            |               |           |         |         |              |              |          |      |         |
| Inlet Loss    |                | (Diameter     | 1000      | mm), f≕ | 0.5     | V=           | 1.17 m/s     |          | h=   | 0.035 m |
| Tee Branch    |                | (Diameter     | 1000      | 1000    | mm), f= | 0.99         | V=           | 1.17 m/s | h≃   | 0.069 m |
| Tee Branch    |                | (Diameter     | 1000      | 600     | mm), f= | 0.05         | V=           | 0.58 m/s | h=   | 0.001 m |
| Tee Combin    | e              | (Diameter     | 1000      | 1000    | mm), f= | 0.36         | V=           | 0.88 m/s | h=   | 0.014 m |
| Tee Branch    |                | (Diameter     | 1000      | 600     | mm), f= | 0.05         | V=           | 0.88 m/s | h=   | 0.002 m |
| Reducer       |                | (Diameter     | 1000      | 800     | mm), f= | 0.00         | V=           | 0.58 m/s | h≕   | 0.000 m |
| Tee Branch    |                | (Diameter     | 800       | 600     | mm), f= | 0.90         | V=           | 0.91 m/s | h=   | 0.038 m |
| Valve Loss    |                | (Diameter     | 600       | mm), f= | 0.30    | V=           | 0.81 m/s     |          | h=   | 0.010 m |
| Outlet Loss   |                | (Diameter     | 600       | mm), f= | 1.0     | V=           | 0.81 m/s     |          | h=   | 0.033 m |
| Pipe Friction | ı Loss         | (Diameter     | 1000      | mm), I= | 0.00152 | L=           | 5.75 m       |          | h=   | 0.009 m |
| Pipe Friction | 1 Loss         | (Diameter     | 1000      | mm), I= | 0.00042 | L=           | 20.90 m      |          | h=   | 0.009 m |
| Pipe Friction | a Loss         | (Diameter     | 1000      | mm), I= | 0.00012 | L=           | 6.20 m       |          | h≕   | 0.001 m |
| Pipe Friction | ı Loss         | (Diameter     | 1000      | mm), I= | 0.00089 | L=           | 8.00 m       |          | h=   | 0.007 m |
| Pipe Friction | a Loss         | (Diameter     | 1000      | mm), I= | 0.00042 | L=           | 3.00 m       |          | h=   | 0.001 m |
| Pipe Friction | a Loss         | (Diameter     | 800       | mm), I= | 0.00125 | L=           | 16.60 m      |          | h≔   | 0.021 m |
| Pipe Friction | ı Loss         | (Diameter     | 600       | mm), I= | 0.00141 | L=           | 6.01 m       |          | h≕   | 0.008 m |
|               | Total          | h             | =         | 0.258   | m       |              |              |          |      |         |
| where         | C=             | 110           |           |         |         |              |              |          |      |         |
|               | Ql=            | 19800 п       | 13/d=     | 0.229   | m3/sec  | (110000*(1.0 | 5+0.03)/6)   |          |      |         |
|               | Q2=            | 39600 п       | 13/d=     | 0.458   | m3/sec  | (110000*(1.0 | 5+0.03)/6*2) |          |      |         |
|               | Q3=            | 59400 п       | 13/d=     | 0.688   | m3/sec  | (110000*(1.0 | 5+0.03)/6*3) |          |      |         |
|               | Q4=            | 79200 п       | 13/d=     | 0.917   | m3/sec  | (110000*(1.0 | 5+0.03)/6*4) |          |      |         |
|               | Q5=            | 99000 п       | 13/d=     | 1.146   | m3/sec  | (110000*(1.0 | 5+0.03)/6*5) |          |      |         |
|               | Q6=            | 118800 п      | 13/d=     | 1.375   | m3/sec  | (110000*(1.0 | 5+0.03))     |          |      |         |
| The Inlet wa  | ter level of C | lear Water Re | servoir i | s       |         |              | 445.820 m (  | 446.     | .080 | -0.260) |
|               |                |               |           |         |         |              | •            |          |      | •       |

# 6. Connection Pipe between Filter(No.1+No.2+No.3) and Clear Water Reservoir(No.3-2) Phase3

| Filter Outlet  | water level    |                |           |         |         |             | 446.070 m <sup>v</sup> | ,        |            |         |
|----------------|----------------|----------------|-----------|---------|---------|-------------|------------------------|----------|------------|---------|
| Outlet pipe le | oss            |                |           |         |         |             |                        |          |            |         |
| Inlet Loss     |                | (Diameter      | 1000      | mm), f= | 0.5     | <b>V</b> =  | 1.17 m/s               |          | <b>h</b> = | 0.035 m |
| Tee Branch     |                | (Diameter      | 1000      | 1000    | mm), f= | 0.99        | V=                     | 1.17 m/s | h=         | 0.069 m |
| Tee Branch     |                | (Diameter      | 1000      | 600     | mm), f= | 0.05        | V=                     | 0.58 m/s | h=         | m 100.0 |
| Tee Combine    | •              | (Diameter      | 1000      | 1000    | mm), f= | 0.36        | V=                     | 0.88 m/s | h=         | 0.014 m |
| Tee Branch     |                | (Diameter      | 1000      | 600     | mm), f= | 0.05        | V=                     | 0.88 m/s | <b>h</b> = | 0.002 m |
| Reducer        |                | (Diameter      | 1000      | 800     | mm), f= | 0.00        | V=                     | 0.58 m/s | h≕         | 0.000 m |
| Tee Branch     |                | (Diameter      | 800       | 600     | mm), f= | 0.05        | V=                     | 0.91 m/s | h=         | 0.002 m |
| Reducer        |                | (Diameter      | 800       | 600     | mm), f= | 0.00        | V=                     | 0.91 m/s | <u>h</u> = | 0.000 m |
| 90°Bend Los    | s              | (Diameter      | 600       | mm), 듣  | 0.23    | V=          | 0.81 m/s               |          | h=         | 0.008 m |
| Valve Loss     |                | (Diameter      | 600       | mm), f= | 0.30    | <b>V</b> =  | 0.81 m/s               |          | h≔         | 0.010 m |
| Outlet Loss    |                | (Diameter      | 600       | mm), f= | 1.0     | V=          | 0.81 m/s               |          | h=         | 0.033 m |
| Pipe Friction  | Loss           | (Diameter      | 1000      | mm), I= | 0.00159 | L=          | 5.75 m                 |          | h=         | 0.009 m |
| Pipe Friction  | Loss           | (Diameter      | 1000      | mm), I= | 0.00042 | L=          | 20.90 m                |          | h=         | 0.009 m |
| Pipe Friction  | Loss           | (Diameter      | 1000      | mm), I≂ | 0.00012 | L=          | 6.20 m                 |          | h=         | 0.001 m |
| Pipe Friction  | Loss           | (Diameter      | 1000      | mm), I= | 0.00089 | L=          | 8.00 m                 |          | h=         | 0.007 m |
| Pipe Friction  | Loss           | (Diameter      | 1000      | mm), I= | 0.00042 | L=          | 3.00 m                 |          | <u>h</u> = | 0.001 m |
| Pipe Friction  | Loss           | (Diameter      | 800       | mm), I= | 0.00125 | L=          | 19.10 m                |          | h=         | 0.024 m |
| Pipe Friction  | Loss           | (Diameter      | 600       | mm), I= | 0.00141 | L=          | 17.71 m                |          | h=         | 0.025 m |
|                | Total          | h              | =         | 0.250   | m       |             |                        |          |            |         |
| where          | C=             | 110            |           |         |         |             |                        |          |            |         |
|                | Q1=            | 19800 n        | 13/d=     | 0.229   | m3/sec  | (110000*(1. | .05+0.03)/6)           |          |            |         |
|                | Q2=            | 39600 п        | 13/d=     | 0.458   | m3/sec  | (110000*(1. | .05+0.03)/6*2)         |          |            |         |
|                | Q3=            | 59400 n        | 13/d=     | 0.688   | m3/sec  | (110000*(1. | .05+0.03)/6*3)         |          |            |         |
|                | Q4=            | 79200 n        | 13/d=     | 0.917   | m3/sec  | (110000*(1. | .05+0.03)/6*4)         |          |            |         |
|                | Q5=            | 99000 п        | 13/d=     | 1.146   | m3/sec  | (110000*(1. | .05+0.03)/6*5)         |          |            |         |
|                | Q6=            | 118800 п       | 13/d≕     | 1.375   | m3/sec  | (110000*(1. | .05+0.03))             |          |            |         |
| The Inlet wat  | ter level of ( | Clear Water Re | servoir i | s       |         |             | 445.820 m (            | 440      | 5.070      | -0.250) |

l Clear water reservor Water Level

445.820 m

```
I Head loss in the channel (under the conditions that two reservoirs are duty)
```

0=

0.219 m3/sec=

18883 m3/day (110000\*1.03/3/2)

Inflow sectional area

A=B\*H=

12.30 m2 4.10 m

R≃ where H=

3.00 m

Velocity

V=Q/A=

0.02 m/sec

Hydraulic radius

R=A/(B+H\*2)=

1.218 m

Roughness coefficient 0.015

Head losses are calculated using Manning Formula.

h=n^2\*L\*v^2/R^(4/3)

where Ľ=

57.2 m

0.00000= 0.000 m

2 Head loss in the channel (under the conditions that one reservoir is duty)

0.437 m3/sec=

37767 m3/day (110000\*1.03/3)

Inflow sectional area

A=B\*H=

12.30 m2

where H= 4.10 m

3.00 m

Velocity V=Q/A=

Hydraulic radius R=A/(B+H\*2)=

1.218 m

0.04 m/sec

Roughness coefficient 0.015

Head losses are calculated using Manning Formula.

h=n^2\*L\*v^2/R^(4/3)

where

L=

57.2 m

0.00001 = 0.000 m

3 Bend loss

h=(V1-V2)^2/(2\*g)\*n

V1= where

0.018 m/sec V2= 0 m/sec 9.8 m/sec2 g= n=

 $h=(V1-V2)^2/(2*g)*n=$ 

0.0001 =

0.000 m

 $0.000 \ m$ 4 Total head loss

Therefore High water level in clear water reservoir is

445.820

(

-0.000)

Effective Depth is

3.000 m.

Low Water Level in Clear Water Level is

442.820 m

445.820 m

445.820

- 3.000)

20

# 10. Connection Pipe between Clear Water Reservoir (No.3) and Transmission Pump Station

| 1 Clear Wa | ter Reservoir Ou   | tlet water le | evel (LWL | )       |         |            | 442.820   | m       |         |            |
|------------|--------------------|---------------|-----------|---------|---------|------------|-----------|---------|---------|------------|
| utlet pipe | loss               |               |           |         |         |            |           |         |         |            |
| Inlet Los  |                    | (Diameter     | 600       | mm), f= | 0.5     | V=         | 0.77      | m/s     | h=      | 0.015 m    |
| Valve Lo   |                    | (Diameter     |           | mm), f= | 0.1     |            | 0.77      | m/s     | h=      | 0.003 m    |
| 90°Bend    |                    | (Diameter     |           | mm), f= | 0.1     | <b>V</b> = | 0.77      | m/s     | h=      | 0.003 m    |
| Gradually  | y Expanded Pipe    | •             | 800       | •       | mm), f≈ | 0.494      | θ==       |         | h=      | 0.003 m    |
| Tee Com    |                    | (Diameter     | 800       |         | mm), f= | 0.47       | V=        | 0.44 m/ | s h≕    | 0.005 m    |
|            | Expanded Pipe      | (Diameter     | 900       |         | mm), f= | 0.416      | θ=        | 19.7°   | h=      | 0.001 m    |
| Tee Com    | bine               | (Diameter     | 900       |         | mm), f= | 0.05       | V=        | 0.69 m/ | s h=    | 0.001 m    |
|            | Expanded Pipe      | (Diameter     | 1000      |         | mm), f= | 0.416      | θ=        | 19.7°   | h=      | 0.001 m    |
| Tee Com    |                    | (Diameter     | 1000      |         | mm), f= | 0.05       | V≃        | 0.84 m/ | s h=    | 0.002 m    |
| Gradualh   | Expanded Pipe      | (Diameter     | 1100      |         | mm), f= | 0.416      | 6=        | 19.7°   | h≔      | 0.001 m    |
| Tee Com    | _                  | (Diameter     | 1100      |         | mm), f= | 0.05       | V=        | 0.92 m/ | s h=    | 0.002 m    |
| Gradually  | Expanded Pipe      | (Diameter     | 1200      |         | mm), f= | 0.416      | θ==       | 19.7°   | h=      | 0.001 m    |
| Tee Loss   |                    | (Diameter     | 1200      | 1200    | mm), f= | 1.0        | V=        | 1.16 m/ | s h=    | 0.069 m    |
| Pipe Fric  |                    | (Diameter     | 1200      | mm), I= | 0.00121 | L=         | 9.54      | m       | h=      | 0.012 m    |
| Pipe Fric  |                    | (Diameter     |           | mm), I= | 0.00132 | L=         | 8.43      | m       | h=      | 0.011 m    |
| Pipe Fric  | tion Loss          | (Diameter     |           | mm), I= | 0.00139 | L≖         | 10.33     | m       | b=      | 0.014 m    |
| Pipe Fric  | tion Loss          | (Diameter     | 900       | mm), I= | 0.00137 | L=         | 14.14     | m       | h=      | 0.019 m    |
| Pipe Fric  | tion Loss          | (Diameter     | 800       | mm), I= | 0.00114 | L=         | 19.64     | m       | h=      | 0.022 m    |
| Pipe Fric  | tion Loss          | (Diameter     | 600       | mm), I= | 0.00129 | L=         | 17.55     | m       | h=      | 0.023 m    |
|            | Total              |               | h=        | 0.207   | m       |            |           |         |         |            |
| where      | C=                 | 110           |           |         |         |            |           |         |         |            |
|            | Q1=                | 18883         | m3/d=     | 0.219   | m3/sec  | (110000*1. | 03/3/2)   |         |         |            |
|            | Q2=                | 37767         | m3/d=     | 0.437   | m3/sec  | (110000*1. | 03/3/2*2) |         |         |            |
|            | Q3=                | 56650         | m3/d=     | 0.656   | m3/sec  | (110000*1. | 03/3/2*3) |         |         |            |
|            | Q4=                | 75533         | m3/d=     | 0.874   | m3/sec  | (110000*1. | 03/3/2*4) |         |         |            |
|            | Q5=                | 94417         | m3/d=     | 1.093   | m3/sec  | (110000*1. | 03/3/2*5) |         |         |            |
|            | Q6=                | 113300        | m3/d=     | 1.311   | m3/sec  | (110000*1. | 03/3/2*6) |         |         |            |
| The Inlet  | water level of Tr  | ansmission    | Pump Sta  | tion is |         |            | 442.610   | m (4    | 142.820 | -0.210)    |
| (Pipe cen  | ter Level in the C | lear Water    | Reservoir | is      |         |            | 441.320   | m (4    | 42.820  | -0.6*2.5 ) |
| (Pipe cen  | ter Level in the T |               | 440.860   | m )     |         |            |           |         |         |            |

# 11 Hydraulic Calculation of Sedimentation Basin - Sludge Lagoon In case of drainage from 4 hoppers (for the purpose of empty of sedimentation basin)

Sedimentation Basin Sludge Pipe - Manhole (DIP Pipe 150mm -250mm) Manhole - Sludge Lagoon (RC Pipe 700mm)

|           | - Sludge Lagoor                 |           |              |          |            |            |              |            |                |            |          |
|-----------|---------------------------------|-----------|--------------|----------|------------|------------|--------------|------------|----------------|------------|----------|
| 1.Sedim   | entation Basin W                | ater Leve | el .         |          |            |            |              |            |                |            |          |
|           | H.W.L.                          |           | 449.960      | m        |            |            |              |            |                |            |          |
|           | L.L.W.L.                        |           | 445.160      | m        | (Drain Pit | Top Leve   | el in Sedime | entatio    | on Basin)      |            |          |
| 2.Drain I | Pipe Center Leve                | 1         |              |          |            |            |              |            |                |            |          |
|           | W.L+                            |           | 443.700      | m        | (DIP 150 - | - 250 Drai | in Pipe Cen  | ter Le     | evel)          |            |          |
| 3.First M | lanhole Water Le                | evel      |              |          |            |            |              |            |                |            |          |
|           | W.L+                            |           | 442.800      | m        | (Drain Pit | Top Leve   | l in Drain l | Pipe (     | Gallery +443.0 | 0 - 00     | .20m)    |
| 4.Sludge  | Lagoon High W                   | ater Leve | I            |          |            | -          |              |            |                |            |          |
| •         | •                               |           | 442.000      | m        |            |            |              |            |                |            |          |
| 4.Actual  | Head Loss                       |           |              |          |            |            |              |            |                |            |          |
|           |                                 |           | 6.260        | m (      | 449.960    | - 443.700  | • )          |            |                |            |          |
| 5 Intake  | Flow & Verosity                 | v         | 0.200        | (        |            |            | ,            |            |                |            |          |
| J 2334110 | Q1=                             | ,         | 0.0414       | m3/sec=  | 3577 t     | n3/day     |              |            |                |            |          |
|           | Q2=                             |           |              | m3/sec=  |            | n3/day     |              |            |                |            |          |
|           | Q3=                             |           |              | m3/sec=  |            | •          |              |            |                |            |          |
|           | Q4=                             |           |              | m3/sec=  |            |            |              |            |                |            |          |
|           | Q4-                             |           | 0.1050       | шэ/зес-  | 14300 1    | шиау       |              |            |                |            |          |
| 6 Water   | Level Loss                      |           |              |          |            |            |              |            |                |            |          |
| 6.1.      |                                 | ss C≕     | 100          |          |            |            |              |            |                |            |          |
|           | Suction Pipe Lo<br>Inlet Loss   | iss C-    |              | 150      |            |            | 0.5          | 17_        | 2.24/-         | L_         | 0.140 m  |
| *         |                                 |           | (Diameter    | 150      |            | nm)、f=     |              | V=         | 2.34 m/s       | h=         |          |
|           | Valve Loss                      |           | (Diameter    | 150      |            | nm)、f=     | ,            | V=         | 2.34 m/s       | h=         | 0.000 m  |
| •         | Valve Loss                      |           | (Diameter    | 150      |            | nm)、f=     | 10           | V=         | 2.34 m/s       | h=         | 2.794 m  |
|           | Tee Combine L                   |           | (Diameter    | 250      |            | nm)、f=     | 7.00         |            | 0.84 m/s       | h=         | 0.252 m  |
|           | Tee Combine Lo                  |           | (Diameter    | 250      |            | nm), f=    | 2.00         |            | 1.69 m/s       | h≕         | 0.291 m  |
|           | Tee Combine Le                  |           | (Diameter    | 250      | 150 r      | nm)、f=     | 0.60         |            | 2.53 m/s       | h≕         | 0.196 m  |
| 6.1.7.    | Tee Combine L                   | oss       | (Diameter    | 250      | 150 r      | nm), f=    | 0.20         | V≕         | 3.38 m/s       | h=         | 0.117 m  |
| 6.1.8.    | Tee Combine L                   | oss       | (Diameter    | 250      | 150 r      | nm). f≕    | 0.00         | V≕         | 1.69 m/s       | h=         | 0.000 m  |
| 6.1.9.    | Tee Combine L                   | OSS       | (Diameter    | 250      | 150 r      | nm)、f=     | 0.00         | V=         | 2.53 m/s       | h=         | 0.000 m  |
| 6.1.10    | Tee Combine L                   | oss       | (Diameter    | 250      | 150 r      | nm)、f=     | 0.00         | <b>V</b> = | 3.38 m/s       | h=         | 0.000 m  |
| 6.1.11    | . Tee Combine L                 | oss       | (Diameter    | 250      | 150 r      | nm)、f=     | 0.00         | V=         | 3.38 m/s       | h≕         | 0.000 m  |
| 6.1.12    | Outlet Loss                     |           | (Diameter    | 250      | r          | nm). f=    | 1.0          | <b>V</b> = | 3.38 m/s       | <u>h</u> = | 0.583 m  |
|           | Pipe Friction Lo                | oss       | (Diameter    | 150      |            | nm), I=    | 0.061        | L=         | 2.6 m          | h=         | 0.157 m  |
|           | Pipe Friction Lo                |           | (Diameter    | 250      |            | nm), I=    | 0.065        |            | 26.1 m         | h=         | 1.704 m  |
| 0.2.2     | . <b> p</b> - 2 - 2 - 2 - 2 - 2 |           | (2 11121111  |          |            | , • -      | *****        | _          |                |            |          |
|           | Sub Total                       |           |              |          |            |            |              |            |                | H=         | 6.234 m  |
|           | 240 1000                        |           |              |          |            |            |              |            |                |            | <6.260 m |
| 6.2.      | RC Pipe Loss (S                 | Sedimenta | tion Rasin - | → Sludge | (agonn)    |            |              |            |                |            | 0.200    |
|           | - '                             | 100%      | (Diameter    | 600      |            | nm), I=    | 0.00080      | Ŧ =        | 127.45 m       | h=         | 0.102 m  |
|           |                                 |           | <u> </u>     |          |            |            | 0.00080      | _          | 154.10 m       |            | 0.102 m  |
|           | Pipe Loss Manhole Loss          | 100%      | (Diameter    | 600      |            | nm), l≕    |              | L=         |                | h=         |          |
|           |                                 | 1000/     | (Diameter    | 600      |            | nm)        | 2.0          | cm         | 8 ps           | h=         | 0.160 m  |
|           | -                               | 100%      | (Diameter    | 450      |            | nm). I=    | 0.00340      |            | 3.64 m         | h=         | 0.012 m  |
| 6.2.5.    | Outlet Loss                     |           | (Diameter    | 450      | r          | nm).f=     | 1.0          | V=         | 1.04 m/s       | h=         | 0.055 m  |
|           |                                 |           |              |          |            |            |              |            |                |            | 2.452    |
|           | Sub Total                       |           |              |          |            |            |              |            |                | H=         | 0.452 m  |
| _         |                                 |           |              |          |            |            |              |            |                |            |          |
| 7.        | Total Pipe Loss                 |           |              |          |            |            |              |            |                | H=         | 6.686 m  |
|           | _                               | _         |              |          | , ,,,      |            |              |            |                |            |          |
| 8 Sludge  | e Lagoon Inlet W                | ater Leve | 442.348      | m (      | 442.800    | - 0.452    | . )          | >          | 442.000 m      | OK         |          |
|           |                                 |           |              |          |            |            |              |            |                |            |          |

RC600mmPipe Loss Calculation (Sedimentation Basin - Sludge Lagoon)

| [ <del></del> |      |             | Length(ctc) |           | <u> </u> | Loss(m) |       | Inlet        | Pipe                                  | Outlet       | Pipe      |             | Elevation | Soil Cover | Manhole  |
|---------------|------|-------------|-------------|-----------|----------|---------|-------|--------------|---------------------------------------|--------------|-----------|-------------|-----------|------------|----------|
| Manhole No.   | Dia. | Gradient(‰) | 7 3 1       | Length(m) | Pipe     | Manhole | Total | Bottom Level | Top Level                             | Bottom Level | Top Level | Water Level | Level(m)  | Depth(m)   | Depth(m) |
| 1             |      |             |             |           |          |         |       |              | · · · · · · · · · · · · · · · · · · · | 442.020      | 442.660   | 442.620     | 446,500   | 3.84       | 4.45     |
| 2             | 600  | 1.0         | 47.16       | 46.66     | 0.047    | 0.020   | 0.067 | 441.973      | 442.463                               | 441.900      | 442.540   | 442.500     | 446.500   | 4.04       | 4.57     |
| 3             | 600  | 1.0         | 16.60       | 15.40     | 0.015    | 0.020   | 0.035 | 441.885      | 442.525                               | 441.865      | 442.505   | 442.465     | 446.500   | 3.98       | 4.60     |
| 6             | 600  | 1.0         | 33.80       | 32.60     | 0.033    | 0.020   | 0.053 | 441.832      | 442.472                               | 441.812      | 442.452   | 442.412     | 446.500   | 4.03       | 4.65     |
| 9             | 600  | 1.0         | 33.80       | 32.60     | 0.033    | 0.020   | 0.053 | 441.779      | 442.419                               | 441.759      | 442.399   | 442.359     | 446.500   | 4.08       | 4.71     |
| 10            | 600  | 1.0         | 49.26       | 48.06     | 0.048    | 0.020   | 0.068 | 441.711      | 442.351                               | 441.691      | 442.331   | 442.291     | 444.000   | 1.65       | 2.27     |
| 11            | 600  | 1.0         | 31.88       | 30.68     | 0.031    | 0.020   | 0.051 | 441.661      | 442,301                               | 441,641      | 442.281   | 442.241     | 443.000   | 0.70       | 1.51     |
| 12            | 600  | 1.0         | 41.90       | 40.70     | 0.041    | 0.020   | 0.061 | 441.600      | 442.240                               | 441.580      | 442.220   | 442.180     | 443,000   | 0.76       | 1.51     |
| 13            | 600  | 1.0         | 41.90       | 40.70     | 0.041    | 0.020   | 0.061 | 441,539      | 442.179                               | 441.519      | 442,159   | 442.119     | 443.000   | 0.82       | 1.51     |
| 14            | 600  | 1.0         | 41.90       | 40.70     | 0.041    | 0.020   | 0.061 | 441.479      | 442.119                               | 441.459      | 442,099   | 442.059     | 443.000   | 0.88       | 1.51     |
| Inlet Mouth   | 450  | 4.5         | 2.5         | 1.65      | 0.007    | 0.000   | 0.007 | 441.451      | 442.091                               |              |           | 442.051     |           |            |          |
| Total         |      |             | 338,19      | 329.74    | 0.289    | 0.160   | 0.449 |              |                                       |              |           |             |           |            |          |

Note:

No.1 Manhole Water level

No.1 Manhole Outlet Pipe Bottom level

No.2 Manhole Water level

No.2 Manhole Outlet Pipe Bottom level

Total loss

442.620 m (Filter Outlet Gallery Floor drain pipe center level +442.92-0.3m)

442.020 m (No.1Manhole Water level +443.27 - Pipe diameter 0.60m)

442.500 m (Sedimentation Drain Pit Floor Level +443.30-0.80m)

441.900 m (No.2 Manhole Water level +442.50 - Pipe diameter 0.60m)

0.449 m

( ) RC 450mm Outlet Pipe Top Level

RC Pipe Top Level (Bottom Level + Innerdiameter 450mm + Thickness 40mm) = RC Pipe Top Level (Bottom Level + Innerdiameter 600mm + Thickness 40mm) =

0.49 m 0.64 m

Table of Flow Rate (Manning Formula)

0=

4.10

4.20

4.30

4.40

4.50

4.60

4.70

4.80 4.90

5.00

1.162 0.185

1.176 0.187

1.189 0.189

1.203 0.191

1.216 0.193

1.229 0.195

1.242 0.198 1.255 0.200

1.268 0.202

 $v = (1/n) R^{(2/3)} I^{(1/2)}$ 

 $14308 \text{ m}^{3/d} =$ 

 $q = (1/n) (\pi * D^2) / 4 R^2 (2/3) I^2 (1/2) = (\pi/4n) D^2 (2/3) I^2 (1/2)$ 

0.166 m3/s

n = 0.013

900 900 450 750 Dia 450 600 600 750 v Hydraulic Gradieni V Q V Q O 0 0.252 0.285 0.111 0.181 0.10 0.179 0.029 0.217 0.061 0.402 0.256 0.20 0.254 0.040 0.307 0.087 0.356 0.157 0.314 0.30 0.310 0.049 0.376 0.106 0.436 0.193 0.493 0.569 0.362 0.40 0.359 0.057 0.123 0.504 0.223 0.434 0.50 0.401 0.137 0.563 0.249 0.636 0.405 0.0640.486 0.60 0.439 0.617 0.273 0.697 0.443 0.070 0.532 0.150 0.70 0.474 0.075 0.575 0.162 0.667 0.295 0.753 - 0.479 0.805 0.507 0.174 0.713 0.315 0.800.081 0.614 0.184 0.90 0.538 0.756 0.334 0.854 0.543 0.086 0.651 1.00 0.797 0.352 0.900 0.572 0.567 0.090 0.687 2.194 0.944 0.600 1.10 0.595 0.095 0.720 0.204 0.836 1.20 0.621 0.099 0.752 0.213 0.873 0.386 0.986 .... 0.627 0.909 + 0.401 1.30 0.646 0.103 0.783 0.221 1.026 0.653 1.40 0.813 0.230 0.943 0.417 1.065 ... 0.677 0.671 0.107 1.50 0.976 - 0.431 1.102 0.701 0.694 0.110 0.841 0.238 1.60 0.717 0.114 0.869 0.246 1.008 . 0.445 1.138 0.724 1.70 0.739 0.895 0.253 1.039 0.459 1.173 0:746 0.118 1.207 0.768 1.069 0.472 1.80 0.761 0.121 0.921 0.261 1.90 0.781 0.124 0.947 0.268 1.098 0.485 1.240 0.789 1.127 0.498 2.00 0.802 0.128 0.971 0.275 1.273 0.810 2.10 0.821 0.131 0.995 0.281 1.155 0.510 1.304 0.830 1.335 0.849 2.20 0.841 0.134 1.019 ... 0.288 1.182 0.522 1.365 0.868 2.30 0.860 0.137 1.041 0.294 1.209 0.534 2.40 0.878 1.064 0.301 1.235 0.545 1.394 0.887 0.140 2.50 0.896 0.143 1.086 0.307 1.260 0.557 1.423 0.905 0.914 1.107 0.313 1.285 0.568 1.451 0.923 2.60 0.145 1.479 0.941 1.506 0.958 1.532 0.975 0.931 2.70 1.309 0.578 1.128 0.319 0.148 1.333 0.589 2.80 0.949 0.151 1.149 0.325 1.357 0.600 2.90 0.965 0.154 1.169 0.331 3.00 0.982 1.380 0.610 1.559 - 0.992 0.156 1.189 0.336 1.584 1.008 3.10 0.998 0.159 1.209 0.342 1.403 0.620 3.20 1.014 0.161 1.228 0.347 1.425 0.630 1.610 1.024 1.248 0.353 1.448 0,640 1.635 1.040 3.30 1.030 0.164 1.469 **0.649** 1.491 **0.659** 1.659 1.056 3.40 1.045 0.166 1.266 0.358 1.683 . 1.074 
 1.285
 0.363

 1.303
 0.368
 3.50 1.061 0.169 1.512 0.668 1.533 0.677 0,171 3.60 1.076 1.090 0.173 3.70 1.321 0.373 1.731 1.101 1.105 0.176 3.80 1.339 0.379 1.553 0.686 1.754 1.116 3.90 1.119 0.178 1.356 0.383 1.574 0.695 1.777 
 1.134
 0.180

 1.148
 0.183
 1.373 0.388 1.594 . : 0.704 1.800 1.145 4.00

1.391 0.393

1.407 0.398

1.424 0.403

1.440 0.467

1.457 0.412

1.473 0.416

1.489 0.421 1.505 0.425

1.520 0.430

1.536 0.434

1.614 0.713 1.633 0.721

1.652 30.730

1.672 0.738

1.690 0.747

1.709 0.755

1.728 - 0.763

1.746 0.771

1.764 0.779

1.782 0.787

1.822 L159

1.844 - 1.173

1.866 1.187

1.888 - 71.201

1.909 -1.214

1.930 1.228 1.951 1.241 1.972 1.254

1.992 1.267 2.012 1.280

# 12. Hydraulic Calculation of Filter - Backwash Recycle Pump House

Filter - Backwash Recycle Pump House

Manhole - Backwash Recycle Pump House (RC Pipe 600mm, DIP 600mm)

| ٦. | Filter | Backwash | waste | water | Level |
|----|--------|----------|-------|-------|-------|
|    |        |          |       |       |       |

444.750 m (444.410 m Washwater channel bottom level) 2.Backwash Recycle Pump House Water Level H.W.L..+ 444.010 m (Effective Depth3.0 m) L.W.L.+ 441.010 m 5 Inllow Flow Rate Qi= 0.346 m3/sec =20.74 m3/min (7.2m\*9.6m\*0.3m3/m2/min)

6.2. RC Pipe Loss (Filter → Backwash Recycle Pump House)

|   | • •                 |      |           |     |         |        |    |        |    |         |
|---|---------------------|------|-----------|-----|---------|--------|----|--------|----|---------|
| ( | 5.2.1. Pipe Loss    | 100% | (Diameter | 600 | mm), I= | 0.0032 | L= | 6.73 m | h= | 0.022 m |
| ( | 5.2.4. Manhole Loss |      | (Diameter | 600 | mm)     | 2.0    | cm | l ps   | h= | 0.020 m |
|   | Sub Total           |      | ·         |     |         |        |    |        | H= | 0.042 m |

### 6. Water Level Loss

| o. w ater | Level LOSS              |                |            |                 |       |    |          |    |         |
|-----------|-------------------------|----------------|------------|-----------------|-------|----|----------|----|---------|
| 6.1.      | DIP Pipe Loss (Filter → | Backwash Recyc | ile Pump H | (ouse)          |       |    |          |    |         |
| 6.1.1.    | Inlet Loss              | (Diameter      | 600        | mm). <b>f</b> = | 0.5   | V= | 1.22 m/s | h= | 0.038 m |
| 6.1.2.    | Tee Branch              | (Diameter      | 600        | 600 mm), f=     | 0.05  | V= | 1.22 m/s | h= | 0.004 m |
| 6.1.3.    | 90°Bend Loss            | (Diameter      | 600        | mm), f=         | 0.23  | V= | 1.22 m/s | h= | 0.017 m |
| 6.1.4.    | Valve Loss              | (Diameter      | 600        | mm), f=         | 1.0   | V= | 1.22 m/s | h= | 0.076 m |
| 6.1.5.    | Outlet Loss             | (Diameter      | 600        | mm), f=         | 1.0   | V= | 1.22 m/s | h= | 0.076 m |
| 6.1.6.    | Pipe Friction Loss      | (Diameter      | 600        | mm), I=         | 0.004 | L= | 17.82 m  | h= | 0.064 m |
|           | Sub Total               | -              |            |                 |       |    |          | H= | 0.275 m |
|           |                         |                |            |                 |       |    |          |    |         |

( 0.400 m)

where C= 100

Total

H=

0.317 m)

Table of Flow Rate (Manning Formula)

 $v = (1/n) R^{(2/3)} I^{(1/2)}$ 

 $q = (1/n) (\pi * D^2) / 4) R^2 (2/3) I^1(1/2) = (\pi/4n) D^2(2) R^2(2/3) I^1(1/2)$ 

n = 0.013

Q= 29851 m3/d = 0.346 m3/s

|                    | Q=     | 29851 | m3/d =         | 0.346   | m3/s           |  |       |                |
|--------------------|--------|-------|----------------|---|----------------|--|-------|----------------|
| Dia                | 450    | 450   | 600            | 600   | 750            | 750  | 900   | 900            |
| Hydraulic Gradient | V      | Q     | V              | Q   | V              | Q  | V     | Q              |
| 0.10               | 0.179  | 0.029 | 0.217          | 0.061   | 0.252          | 0.111  | 0.285 | 0.181          |
| 0.20               | 0.254  | 0.040 | 0.307          | 0.087   | 0.356          | 0.157  | 0.402 | 0.256          |
| 0.30               | 0.310  | 0.049 | 0.376          | 0.106   | 0.436          | 0.193  | 0.493 | 0.314          |
| 0.40               | 0.359  | 0.057 | 0.434          | 0.123   | 0.504          | 0.223  | 0.569 | 0.362          |
| 0.50               | 0.401  | 0.064 | 0.486          | 0.137   | 0.563          | 0.249  | 0.636 | 0,405          |
| 0.60               | 0.439  | 0.070 | 0.532          | 0.150   | 0.617          | 0.273  | 0.697 | 0.443          |
| 0.70               | 0.474  | 0.075 | 0.575          | 0.162   | 0.667          | 0.295  | 0.753 | 0.479          |
| 0.80               | 0.507  | 0.081 | 0.614          | 0.174   | 0.713          | 0.315  | 0.805 | 0.512          |
| 0.90               | 0.538  | 0.086 | 0.651          | 0.184   | 0.756          | 0.334  | 0.854 | 0.543          |
| 1.00               | 0.567  | 0.090 | 0.687          | 0.194   | 0.797          | 0.352  | 0.900 | 0.572          |
| 1.10               | 0.595  | 0.095 | 0.720          | 0.204   | 0.836          | 0.369  | 0.944 | 0.600          |
| 1.20               | 0.621  | 0.099 | 0.752          | 0.213   | 0.873          | 0.386  | 0.986 | 0.627          |
| 1.30               | 0.646  | 0.103 | 0.783          | 0.221   | 0.909          | 0.401  | 1.026 | 0.653          |
| 1.40               | 0.671  | 0.107 | 0.813          | 0.230   | 0.943          | 0.417  | 1.065 | 0.677          |
| 1.50               | 0.694  | 0.110 | 0.841          | 0.238   | 0.976          | 0.431  | 1.102 | .0.701         |
| 1.60               | 0.717  | 0.114 | 0.869          | 0.246   | 1.008          | 0.445  | 1.138 | 0.724          |
| 1.70               | 0.739  | 0.118 | 0.895          | 0.253   | 1.039          | : 0.459  | 1.173 | 0.746          |
| 1.80               | 0.761  | 0.121 | 0.921          | 0.261   | 1.069          | 0:472  | 1.207 | 0.768          |
| 1.90               | 0.781  | 0.124 | 0.947          | 0.268   | 1.098          | 0.485  | 1.240 | 0.789          |
| 2.00               | 0.802  | 0.128 | 0.971          | 0.275   | 1.127          | . 0.498  | 1.273 | .0.810         |
| 2.10               | 0.821  | 0.131 | 0.995          | 0.281   | 1.155          | 0.510  | 1.304 | 0.830          |
| 2.20               | 0.841  | 0.134 | 1.019          | 0.288   | 1.182          | 0.522  | 1.335 | . 0.849        |
| 2.30               | 0.860  | 0.137 | 1.041          | 0.294   | 1.209          | - 0.534  | 1.365 | 0.868          |
| 2.40               | 0.878  | 0.140 | 1.064          | 0.301   | 1.235          | 0.545  | 1.394 | 0.887          |
| 2.50               | 0.896  | 0.143 | 1.086          | 0.307   | 1.260          | 0.557  | 1.423 | 0.905          |
| 2.60               | 0.914  | 0.145 | 1.107          | 0.313   | 1.285          | . 0.568  | 1.451 | 0,923          |
| 2.70               | 0.931  | 0.148 | 1.128          | 0.319   | 1.309          | 0.578  | 1.479 | 0.941          |
| 2.80               | 0.949  | 0.151 | 1.149          | 0.325   | 1.333          | are VIII A Valenciar & controls and cole after refer-  | 1.506 |                |
| 2.90               | 0.965  | 0.154 | 1.169          | 0.331   | 1.357          | 0.600  | 1.532 | 0.975          |
| 3.00               | 0.982  | 0.156 | 1.189          | 0.336   | 1.380          | 0.610  | 1.559 | 0,992          |
| 3.10               | 0.998  | 0.159 | 1.209          | 0.342   | 1.403          | 9,620  | 1.584 | 1.008          |
| 3.20               | 1.014  | 0.161 | 1.228          | Control September 1 and 1 April 1 April 1 April 1 and 1 April | 1.425          | 0.630  | 1.610 | 1:024          |
| 3.30               | 1.030  | 0.164 | 1.248          | 0.353   | 1.448          | 0.640  | 1.635 | 1.040          |
| 3.40               | 1.045  | 0.166 | 1.266          | 0.358   | 1.469          | 0.649  | 1.659 | 1.056<br>1.071 |
| 3.50               | 1.061  | 0.169 |                | 0.363   |                |  |       |                |
| 3.60               | 1.076  | 0.171 | 1.303<br>1.321 | 0.368<br>0.373  | 1.512<br>1.533 | The second of the second   |       | 1.086<br>1.101 |
| 3.80               | 1.105  | 0.176 | 1.321          | 0.379   | 1.553          | 0.686  | . 1   | 1.101          |
| 3.90               | 1.119  | 0.178 | 1.356          | 20,4 - 20, 20, 20, 20, 20, 20, 20, 20, 20, 20,  | 1.574          | 0.695  |       | 1.131          |
| 4.00               | 1.1134 | 0.178 | 1.373          | 0.388   | 1.594          | THE PARTY OF THE P |       | 1,131          |
| 4.10               | 1.148  | 0.180 | 1.391          | 0.393   | 1.614          | 0.713  |       | 1.159          |
| 4.20               | 1.148  | 0.185 | 1.407          | 0.398   | 1.633          | THE STATE OF THE S |       | 1.173          |
| 4.20               | 1.102  | 0.183 | 1.407          | 0,403   | 1.652          | 0.730  |       | 1.187          |
| 4.40               | 1.170  | 0.189 | 1.440          | 0.407   | 1.672          | 0.738  |       | 1.201          |
| 4.50               | 1.203  | 0.189 | 1.440          | 0.412   | 1.690          | A LY CORANDONE SAVAGOTANA HOS  |       | 1.214          |
| 4.60               | 1.216  | 0.191 | 1.473          | 0.412   | 1.709          | *** Ob X 109 (CANDA / CANDA /  |       | 1,228          |
| 4.70               | 1.229  | 0.195 | 1.473          | 0.421   | 1.728          | V X X 93000 00000 000  |       | 1,241          |
| 4.70               | 1.242  | 0.198 | 1.505          | 0.425   | 1.746          | 12 Process supplies cont.  |       | 1.254          |
| 4.90               | 1.255  | 0.200 | 1.520          | 0.430   | 1.764          | 0.779  | ·     | 1.267          |
| 5.00               | 1.268  | 0.202 |                | 0.434   | 1.782          | 0.787  |       | 1.280          |
|                    | 1.200  | 0.202 | 1.000          | and with the  | 1.,02          | ******   | 2.012 | A CONTRACTOR   |

13. Hydraulic Calculation of Connection Pipe between Backwash Recycle Pump - Receiving Well Backwash Recycle Pump - Receiving Well

1. Filter Backwash waste water Level

L.W.L. 440.130 m (444.13 m Washwater channel bottom level)

2.Receiving Well Water level

W.L..+ 451.200 m

3.Actual Pump Head

11.070 m

5 Recycle Flow

Q1= 0.104 m3/sec = 6.22 m3/min

6.Water Level Loss

| 6.1.   | RC Pipe Loss (Sedimen | tation Basin → Sl | ludge Lagoon) |           |       |    |          |            |         |
|--------|-----------------------|-------------------|---------------|-----------|-------|----|----------|------------|---------|
| 6.1.1. | 45°Bend Loss          | (Diameter         | 250           | mm), $f=$ | 0.16  | V= | 2.11 m/s | h=         | 0.037 m |
| 6.1.2. | 45°Bend Loss          | (Diameter         | 250           | mm), f=   | 0.16  | V= | 2.11 m/s | h=         | 0.037 m |
| 6.1.3. | 45°Bend Loss          | (Diameter         | 250           | mm), f=   | 0.16  | V= | 2.11 m/s | h=         | 0.037 m |
| 6.1.4. | 45°Bend Loss          | (Diameter         | 250           | mm), f=   | 0.16  | V≃ | 2.11 m/s | h=         | 0.037 m |
| 6.1.5. | 90°Bend Loss          | (Diameter         | 250           | mm), f=   | 0.23  | V= | 2.11 m/s | h=         | 0.052 m |
| 6.1.6. | Outlet Loss           | (Diameter         | 250           | mm)、f=    | 1.0   | V= | 2.11 m/s | <u>h</u> = | 0.227 m |
| 6.1.7. | Pipe Friction Loss    | (Diameter         | 250           | mm), I=   | 0.027 | L= | 103.48 m | h=         | 2.844 m |
|        | Sub Total             |                   |               |           |       |    |          | H=         | 3 271 m |

where C= 100

# 14.Receiving Well Overflow Weir

1 Overflow weir loss (2 line duty)

h=(Q/(1.84\*b))^(2/3)

where Q= 1.375 m3/sec (110000\*(1.05+0.03)/86400)

b= 4.00 m h=(Q/(1.84\*b))^(2/3)= 0.327 m

4 Water loss

The water level of Receiving well is 451.680 m

The height of the overflsow weir is 451.900 m

The water level of upstream of the weir is 452.230 m (0.327)

The water loss of downstream of the weir is 4.570 m.

Therefore the water loss (total) is 4.897 m

The water level at the downstream of the weir (overflow chamber) is 447.330 m

# 15. Hydraulic Calculation of Overflow from Receiving Well

1.Water Level at Inlet Chamber of Distribution Chamber Overflow Water Level 452.330 m (452.00 +0.33) 2.Top Level of Overflow Weir H.W.L. 452.000 m 3. Water Level at Downstream of Overflow Weir 451.800 m (452.00 m Top Level of Overflow Weir. Allowance is 0.20 m)H.W.L. 4. Overflow Pipe Center Level at Blowoff Point W.L..+ 442.930 m (446.50 m WTP site Elevation Level, Soil Cover 2.2m) 5. Water Loss 8.870 m (451.800 - 442.930 =8.870 m > 3.933 m 6 Intake Flow & Verosity  $1.375 \text{ m}^{3/\text{sec}} = 118800.00 \text{ m}^{3/\text{day}} (110000*(1.05+0.03))$ Q1 =7.Water Level Loss 7.1.1. Inlet Loss (Diameter 600 mm), f= 0.5 V= 4.87 m/s 0.605 m θ=5° 7.1.2. Valve Loss (Diameter 0.363 m 600 mm), f= 0.3 V= 4.87 m/s h=0.16 V= 0.197 m 7.1.3. 45°Bend Loss (Diameter 600 4.87 m/s mm), f= h=0.197 m 7.1.4. 45°Bend Loss (Diameter 600 mm), f= 0.16 V= 4.87 m/s h≖ 7.1.5. 90°Bend Loss (Diameter 600 0.23 V= 4.87 m/s 0.278 m mm), f= h=7.1.6. Outlet Loss (Diameter 600 mm), f= 1.0 V= 4.87 m/s 1.210 m 7.1.7. Pipe Friction Loss (Diameter 600 mm)、I= 0.046 L= 23.47 m h=1.083 m Sub Total H= 3.933 m where C=100

# 16. Hydraulic Calculation of Overflow from Clear Water Reservoir

Overflow from Clear Water Reservoir

Clear Water Reservoir - Drainage Point

1.Water Level at Clear Water Reservoir

H.W.L. 445.820 m

2.Small Stream

W.L..+ 441.820 m Stream Bed Level 441.320 m

3.Pipe Bottom Level at Drainage Point

442.090 m

(RC Pipe Bottom Level at starting point + 444.525)

(Small Stream Bottom Level + 441.323)

5 Overflow Flow Rate

| Q1= | 0.212  m3/sec = | 18333 m3/day  | (110000/6)   |
|-----|-----------------|---------------|--------------|
| Q2= | 0.424  m3/sec = | 36667 m3/day  | (110000/6*2) |
| Q3= | 0.637  m3/sec = | 55000 m3/day  | (110000/6*3) |
| Q4= | 0.849  m3/sec = | 73333 m3/day  | (110000/6*4) |
| Q5= | 1.061  m3/sec = | 91667 m3/day  | (110000/6*5) |
| 06= | 1.273  m3/sec = | 110000 m3/day | (110000/6*6) |

6.1. DIP Pipe Loss (Sedimentation Basin → Sludge Lagoon)

| 6.1.1. | Inlet Loss         | (Diameter | 350 | mm), 1= | 0.5   | γ= | 2.21 m/s | <u>n</u> = | U.125 m |
|--------|--------------------|-----------|-----|---------|-------|----|----------|------------|---------|
| 6.1.2. | 90°Bend Loss       | (Diameter | 350 | mm)、f=  | 0.20  | V≃ | 2.21 m/s | <u>h</u> = | 0.050 m |
| 6.1.3. | Outlet Loss        | (Diameter | 350 | mm), f= | 1.0   | V≔ | 2.21 m/s | h=         | 0.249 m |
| 6.1.4. | Pipe Friction Loss | (Diameter | 350 | mm), I= | 0.020 | L= | 2.82 m   | h=         | 0.057 m |
|        | Sub Total          |           |     |         |       |    |          | H=         | 0.481 m |
|        |                    |           |     |         |       |    |          |            |         |

6.2. RC Pipe Loss (Sedimentation Basin → Sludge Lagoon)

| 6.2.1. Pipe Loss | 100% | (Diameter | 450        | mm), l= | 0.013 | L= | 13./U m  | n= | U.1/8 m |
|------------------|------|-----------|------------|---------|-------|----|----------|----|---------|
| 6.2.2. Pipe Loss | 100% | (Diameter | 600        | mm)、I=  | 0.011 | L= | 18.60 m  | h≔ | 0.205 m |
| 6.2.3. Pipe Loss | 100% | (Diameter | 750        | mm), I= | 0.008 | L= | 13.20 m  | h= | 0.106 m |
| 6.2.4. Pipe Loss | 100% | (Diameter | 750        | mm), I≖ | 0.014 | L= | 6.80 m   | h= | 0.095 m |
| 6.2.5. Pipe Loss | 100% | (Diameter | 750        | mm), I= | 0.010 | L= | 13.20 m  | h= | 0.132 m |
| 6.2.6. Pipe Loss | 100% | (Diameter | 750        | mm)、I=  | 0.030 | L= | 5.00 m   | h= | 0.150 m |
| 6.2.7. Pipe Loss | 100% | (Diameter | 750        | mm), I= | 0.030 | L= | 22.95 m  | h= | 0.689 m |
| 6.2.8. Pipe Loss | 100% | (Diameter | 1050       | mm), I= | 0.005 | L= | 132.80 m | h= | 0.664 m |
| 6.2.9 Manhole    | Loss | (Diameter | 450 - 1050 | mm)     | 2.0   | cm | 11 ps    | h= | 0.220 m |
|                  |      |           |            |         |       |    |          |    |         |

Sub Total H= 2.439 m

7. Total Pipe Loss H= 2.920 m

where C=100

Pipe Loss Calculation for Clear Water Reservoir Overflow Pipe (RCP450 - 1050mm)

|             |      | Pipe      | Gradient |           |       | Loss(m) |       | Inlet        | Pipe      | Outle        | t Pipe    | Manhole   | Water     | Elevation | Soil Cover | Manhole        |
|-------------|------|-----------|----------|-----------|-------|---------|-------|--------------|-----------|--------------|-----------|-----------|-----------|-----------|------------|----------------|
| Manhole No. | Dia. | Thickness | (%)      | Length(m) | Pipe  | Manhole | Total | Bottom Level | Top Level | Bottom Level | Top Level | Depth (m) | Level (m) | Level (m) | Depth (m)  | Distance (ctc) |
| 1           |      |           |          |           |       |         |       |              |           | 444.500      | 444.990   | 1.96      | 444.950   | 446.500   | 1.51       |                |
| 2           | 450  | 40        | 13       | [3,10]    | 0.170 | 0.020   | 0.190 | 444.330      | 444.820   | 444.310      | 444.800   | 2.16      | 444.760   | 446.500   | 1.68       | 14.20          |
| 3           | 600  | 40        | . 11     | 18.50     | 0.204 | 0,020   | 0.224 | 444.106      | 444.746   | 444.086      | 444.726   | 2.37      | 444,536   | 446.500   | 1.75       | 19.70          |
| 4           | 750  | 50        | 8        | 13.00     | 0.104 | 0.020   | 0.124 | 443.982      | 444.782   | 443.962      | 444.762   | 2.49      | 444.412   | 446.500   | 1.72       | 14.20          |
| 5           | 750  | 50        | 14       | 6.70      | 0.094 | 0.020   | 0.114 | 443.868      | 444.668   | 443.848      | 444.648   | 2.61      | 444.298   | 446.500   | 1.83       | 7.90           |
| 6           | 750  | 50        | 21       | 13.00     | 0.273 | 0.020   | 0.293 | 443.575      | 444.375   | 443.555      | 444.355   | 2,90      | 444.005   | 446,500   | 2.12       | 14.20          |
| 7           | 750  | 50        | 30       | 5.55      | 0.167 | 0.020   | 0.187 | 443.389      | 444.189   | 443.369      | 444.169   | 3.09      | 443.819   | 446.500   | 2.31       | 6.75           |
| 8           | 750  | 50        | 30       | 22.84     | 0.685 | 0.020   | 0.705 | 442.684      | 443,484   | 442,664      | 443.464   | 3.78      | 443.114   | 446.500   | 3.02       | 24.19          |
| 9           | 1050 | 60        | 4.9      | 47.85     | 0.234 | 0.020   | 0.254 | 442,429      | 443.539   | 442.409      | 443.519   | 4.04      | 442.859   | 446.500   | 2.96       | 49.35          |
| 10          | 1050 | 60        | 4.9      | 18.75     | 0.092 | 0.020   | 0.112 | 442.317      | 443.427   | 442.297      | 443,407   | 4.15      | 442,747   | 446.500   | 3.07       | 20.25          |
| Small Steam | 1050 | 60        | 4.9      | 40.49     | 0.198 |         | 0.198 | 442.099      | 443.209   |              |           |           | 442.549   | 446.500   | 3,29       | 41.24          |
| Total       |      |           |          | 199.78    | 2.221 | 0.180   | 2,401 |              |           |              |           |           |           |           |            | 211.98         |

Note:

No.1Manhole Water level

No.1 Manhole Outlet Pipe Bottom level

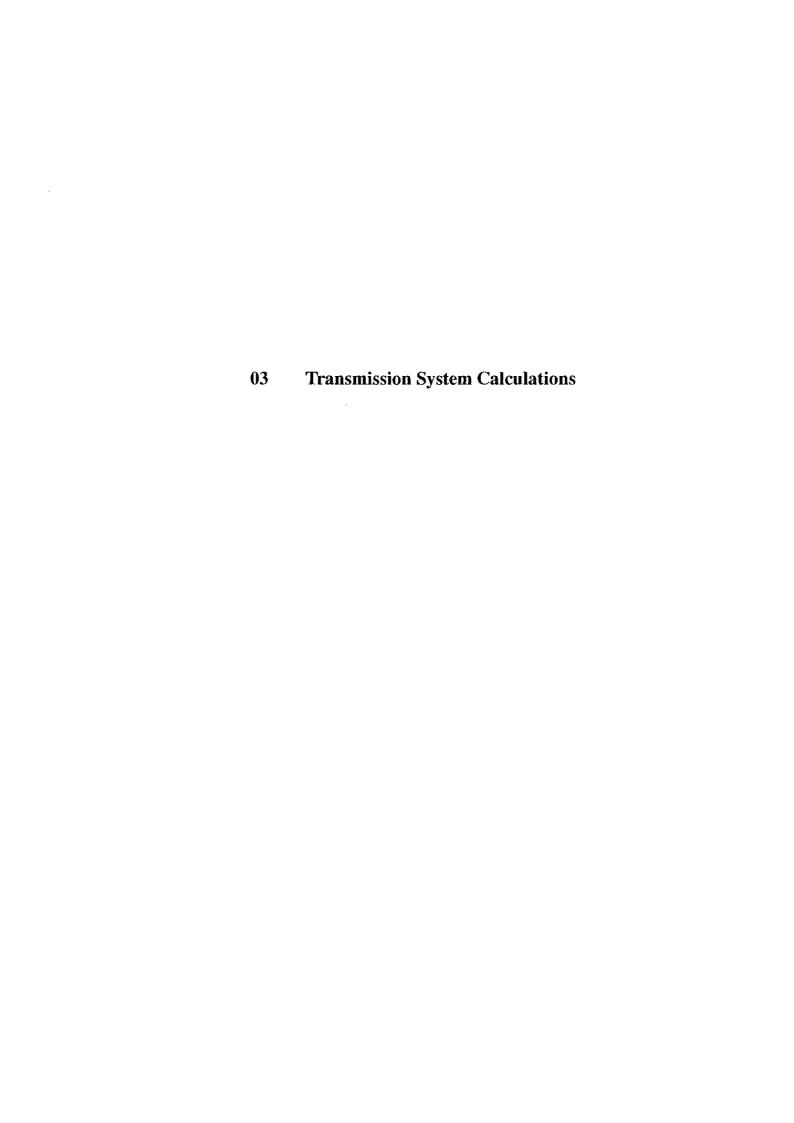
Manhole Depth (m)

Total loss

444.950 m (Overflow pipe bottom Level +444.975m)
444.500 m (No.1Manhole Water level +444.950 - Pipe diameter 0.45m)

446.50-(Outlet Pipe Bottom Level)-(Pipe Thickness)

2.401 m



## **Transmission System Calculation**

#### 1. Basic Conditions

The following data/ conclusions/ information was also incorporated in the hydraulic calculation of the pipelines.

# Pipeline Data:

The data such as the length, elevation of the existing and new pipelines, together with the type and diameter of the existing ones were collected during the topographical surveys.

# High and Low Water Levels of Service Reservoirs (existing and new):

This information was tabulated in Table TM-1.

# The Quantity of Flow to each Service Reservoir:

Maximum day demand (m³/d) was assessed and tabulated in Figure TM-1 for each of the three Phases separately.

### Peak Factors:

The peak factor (maximum daily demand to the daily average demand) is assumed to be 1.2.

# 2. Pipe Materials

For diameters 250mm and larger Ductile Cast Iron (DI) pipes, and for diameters less than 250mm, Unplasticized Polyvinyl Chloride (U-PVC) pipes were basically applied.

## DI Pipes:

Straight Pipe -----K=9
Tees -----K=14
Other fittings -----K=12

## U-PVC Pipes:

The pipes shall have a minimum working pressure of 10kgf/sq.m or 10 bars for type 1000 pipes, at a temperature of 29°C.

# 3. Hydraulic Design

Pipelines will be sized using the exponential equation developed by Hazen and Williams shown below in metric units.

 $H = 10.666 \quad x \quad C^{-1.85} \quad x D^{-4.87} x \quad Q^{1.85} x \quad L$ 

Where, H: friction loss (m)

C: friction coefficient

D: diameter of pipe (m)

Q: rate of flow (m<sup>3</sup>/sec)

L: Pipe length (m)

Pipelines will be sized using the same Hazen Williams friction coefficient (C) as indicated in Table TM-3.

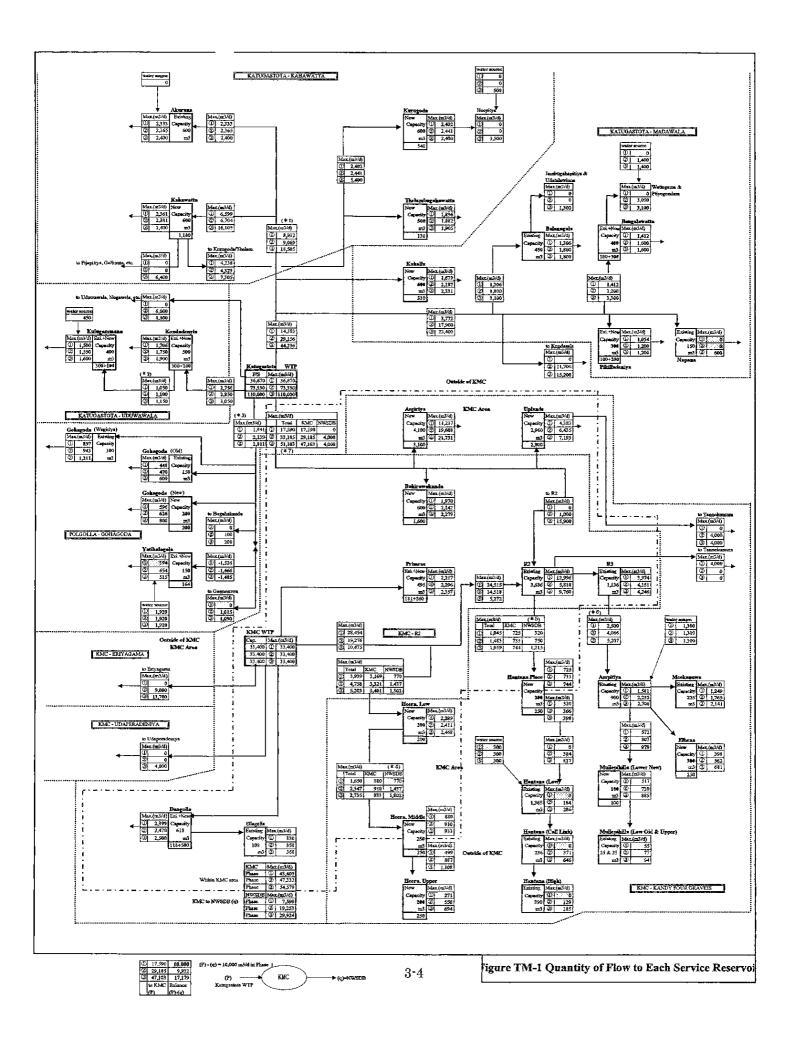
Table TM-3 Pipe Friction Coefficients

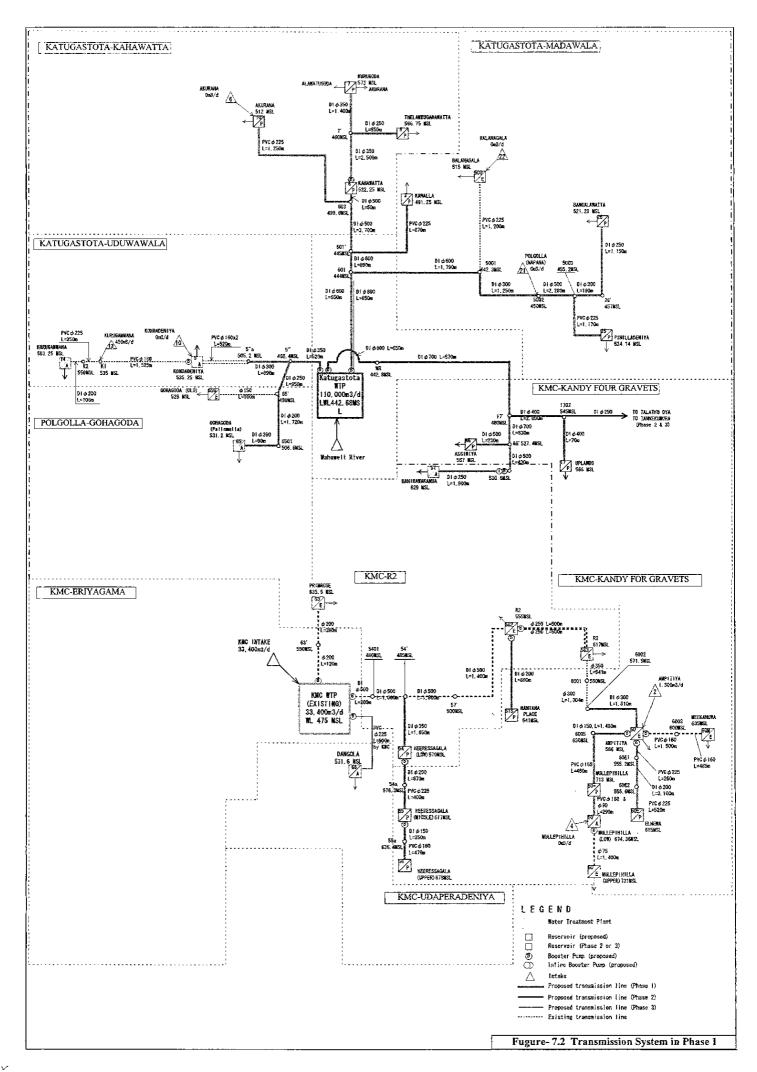
| Pipe Material | Existing or New | Friction Coefficient (C) |
|---------------|-----------------|--------------------------|
| Cast Iron     | Existing        | 90                       |
| u-PVC, ACP    | Existing        | 120                      |
| Ductile Iron  | New             | 140                      |
| u-PVC         | New             | 140                      |

The appropriate flow velocity shall be taken as economical and reasonable velocity (approximately 1.0 m/sec). Residual pressure of hydraulic grade line at inlet to the Service Reservoir shall be more than 5m.

Table TM-1 Water Level of Service Reserrooir

| Mada        |                           |        | Water I | Capacity (m3) |        |          |          |
|-------------|---------------------------|--------|---------|---------------|--------|----------|----------|
| Node<br>No. | Name of the site          | Exis   | ting    | Prop          | osed   | Existing | Proposed |
| 110.        |                           | LWL    | HWL     | LWL           | HWL    | Existing | Troposcu |
| 10          | Akurana                   | 508.00 | 512.00  |               |        | 600      |          |
| 60          | Ampitiya                  | 582.50 | 586.00  |               |        | 900      |          |
| AG          | Asgiriya                  |        |         | 561.50        | 567.00 |          | 4,100    |
| ΙΒ          | Asgiriya P.S              |        |         |               |        |          |          |
| 57          | Bahirawakanda             | 619.10 | 620.90  | 625.00        | 629.00 | 204      | 600      |
| 500         | Balanagala                | 513.00 | 515.00  |               |        | 450      |          |
| 26          | Bangalawatta              | 519.28 | 521.28  | 518.28        | 521.28 |          | 300      |
| 66          | Dangolla                  | 529.90 | 531.60  | 527.60        | 531.60 | 118      | 500      |
| 60E         | Elhena                    |        |         | 611.00        | 615.00 |          | 300      |
| 65          | Gohagoda (Pallemulla New) |        |         | 527.20        | 531.20 |          | 200      |
| 65          | Gohagoda (Pallemulla Old) | 521.90 | 524.10  |               |        | 150      |          |
| 65G         | Gohagoda (Wegiriya)       | 524.00 | 528.00  |               |        | 150      |          |
| 61S         | Hantana Place             |        |         | 637.00        | 641.00 |          | 200      |
| 54          | Heerassagala Low          |        |         | 566.00        | 570.00 |          | 200      |
| 55          | Heerassagala Middle       |        |         | 613.00        | 617.00 |          | 250      |
| 56          | Heerassagala Upper        |        |         | 674.00        | 678.00 |          | 200      |
| 3           | Kahalla                   |        |         | 485.00        | 491.25 |          | 600      |
| 6           | Kahawatta                 | 1      |         | 516.00        | 522.25 |          | 600      |
| 5           | Kondadeniya               | 531.25 | 535.25  | 531.25        | 535.25 | 300      | 200      |
| -           | Kondadeniya Sump.         | 1      |         |               |        |          |          |
| 14          | Kulugammana               | 579.25 | 583.25  | 579.25        | 583.25 | 300      | 100      |
| 7           | Kurugoda                  |        |         | 569.00        | 573.00 |          | 600      |
| 60'         | Mullepihilla Low Old      | 672.50 | 674.36  |               |        | 25       |          |
| 60+         | Mullepihilla Low New      |        |         | 709.00        | 713.00 |          | 100      |
| 25          | Pihilladeniya             | 522.14 | 524.14  | 522.14        | 524.14 | 100      | 200      |
| 582         | R2 (KMC)                  | 549.49 | 555.00  |               | - 11   | 3,636    |          |
| 8           | Thelambugahawatta         |        |         | 561.50        | 566.75 |          | 500      |
| 17          | Uplands                   | 556.51 | 558.34  | 560.09        | 566.00 | 27       | 2,960    |





# Hydraulic Calculation for Transmission Pipeline

(Phase 1)

|               | Node        |   | R/C           | Flow Rate                             | Dia              | Winad Dia            | P           | Length                                  | С               | Velocity                                   | Hyd. Grd                              | Loss  | Dynamic                  | LWL                                   | Dynamic  | D              | Required                               | Remark                                      |
|---------------|-------------|---|---------------|---------------------------------------|------------------|----------------------|-------------|---|-----------------|--|---------------------------------------|---|--------------------------|---------------------------------------|--|----------------|--|---|
| Node          | >           | Node                                    | <i>D</i> / 0  | Q (m3/d)                              |                  |                      | EXIST.      | Length<br>L(m)                          |                 | v(m/sec)                                   | I (%)                                 | h(m)  | Pressure                 | HWL                                   | Pressure   |                | Pump Head                              |   |
| House         | <del></del> | House                                   | 1-            |                                       | 2,005            | D10 (11111)          |             | L (III)                                 |                 | V (III/ Sec)                               | 1 (700)                               | 11 (111)  | Hd (MSL)                 | (MSL)                                 | He (m)   | Туре           | H(m)                                   |   |
| 181 J. Co. 10 | KMC WT      | pragass                                 | Prim          | rose SR                               | 2,000<br>3 45 KM | 00000                |             |   | S 1 18.01       | 55576875888364                             | Maria de Indesta                      | E PHEN LAND   | III (MSL)                | · · · · · · · · · · · · · · · · · · · | iie (iii)  | J              | 17 (111)                               | totale messari, in the control              |
| -             | KMC         | 1                                       | 3. J. E III.  | OSC SOLE                              | 24 25.8500       | Later (Lamber        | 2.12.2      | 34                                      | 341.000.000     | 871.C-277E-1574.57                         |                                       | <u> </u>  | 642, 700                 | 471.000                               | 171, 700   | 12             |  | 13003-17                                    |
| KMC           | - 1180      | 63                                      | В             | 2, 220                                | 201              | 201                  | к -         | 500                                     | 120             | 0, 810                                     | 4, 297                                | 2, 148  | 042.100                  | 411.000                               | 111.100  | В              | 171 7                                  | Exist Pipe & 200                            |
| 23,720        | 63          | = Prim                                  |               | <u> </u>                              | 201              | 201                  |             | 500                                     | 120             | 0.010                                      | 3. 201                                | 2, 140  | 640, 552                 | 635. 500                              | 5. 052   | -              |  | Laist Tipe \$200                            |
|               |             | ٠, ــــــــــــــــــــــــــــــــــــ |               | * " / T                               |                  |                      | 3, 525,     | ्या स्टब्स्                             | F (4.55%).      | CLARWING G                                 | 17. J. J. J. (5.7)                    | San San San San San San San San San San               | 275 982930               | 77.5                                  |  | N - 142        | gram en left in s                      | Control of the second                       |
| <u> </u>      | KMC         |   | 1 2           | · · · · · · · · · · · · · · · · · · · |                  |                      |             | X                                       | · Constant      |  |                                       | <u>ye a ye ay 15,700 a 16</u>                         | 580, 300                 | 471,000                               | 109.300  |                |  |   |
| KMC           | -           | 5401                                    | В             | 28, 460                               | 502              | 502                  | K           | 200                                     | 120             | 1.664                                      | 5. 583                                | 1.117   |                          | 111111                                | 100.000  | В              | 109.3                                  | Exist Pipe &500                             |
|               | 5401        |   | 1             |                                       |                  |                      |             |   |                 |  |                                       | <del></del>   | 579. 183                 | 480,000                               | 99, 183  | <del>  -</del> |  | Zizza i zpr y rez                           |
| 5401          | -           | 54'                                     | (B)           | 28, 460                               | 502              | 502                  | К           | 1.000                                   | 120             | 1.664                                      | 6. 583                                | 5, 583  |                          |                                       |  | <u> </u>       |  | Exist Pipe $\phi 500$                       |
|               | 54          |   | 1             |                                       |                  |                      |             | _,                                      |                 |  |                                       |   | 573, 600                 | 485, 000                              | 88, 600  | T -            |  |   |
| 54'           | -           | 57'                                     | (B)           | 24, 520                               | 502              | 502                  | K           | 1, 800                                  | 120             | 1. 434                                     | 4, 238                                | 7, 628  |                          |                                       |  |                |  | Exist Pipe ø 500                            |
|               | 57'         |   |               |                                       |                  |                      |             |   |                 |  |                                       |   | 565, 972                 | 500,000                               | 65, 972  | †—             |  |   |
| 57            |             | 582                                     | (B)           | 24, 520                               | 502              | 502                  | K           | 1,400                                   | 120             | 1.434                                      | 4. 238                                | 5, 933  |                          |                                       |  | 1              |  | Exist Pipe $\phi 500$                       |
|               | 582         | ( = R2                                  |               |                                       |                  |                      |             |   |                 |  |                                       |   | 560, 039                 | 555, 000                              | 5. 039   | $\vdash$       |  |   |
|               | - 9         |   | 75.5          | \$                                    | Seath Live       | To the second second |             | 100                                     |                 | oriens h                                   | Str. and an arrange of the            | da a mante da da                                      |                          |                                       |  |                | ************************************** | A 25 C 18 C 1 C 1 C 1 C 1 C 1 C 1 C 1 C 1 C |
|               | KMC         |   | 1.7.7.00.1    |                                       | 4000000          |                      |             |   |                 |  |                                       |   | 579. 183                 | 471.000                               | 108, 183   | -              | 1                                      |   |
| KMC           | -           | 66                                      | В             | 2, 730                                | 199              | 199                  |             | 900                                     | 130             | 1, 016                                     | 5, 704                                | 5. 133  |                          | 21.27.5.5                             |  | В              | 70. 8                                  |   |
|               | 66          | (= Dan                                  |               |                                       |                  |                      |             |   |                 |  |                                       |   | 574.050                  | 531.600                               | 42, 450  | <u> </u>       |  |   |
| 111,011,05    | 8.5         |   |               | 300 14 V 64                           | No. 1            | gasaran tu tu        | (cs. 15,08) | Ar line have                            | 2000 CONTRACTOR | คือเดียนที่สิบดยากข้า                      | E COM THE STREET                      | Her Amaroleti   | ile kadala etakeri       |                                       | ALLES FREEZES  | 1000           | a Carollian i                          | 1.00  |
|               | 54'         | <del></del>                             | WELL 1 CO 7 S |                                       | ******           | -11. JAMES 102       |             | 11.00.00.00                             | ex7474 museum   | *** 33, C 3, S 3, S 3, S 3, S 3, S 3, S 3, | 20.02 3848350256                      | 7. T. 2. 1. 3. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. | 573, 600                 | 485, 000                              | 88, 600  | 147, 117       | 12. CC 10.5 . F1.0                     | C22.550                                     |
| 54'           | -           | 54                                      | (B)           | 3, 940                                | 350              | 350                  |             | 1,050                                   | 130             | 0.474                                      | 0.719                                 | 0.755   | <u></u>                  |                                       |  | <b></b>        |  |   |
|               | 54          | = Heer                                  | essag         | ala (Low)                             |                  |                      |             |   |                 |  |                                       |   | 572, 845                 | 570,000                               | 2, 845   |                |  |   |
| 3.47          | 0.7         | 15.5                                    |               | Section 1                             |                  |                      | ,           | 2                                       | يداؤن كاوليا    | : Skinkin Anduban.                         | £1.354 143.53                         | Tana a  |                          |                                       |  | 100            |  |   |
|               | 54          |   | **            | · <del>421-421-1-1-1-1-1</del>        |                  | <del></del>          |             |   | S-18-11 11-81   |  | 20 2149-26 200-0039                   | Processor Service Comment                             | 624, 800                 | 566, 000                              | 58, 800  |                |  |   |
| 54            | _           | 54a                                     | В             | 1,650                                 | 201              | 201                  |             | 870                                     | 130             | 0.602                                      | 2. 140                                | 1.862   |                          |                                       |  | B              | 58.8                                   | DIP   |
|               | 54a         |   |               |                                       |                  |                      |             |   |                 |  |                                       |   | 622, 938                 | 576, 330                              | 46, 608  | ┌╴             |  |   |
| 64a           | 1           | 55                                      | В             | 1,650                                 | 199              | 199                  |             | 400                                     | 130             | 0, 614                                     | 2. 247                                | 0, 899  |                          |                                       |  | <u> </u>       |  | PVC   |
|               | 55          | = Heer                                  | essag         | ala (Middl                            | e)               |                      |             |   |                 |  |                                       |   | 622, 039                 | 617, 000                              | 5, 039   | <u> </u>       |  | <del></del>                                 |
| 7.77          | 200 000     |   |               | 1 - 13 7 - 1                          | 7.5              | 37.212.22            | 27:24:5     | Service .                               | Carlo San       |  | Salar Salar                           | 1,000   | Maria de Albridadas de   | raperint (Symmax) is                  | Color water the  | 2000           | St. Prestituti                         | ETTE JAMES LETTER LETTER                    |
|               | 55          |   |               |                                       |                  |                      |             | *************************************** | ************    |  |                                       |   | 683, 400                 | 613.000                               | 70.400   |                |  |   |
| 55            | -           | 55a                                     | В             | 280                                   | 149              | 149                  |             | 350                                     | 130             | 0, 186                                     | 0.346                                 | 0, 121  |                          |                                       |  | В              | 70, 4                                  | DIP   |
|               | 55a         |   |               |                                       |                  |                      |             |   |                 |  |                                       |   | 683, 279                 | 636, 350                              | 46, 929  |                |  |   |
| 55a           |             | 56                                      | В             | 280                                   | 141              | 141                  |             | 470                                     | 130             | 0. 208                                     | 0.452                                 | 0. 212  |                          |                                       |  |                |  | PYC   |
|               | 56          | = Heer                                  | essag         | ala (Upper                            | )                |                      |             |   |                 |  |                                       |   | 683, 067                 | 678,000                               | 5, 067   |                |  |   |
|               | KMC. R2     |   |               | - 15 to a                             |                  | 4. 32. 6.34.         |             |   | J. S            |  |                                       | EALLY<br>EALLY  |                          | Kanene (                              |  | 1,275          |  | Santi Print National Assets                 |
|               |             | (= R2)                                  |               |                                       |                  |                      |             |   |                 | or state of the first                      |                                       |   | 623, 490                 | 549, 490                              | 74.000   | Г              |  |   |
| 582           |             | 583                                     | В             | 6, 480                                | 328              | 328                  | K           | 500                                     | 120             | 0, 888                                     | 2. 872                                | 1.436   |                          |                                       |  | В              | 74. 0                                  | Exist Pipe φ250×2                           |
| ***           | 583         | (= R3)                                  | -             | · · · · · · · · · · · · · · · · · · · |                  |                      |             |   |                 |  |                                       |   | 622, 054                 | 617.000                               | 5, 054   |                |  |   |
|               | , , , ,     | 7                                       |               | 1 1 1 1 1 1                           |                  | 100                  | 3.32        | \$ 1 Total                              |                 |  | Carles Santa                          | A PRINCIPAL   | The said see seems pages | Target Marie 1921                     |  |                |  |   |
|               | 582         |   |               |                                       |                  |                      |             |   |                 |  |                                       | متنا اول بر دو و بن و سند د د                         | 646, 890                 | 549, 490                              | 97, 400  |                |  |   |
| 582           | -           | 618                                     | В             | 1,050                                 | 201              | 201                  |             | 860                                     | 130             | 0. 383                                     | 0. 927                                | 0.798   |                          |                                       |  | B              | 97. 4                                  |   |
|               | 61S         | (= Han                                  |               | Place)                                |                  |                      |             |   |                 | · · · · · · · · · · · · · · · · · · ·      | · · · · · · · · · · · · · · · · · · · | ·····   | 646, 092                 | 641,000                               | 5, 092   |                |  |   |
| ,             |             | 2:::::::::::::::::::::::::::::::::::::: |               | 3 2 23                                |                  |                      |             | 21.00                                   | ters/over       | Patrick Locked                             | 1041, 2010, 02 1807                   |   |                          | Department of the                     | A STATE OF THE STA | 1.00           |  |   |
|               | 583         |   |               |                                       |                  |                      |             |   |                 |  |                                       |   | 613,000                  | 613.000                               | 0,000  |                |  |   |
| 583           | -           | 6001                                    | G             | 9, 140                                | 350              | 350                  | K           | 541                                     | 120             | 1, 100                                     | 3, 955                                | 2. 139  |                          |                                       |  |                |  | Exist Pipe φ350                             |
|               | 6001        |   |               |                                       |                  |                      |             |   |                 |  |                                       |   | 610. 861                 | 560.000                               | 50.861   | L              |  | 3, 980x1, 67=6, 640                         |
| 6001          | -           | 6002                                    | (G)           | 9, 140                                | 299              | 299                  | K           | 1,304                                   | 120             | 1, 507                                     | 8, 515                                | 11.104  |                          |                                       |  | L              |  | Exist Pipe φ300                             |
|               | 6002        |   |               |                                       |                  |                      |             |   |                 |  |                                       |   | 599, 757                 | 571, 450                              | 28, 307  |                |  | 3, 980x1. 67=6, 640                         |
| 6002          | _           | 60                                      | (G)           | 2,500                                 | 299              | 299                  |             | 1,810                                   | 130             | 0.412                                      | 0, 667                                | 1.208   |                          |                                       |  |                |  | Exist Pipe $\phi$ 160                       |
|               | 60          | (= Amp                                  |               |                                       |                  |                      |             |   |                 |  |                                       |   | 598, 549                 | 586, 000                              | 12. 549  |                |  |   |
|               |             |   |               | <del></del>                           | ·                |                      |             |   |                 |  |                                       |   | ···                      |                                       | <del></del>  | •—             | -                                      |   |

(Phase 1)

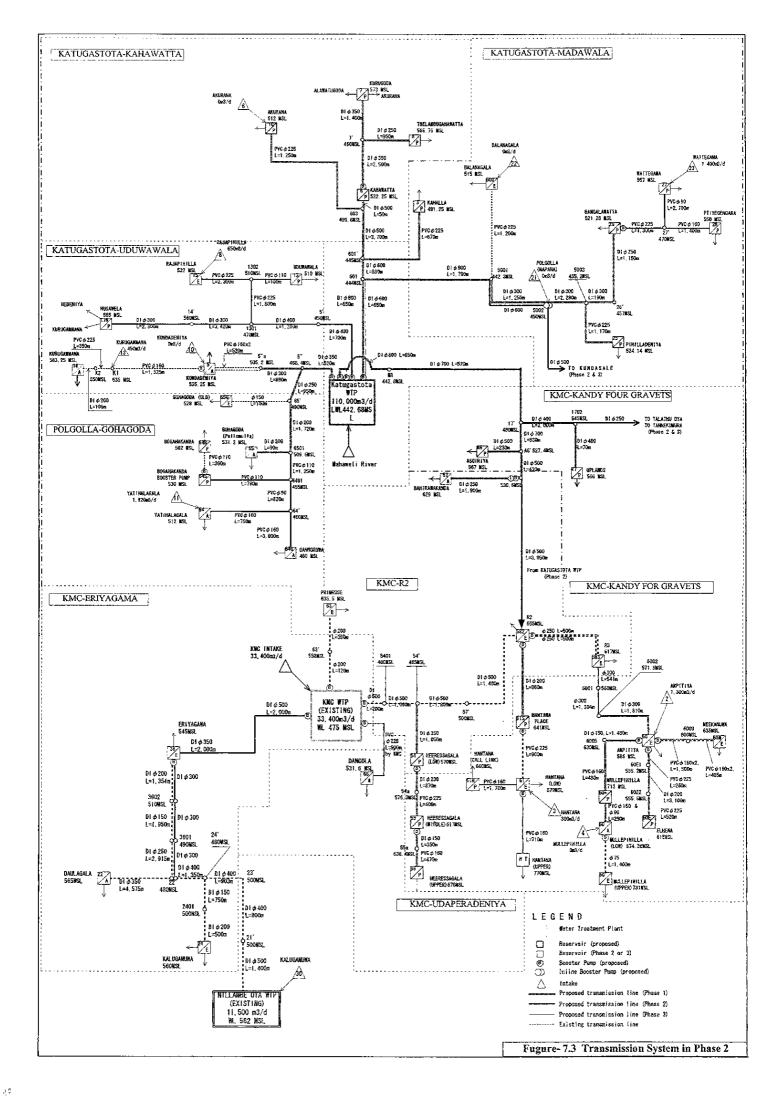
|          | Node           |  | B/G           | Flow Rate                                     | Dia.                                  | Mixed Dia                               | Exist.                                 | Length                 | С                  | Velocity   | Hyd. Grd   | Loss  | Dynamic                                   | LWL  | Dynamic                                    | Pump       | Required                                | Remark   |
|----------|----------------|--|---------------|---|---------------------------------------|---|--|------------------------|--------------------|--|--|---|---|--|--|------------|---|--|
| Node     | >              | Node   |               | Q (m3/d)                                      | D (mm)                                | Dm(mm)                                  |  | L(m)                   | İ                  | v(m/sec)   | I (%a)   | h(m)  | Pressure                                  | HWL  | Pressure                                   |            | Pump Head                               |  |
|          |                | 0- 1-  |               |   |                                       |   | 33                                     |                        |                    |  | 5-13-11-2014   | 74 250  |   | i sa sassifi   | gora e e e e e e e e e e e e e e e e e e e | ,          |   |  |
|          | 60             |  |               |   |                                       | •                                       |  |                        |                    |  |  |   | 620. 700                                  | 582, 500   | 38, 200                                    |            |   |  |
| 60       | -              | 60E-1  | В             | 400   | 199                                   | 199                                     |  | 260                    | 130                | 0. 149   | 0, 163   | 0.042   |   |  |  | В          | 38. 2                                   | PVC  |
| L        | 60E-1          |  |               |   |                                       |   |  |                        |                    |  |  |   | 620, 658                                  | 555. 170   | 65, 488                                    |            |   |  |
| 60E-1    |                | 60E-2  |               | 400   | 201                                   | 201                                     |  | 3, 100                 | 130                | 0.146  | 0. 156   | 0.482   |   |  |  |            |   | DIP  |
| L        | 60E−2          |  |               |   |                                       |   |  |                        |                    |  |  | <b></b>   | 620.175                                   | 555. 620   | 64, 555                                    |            |   |  |
| 60E-2    |                | 60E  | I, J          | 400   | 199                                   | 199                                     |  | 520                    | 130                | 0.149  | 0.163  | 0.085   |   |  |  | L.,        | <u>-</u>                                | PVC  |
|          | 60E            | (= E1h   | ena)          |   |                                       | - <del> </del>                          |  | T 0.05 578 12 38 8 8 4 |                    |  |  | 10 to | 620.090                                   | 615.000  | 5. 090                                     |            |   |  |
| أنستت    |                | <u> </u>   |               |   |                                       | Paritara                                |  |                        | geye traditi       |  |  | Mary State of Asset   |   | reda Nigir   |  |            |   |  |
|          | 60             | 4005   | <u> </u>      | ¥55   |                                       |   |  |                        |                    |  |  |   | 720. 900                                  | 582. 500   | 138, 400                                   |            |   |  |
| 60       | - 1            | 6005   | В             | 580_  | 149                                   | 149                                     |  | 1,480                  | 130                | 0.385  | 1, 329   | 1. 967  |   |  |  | В          | 138. 4                                  | DIP  |
| 2005     | 6005           |  |               | 500   |                                       | <del></del>                             |  |                        |                    |  |  |   | 718. 933                                  | 648. 760   | 70. 173                                    |            |   |  |
| 6005     |                | 60+  | В             | 580   | 141                                   | 141                                     |  | 480                    | 130                | 0. 430   | 1. 739   | 0.835   |   |  |  |            | -                                       | PVC  |
| ļ        | 11 Proceedings | (= Mul   |               |   | 74 7 11 11 11                         | California (Marcon)                     | N. P. T. T. T.                         | 10 KM 121 CH 125 A     | 20 40 40 40        | Sarvacioni, barcino  | O  |   | 718. 098                                  | 713,000  | 5, 098                                     |            |   |  |
|          |                |  | X2.12.        | 48  |                                       |   | No. 1 Sec. 10                          |                        |                    | (\$4,650)  | Section and the section of the secti | A veal and a  |   |  |  | 200        | toma (Andria)                           |  |
|          | 60+            |  |               |   |                                       |   |  |                        |                    |  |  | 2 205   | 709. 000                                  | 709,000  | 0,000                                      |            |   |  |
| 60+      | 2011           | 60+1   | G             | 60  | 141                                   | 141                                     |  | 100                    | 130                | 0.044  | 0, 026   | 0, 003  | 700 007                                   | 004 000  | 11 207                                     |            |   | PVC  |
|          | 60+1           | 60'  |               |   | 79                                    | 79                                      |  | 100                    | 100                | 0.140  | 0.400  | 0.000   | 708, 997                                  | 664, 330   | 44. 667                                    |            |   | DUO  |
| 60+1     | 60,            |  | 1 - 2 1 - 2   | 60  | 79                                    |   | <u>-</u>                               | 190                    | 130                | 0.142  | 0.439  | 0.083   | 700 014                                   | C74 000  | 24 554                                     |            |   | PVC  |
|          | - 00           |  |               | lla (Low))                                    |                                       | 75, 75, 75, 75, 75, 75, 75, 75, 75, 75, | og moon to                             |                        |                    |  | 100 C C C C C C C C C C C C C C C C C C  | and the second second   | 708. 914                                  | 674, 360   | 34, 554                                    | ·          |   | Six comp hints are paint   |
|          | 60'            | مَنْ كُوْمُ فَأَمْنِهُ   | <u> </u>      |   | ننيت تارا                             | 4                                       | ericust s                              | فقاتا المستخف          | 8.72               |  |  | المنشتسخة   | GO AVECUA DAMA VICENTA PROVINCE A PART    | 270 500  |  |            | <u> </u>                                |  |
| 60'      |                | 60"  | B             | 60  | 66                                    |   | 1/                                     | 1 400                  | 100                |  | 1 000  | 1 710   | 737. 800                                  | 672.500  | 65. 300                                    |            | CF 0                                    | D. 1 . D1 . 17C  |
| 00       |                | = 0V<br>= 10.11  | L P           | la (Upper)                                    | 00                                    | 66                                      | K                                      | 1,400                  | 120                | 0, 203   | 1, 223   | 1, 712  | 706 000                                   | 701 000  | F 000                                      | B          | 65.3                                    | Exist Pipe $\phi$ 75   |
| <u>-</u> |                | <u> - matt</u>   | pinit         | ra (opper)                                    | Ti Actual                             | 57. E.M.                                |  |                        | 11.28.4            |  |  | L. Zalajinija   | 736. 088                                  | 731, 000   | 5, 088                                     | \$E.       | Bart- di Santi                          | . <u> </u>   |
|          | 60             | A STATE OF THE STA |               | 2-120-12-12-12-12-12-12-12-12-12-12-12-12-12- |                                       |   | Links                                  |                        | 100.000            | as card artic  | L Million News   | Manager Control   | 656, 600                                  | 582, 500   | 74, 100                                    | érastria.  | 25-1-22-1-22-2                          | <u> </u>   |
| 60       |                | 6003   | В             | 1, 250  | 141                                   | 141                                     | K                                      | 1,500                  | 120                | 0. 927   | 8. 347   | 12, 521   | 656, 600                                  | 562, 500   | 74. 100                                    | В          | 7/ 1                                    | Exist Pipe $\phi$ 160  |
| - 00     | 6003           | 0000   |               | 1,200   | 141                                   | 171                                     |  | 1,000                  | 1,20               | 0, 321   | 0.041  | 12. 521   | 644. 079                                  | 600,000  | 44. 079                                    | _Б_        | (4, 1                                   | CXISC Fibe \$ 100  |
| 6003     | -              | 60M  | (B)           | 1, 250  | 141                                   | 141                                     | K                                      | 485                    | 120                | 0, 927   | 8. 347   | 4, 048  | 044.013                                   |  | 44.018                                     |            |   | Exist Pipe φ160  |
| 1000     |                | = Meek   |               |   |                                       | 171                                     |  | 700                    | 120                | 0, 321   | 0.041  | 4. 040  | 640, 030                                  | 635. 000   | 5. 030                                     |            | ·············                           | Exist Tipe \$100   |
| <b> </b> |                |  |               | . 760.110                                     |                                       | 10050000000                             | Grand M                                | 18 1 1 S               | Brelevic of us     | 4431 IP 31, 115  | F1.11-12/19/19   |   | Frozpailaria                              |  |  | \$.7°.2°.8 | Anatha Albara                           |  |
|          | 1              |  |               |   | · · · · · · · · · · · · · · · · · · · | ALTE TANK CARACT                        |  | 133                    | F1 3 37 - A2 - LAS | STEAN AND AND A 201  |  | A   | A. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. | the state of the s | 11,2                                       | ****       | ##! **A., :: p., \$1;-\$1;- 1           | <del>lament d'al mandinat d'anna anna</del>  |
|          | Katngas        | stota -  | usvea.        | adawala                                       | Harage of the con-                    |   | 19.10<br>19.30<br>19.30                | 1.1. J. A.S.           | 150 C 100          | CO BIARD   | i on a single  |   | CONSTRUCTOR                               | Side and   | 1.00                                       |            | 1.1. 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. |  |
|          | PG             |  |               | 3-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1       |                                       | Samula made                             | LUSYSKI A                              | v sinih nie maseniki   | Marian Salah       | Santana di Andrea d  | - To be a second and the   | · Children Consideration and all to   | 532, 580                                  | 442, 680   | 89, 900                                    |            |   | Contract Con |
| PG       |                | 601  | В             | 14, 390                                       | 603                                   | 603                                     |  | 650                    | 130                | 0. 583   | 0. 558   | 0. 363  | ******                                    |  |  | В          | 89. 9                                   |  |
|          | 601            |  | <del>  </del> |   |                                       |   |  |                        |                    |  |  |   | 532, 217                                  | 444. 020   | 88. 197                                    |            | ······································  |  |
| 601      |                | 5001   | (B)           | 3,780   | 603                                   | 603                                     |  | 1,790                  | 130                | 0. 153   | 0.047  | 0.084   |   | <u> </u>   |  |            | <del></del>                             | -  |
|          | 5001           | -,,,   |               |   |                                       |   |  |                        |                    |  |  |   | 532, 133                                  | 442. 250   | 89. 883                                    |            |   |  |
| 5001     |                | 5002   | (B)           | 2, 480  | 299                                   | 299                                     |  | 1, 250                 | 130                | 0, 409   | 0.657  | 0.822   |   |  |  |            |   |  |
|          | 5002           |  |               |   |                                       |   | ******                                 |                        |                    |  |  |   | 531. 311                                  | 450,000  | 81. 311                                    |            |   |  |
| 5002     |                | 5003   | (B)           | 2, 480  | 299                                   | 299                                     |  | 2, 280                 | 130                | 0, 409   | 0.657  | 1, 499  |   |  |  |            |   |  |
|          | 5003           |  |               |   |                                       |   |  |                        |                    |  |  |   | 529.812                                   | 455. 220   | 74, 592                                    |            |   |  |
| 5003_    |                | 26-1   | (B)           | 1,060   | 201                                   | 201                                     |  | 410                    | 130                | 0.387  | 0. 944   | 0.387   |   |  |  |            | DI                                      |  |
|          | 25-1           |  |               |   |                                       |   |  |                        |                    |  |  |   | 529, 425                                  | 455, 200   | 74, 225                                    |            |   |  |
| 25-1     |                | 25   |               | 1,060   | 199                                   | 199                                     |  | 220                    | 130                | 0.394  | 0. 991   | 0, 218  |   |  |  |            | PVC                                     |  |
|          | 25             | = Pihi   | llade         | niya  |                                       |   |  |                        |                    |  |  |   | 529, 207                                  | 524. 140   | 5, 067                                     |            |   |  |
|          |                |  |               |   | Start a                               | TATE OF THE STREET                      | ·* · · · · · · · · · · · · · · · · · · | XX XX Links            | 1304               | Control of the contro | Transmiss Sec. in  | Company of Alex   | rates of British Colors                   | 200000000000000000000000000000000000000  |  | Z(         |   |  |
|          | 601            |  |               |   |                                       |   |  |                        |                    |  |  |   | 532, 217                                  | 444. 020   | 88, 197                                    |            |   |  |
| 601      |                | 601  | (B)           | 10,620  | 603                                   | 603                                     |  | 890                    | 130                | 0.430  | 0, 318   | 0. 283  |   |  |  |            |   |  |
|          | 601'           |  |               |   |                                       |   |  |                        |                    |  |  |   | 531. 934                                  | 443, 000   | 88, 934                                    |            |   |  |
| 601,     |                | _3   | (B)           | 1,680   | 199                                   | 199                                     |  | 870                    | 130                | 0.625  | 2, 323   | 2. 021  |   |  |  |            |   |  |
|          | 3              | = Kaha   |               |   |                                       |   |  |                        |                    | I  |  | ×   | 530, 196                                  | 491. 250   | 38, 946                                    | ]          |   |  |
|          |                |  | A 11 T        | 25 4 5 7 7 7 7 7 7                            | 7. 1. 71                              | 0 . 5                                   |  |                        |                    | A  |  | 7.02 2.02<br>7.744.73c 8-   |   | C. C. C. C. C. C. C. C. C. C. C. C. C. C   | data karan                                 |            |   | January Control of the Control of th |

(Phase 1)

|                | Node         |              | R/C               | Flow Rate                               | Dia          | Mixed Dia                                   | Sviat          | Length  | Ċ                                | Velocity                              | Hvd. Grd                       | Loss                                    | Dynamic                            | LWL              | Dynamic        | Derman   | Required                                | Remark  |
|----------------|--------------|--------------|-------------------|---|--------------|---|----------------|---|----------------------------------|---------------------------------------|--------------------------------|---|------------------------------------|------------------|----------------|--|---|---|
| Node           | >            | Node         | D/ G              | Q (m3/d)                                |              |   | Exist.         | L (m)   |                                  | v(m/sec)                              | I (%)                          | h (m)                                   | Pressure                           | HWL              |                |  | Pump Head                               | Kemark  |
| Houe           | 5001         | 110dc        | <del> </del>      | Q (115) G)                              | 15 (IIII)    | Din (maa)                                   |                | L (III)   |                                  | * (iii/ 36C)                          | 1 (7007                        | 17 (1117                                | 532, 133                           | 442. 250         | 89, 883        | Type   | 1 diip Head                             |   |
| 5001           | -            | 500          | (B)               | 1,310                                   | 199          | 199   | K              | 1,200   | 120                              | 0.487                                 | 1.700                          | 2.040                                   | *****                              |                  |                |  |   | Exist Pipe φ225   |
|                | 500          | = Bala       | nagal             | a                                       |              |   |                |   |                                  |                                       |                                |   | 530, 093                           | 514. 350         | 15. 743        |  |   | ,   |
|                |              |              | 11 4/4            |   |              |   | -y- + y-2+j    |   | 新文物艺                             |                                       | 2                              |   | as Sentin                          |                  |                |  |   | with the state of |
|                | 5003         |              | ļ., <u> </u>      |   |              |   |                |   |                                  |                                       |                                |   | 529. 812                           | 455. 220         | 74. 592        |  |   |   |
| 5003           | -            | 26'          | (B)               | 1,420                                   | 299          | 299   | ļ              | 190   | 130                              | 0. 234                                | 0, 234                         | 0.045                                   |                                    |                  | ļ <del>.</del> |  |   |   |
| 00'            | 26'          | 0.0          | 75/-              |   | 050          | 250   |                |   | 100                              | 0.000                                 | 0.500                          | A 400                                   | 529. 767                           | 456, 990         | 72, 777        | $\vdash$   |   |   |
| 26'            | 26           | 26<br>= Bang | (B)               | 1,420                                   | 252          | 252   |                | 1,150   | 130                              | 0.330                                 | 0.539                          | 0.620                                   | 529, 148                           | 521, 280         | 7, 868         |  |   | <del>   </del>  |
| 17.5           |              |              |                   | aliawatta                               |              | in i dice                                   | - y> 1-a       | again an a taol (an   | 1 2                              |                                       |                                | 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |                                    | 521.200          | 1.000          |  |   | <del></del>   |
| -              | 601          | 0.50.00      |                   | anawa cta                               | (Ka          | 1-7-1 (1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1- | 13.471.94      | St. 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2   | 310                              | 79.00                                 |                                | <u> </u>                                | 531. 934                           | 443, 000         | 88, 934        |  | <u> </u>                                |   |
| 601'           | -501         | 603          | (B)               | 8, 940                                  | 502          | 502   |                | 3,700   | 130                              | 0. 523                                | 0, 565                         | 2, 091                                  | 001.501                            | 110.000          | 00.551         |  |   |   |
| 372            | 603          |              | 107.              | 914.5                                   |              |   |                | 27,700  | -100                             | 01.520                                | 0.000                          | 21.001                                  | 529, 843                           | 499, 600         | 30, 243        |  |   |   |
| 603            |              | 6            | (B)               | 6,600                                   | 502          | 502   |                | 50  | 130                              | 0. 386                                | 0. 322                         | 0.016                                   |                                    |                  |                |  |   |   |
|                | 6            | = Kaha       | watta             |   |              |   |                |   |                                  |                                       |                                |   | 529. 826                           | 522. 250         | 7. 576         |  |   |   |
| 1 1            | and the same |              | 73 a.             |   |              | n to fores                                  |                | 44 65   | CRA TET                          |                                       |                                |   |                                    | Developed        |                |  | tasa at a                               | anger the later of the first  |
|                | 603          |              |                   |   |              |   |                |   |                                  |                                       |                                |   | 529. 826                           | 499.600          | 30. 226        |  |   |   |
| 603            |              | 10           | (B)               | 2, 340                                  | 199          | 199   |                | 1,250   | 130                              | 0.871                                 | 4. 288                         | 5. 360                                  |                                    |                  |                | Ш  |   |   |
|                | 10           | = Akur       |                   |   | ]            |   |                |   |                                  |                                       |                                |   | 524. 466                           | 512.000          | 12. 466        | ļ  |   |   |
|                | فتنينت       |              | 11.36             |   | 20.00        |   | 32             | (m. 1472)   | a Armita                         |                                       |                                | Between transcr                         | THE POST AND ADDRESS OF THE PARTY. | تتواناك ليطيانان |                | إستنتا   |   |   |
|                | 6            | 7,           |                   |   | 0.50         |   |                | - F00   | 100                              |                                       | 0 001                          |   | 580, 550                           | 518, 250         | 62, 300        |  | 40.0                                    |   |
| 6              | -<br>7       |              | В                 | 4, 240                                  | 350          | 350   |                | 2, 500  | 130                              | 0, 510                                | 0.824                          | 2, 059                                  | 578. 491                           | 455, 030         | 123, 461       | В  | 62. 3                                   |   |
| 7,             |              | 7            | (B)               | 2, 410                                  | 350          | 350   |                | 1, 400  | 130                              | 0, 290                                | 0, 290                         | 0, 405                                  | 576.491                            | 455, 030         | 123, 461       | ╁╾╾╅   |   | <del></del>   |
| <del></del>    |              | = Kuru       |                   | 2,410                                   | 300          | 350   |                | 1, 100  | 130                              | 0. 250                                | 0.290                          | 0.400                                   | 578, 086                           | 573.000          | 5,086          |  |   | -   |
|                |              | - NGIQ       | goua              | 1 | Allekaria er | 1141708                                     |                | 1   | \$58.53(SP)                      | 915 - 1980                            | 1.551770                       | 32 C                                    | 310.000                            | 13.000           | 2.000          |  |   | schrunge in Palamena in d   |
| <del></del>    | 7'           | <u> </u>     |                   | 1440-1-1-1-1-1-1-1                      | -7780a (c    | 10 <u>8 12.614</u> 4                        | 133 <u>1 3</u> | 7.05(3380.9%  | (12-1,                           | 63 / "475 <u>  1896</u> 5)            | the Capture Copy and Mary Copy | Section and the section is              | 578, 491                           | 455, 030         | 123, 461       |  | 100 100 100 100 100 100 100 100 100 100 | <del>(************************************</del>  |
| 7,             | -            | - 8          | (B)               | 1,840                                   | 252          | 252   |                | 950   | 120                              | 0, 427                                | 1, 009                         | 0. 959                                  | <u></u>                            | 220, 70,2.       |                | $\vdash$   |   |   |
|                | 8            | = Thel       | ambuga            | watta                                   |              |   |                |   |                                  |                                       |                                |   | 577, 532                           | 566, 750         | 10. 782        |  | -                                       |   |
|                | Katuga       | stora ?      | ***> K            | ondadeniya                              | . Kuruga     | amana 🚌                                     | di wali        | 354H-c17K   | $A \subseteq \mathbb{R}^{d_{1}}$ | 1010, 111, 124                        |                                | jęjak v                                 |                                    | 19496 (1975)     |                | 300  | 88° (11. 1. 1                           |   |
|                | PG           | ·            |                   |   |              |   |                |   |                                  |                                       |                                |   | 546, 780                           | 442.680          | 104.100        |  |   |   |
| PG             | -            | 5″           | В                 | 4, 710                                  | 350          | 350   |                | 520   | 130                              | 0. 567                                | 1,000                          | 0, 520                                  |                                    |                  |                | В  | 104.1                                   |   |
|                | 5"           |              | - <del>,_</del> , |   |              |   |                |   |                                  |                                       |                                |   | 546, 260                           | 468, 410         | 77. 850        | -  |   |   |
| 5"             |              | 5″a          | (B)               | 2, 760                                  | 299          | 299   |                | 890   | 130                              | 0.455                                 | 0.801                          | 0.713                                   | 5 (F F (F                          | 505 130          | 40.007         |  |   |   |
| 5″a            | 5 a          |              | (D)               | 0.700                                   | 107          | 48530                                       |                |   | 100                              | 1 000                                 | 10.010                         | F 900                                   | 545, 547                           | 505, 180         | 40. 367        | $\vdash$   |   | Police Disc. 4 160 V 2  |
| _5 a           |              | 5            | (B)               | 2, 760                                  | 184          | 184   | <u>K</u>       | 520   | 120                              | 1. 208                                | 10, 012                        | 5, 206                                  | 545, 547                           | 535, 250         | 10, 297        | <del>                                     </del> |   | Exist Pipe φ160×2   |
|                | 5            | = Kond       | adeni             |   |              | e Zyra háğuk                                | 9757 J.C       | <del>,,,,,,,,,,,,,,,</del> ,,,,,,,,,,,,,,,,,,,,,  |                                  |                                       | 25 129 1313                    | TAL 1995                                | 040.041                            | 000.200          | 10. 291        |  |   |   |
|                | 5            | 32×16 (      |                   |   | ·2`          | r / 31-5 336/46                             | <u> </u>       | هٔ د محمد المحمد ا | 37,325,73                        | <u></u>                               | S'1,12, Nation 1981            | (11.40 )2.50 (11.50 CE                  | 598, 550                           | 531. 250         | 67, 300        | 11.77  | <u>&gt;:</u>                            | <u> </u>  |
| 5              |              | <u>K1</u>    | B                 | 1,050                                   | 141          | 141   | К              | 1, 525  | 120                              | 0, 778                                | 6, 046                         | 9, 220                                  | 555, 550                           | 001.200          | 01,000         | В  | 67. 3                                   | Exist Pipe ø 160 PVC  |
| - <del>-</del> | K1           | 114          |                   | 1,000                                   | ***          | ***   |                |   |                                  | · · · · · · · · · · · · · · · · · · · | 2. 4.0                         | V. 400                                  | 589, 330                           | 535, 000         | 54, 330        | ┌╌┤  |   |   |
| <u>K1</u>      | -            | K2           | (B)               | 1,500                                   | 199          | 199   | K              | 350   | 120                              | 0, 558                                | 2. 184                         | 0.765                                   |                                    |                  | 1              |  |   | Exist Pipe \$225 PVC  |
|                | K2           |              |                   | ,TI, T T Y                              |              |   |                |   |                                  |                                       |                                |   | 588, 565                           | 550.000          | 38. 565        | T  |   |   |
| K2             | _            | 14           | (B)               | 1,500                                   | 201          | 201   | K              | 106   | 120                              | 0.547                                 | 2. 081                         | 0. 221                                  |                                    |                  |                |  |   | Exist Pipe φ200 DI  |
|                | 14           | = Kuru       | gammai            | 18                                      |              |   |                |   |                                  |                                       |                                |   | 588. 345                           | 583. 250         | 5. 095         |  |   |   |

# (Phase 1)

|      | Node    |           | B/G    | Flow Rate   |        | Mixed Dia                                    | Exist.   | Length                    | C           | Velocity   | Hyd. Grd     | Loss                          | Dynamic  | LWL                  | Dynamic                                    | Pump |                | Remark                                       |
|------|---------|-----------|--------|-------------|--------|--|----------|---------------------------|-------------|--|--------------|-------------------------------|--|----------------------|--|------|----------------|--|
| Node | >       |           |        | Q (m3/d)    | D (mm) | D m (mm)                                     |          | L(m)                      |             | v(mu/sec)  | I (‰)        | h(m)                          | Pressure   | HWL                  | Pressure                                   | Type | Pump Head      |  |
| 11.2 |         | stota 🤊   | ·      | KEG, R2     |        |  |          | in ejeden in              |             |  | 20 00 1 00 0 |                               |  |                      |  | 13.3 |                |  |
|      | PG      |           |        |             |        |  |          |                           |             |  |              |                               | 572. 780   | 442.680              | 130, 100                                   |      |                | ·  |
| PG   | -       | MR        | В      | 17,600      | 802    | 802  |          | 650                       | 130         | 0.403  | 0. 202       | 0. 131                        |  |                      |  | В    | 130.1          |  |
| L    | MR      |           |        |             |        |  |          |                           |             |  |              |                               | 572, 649   | 442.770              | 129, 879                                   |      |                |  |
| MR   |         | 17'       | (B)    | 17,600      | 700    | 700  |          | 570                       | 130         | 0.529  | 0.392        | 0. 223                        |  |                      |  |      |                |  |
|      | 17'     |           |        |             |        |  |          |                           |             |  |              |                               | 572. 425   | 453. <del>6</del> 50 | 118, 775                                   | L    |                |  |
| 17'  | -       | AG'       | (B)    | 13, 210     | 700    | 700  |          | 830                       | 130         | 0, 397   | 0. 231       | 0. 191                        |  |                      |  |      |                | ]  |
|      | AG'     |           |        |             |        |  |          |                           |             |  |              |                               | 572. 234   | 527.400              | 44. 834                                    |      |                |  |
| AG'  | -       | AG        | (B)    | 11, 240     | 502    | 502  |          | 230                       | 130         | 0.657  | 0.863        | 0. 199                        |  |                      |  |      |                |  |
|      | AG      | = Asgi    |        |             |        |  |          |                           |             |  |              |                               | 572. 035   | 567, 000             | 5, 035                                     |      |                |  |
| *    |         |           |        | a dine in   | 47112  | ະ ທີ່ ໄດ້ໄດ້ເຂົ້າ<br>ການ ເຂົ້າຂອນ ກ່ຽວກັນໄດ້ | \$ 10 mg | 344 314<br>243            | didirection |  |              |                               | 251 (140 H 21 H 21 H 2 H 2 H 2 H 2 H 2 H 2 H 2 H |                      |  |      |                |  |
| L    | AG'     |           |        |             |        |  |          |                           |             |  |              |                               | 572. 234   | 527.400              | 44. 834                                    | l    |                |  |
| AG'  |         | (IB)      | (B)    | 1, 970      | 502    | 502  |          | 430                       | 130         | 0.115  | 0. 034       | 0.015                         |  |                      |  |      |                |  |
|      | (IB)    |           |        |             |        |  |          |                           |             |  |              |                               | 572. 219   | 530, 630             | 41. 589                                    |      |                |  |
| (IB) |         | 57        | _B     | 1,970       | 252    | 252  |          | 1,900                     | 130         | 0.457  | 0.988        | 1.877                         |  |                      |  | В    | 63.7           |  |
|      | 57      | = Bahi    | rawak  | and         |        |  |          |                           |             | i  |              |                               | 6 <u>34. 04</u> 3                                | 629,000              | 5, 043                                     |      |                |  |
|      |         | Non Alice | 94 527 |             |        |  |          |                           | ami ny w    |  |              |                               |  |                      |  |      |                |  |
|      | 17'     |           |        |             |        |  |          |                           |             |  |              |                               | 572. 425   | 453, 650             | 118. 775                                   |      |                | <u> </u>                                     |
| 17'  |         | 1702      | (B)    | 4, 390      | 395    | _ 395  |          | 2,000                     | 130         | 0.415  | 0.487        | 0. 975                        |  |                      |  |      |                |  |
|      | 1702    |           |        |             |        | . —  |          |                           |             |  |              |                               | 571.451  | 545, 000             | 26, 451                                    |      |                | ·  |
| 1702 | -       | $_{17}$   | (B)    | 4, 390      | 395    | 395  |          | 70_                       | 130         | 0, 415   | 0. 487       | 0,034                         |  |                      |  |      |                |  |
|      | 17      | = Upla    |        |             |        |  |          |                           |             |  |              |                               | 571, 417   | 566,000              | 5.417                                      |      |                |  |
|      | Katuga  | stota.    | ;> (   | Johagoda (I | allemu | Lla)   | 100      |                           | 26.32       |  |              | dus<br>etisk med 1 is 5 miles | Jan Alakaka                                      | adorenda California  | or the state with the late of the state of |      | 104 004 4      | San Array Care                               |
|      | 5"      |           |        |             |        |  |          |                           |             |  |              |                               | 546. 260   | 468, 410             | 77, 850                                    |      |                |  |
| 5"   | 1       | 65'       | (B)    | 1,950       | 252    | 252  |          | 950                       | 130         | 0. 453   | 0. 969       | 0.921                         |  |                      |  |      |                |  |
|      | 65'     |           |        |             |        |  |          |                           |             |  |              |                               | 545, 339   | 490, 310             | 55.029                                     |      |                |  |
| 65'  | _       | 6501      | (B)    | 1,050       | 201    | 201  |          | 1,720                     | 130         | 0.383  | 0. 927       | 1.595                         |  |                      |  |      |                |  |
|      | 6501    |           |        |             |        |  |          |                           |             |  |              |                               | 543. 744   | 506.600              | 37. 144                                    |      |                |  |
| 6501 | _       | 65        | (B)    | 1,050       | 201    | 201  | K        | 90                        | 130         | 0, 383   | 0, 927       | 0.083                         |  |                      |  |      |                |  |
|      | 65      | = Goha    | goda   |             |        |  |          |                           |             |  |              |                               | 543, 660   | 531. 200             | 12.460                                     |      |                |  |
| 1.0  | L, Fig. | 1.36      | 16     |             | 100    |  |          | L. T. Babil. Repolicities | THE PARTY   | ATTICLE OF THE STATE OF THE STA | zaan         |                               |  | ior utal             |  |      | บันท์ กลาบลับเ |  |
|      | 65      |           |        |             |        |  |          |                           |             |  |              |                               | 545, 339   | 490. 310             | 55.029                                     |      |                |  |
| 65'  | -       | 65G       | (B)    | 900         | 149    | 149  | ĸ        | 100                       | 120         | 0. 597   | 3. 475       | 0.347                         |  |                      |  |      |                | Exist Pipe ø 200                             |
|      | 65G     | = Goh     | goda   | (old)       |        |  |          |                           |             |  |              |                               | 544, 992   | 528, 000             | 16, 992                                    |      |                |  |
|      | 7.76    | ever 'j   | 2024   |             | 5.50   |  | 9.713    | 4                         | 10.00       | 1 8 89 8 144   | 95884 12 Y   |                               |  |                      |  | 1.4  |                | 2 T + 44 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |



(Phase 2)

|      | Node            |              | B/G         | Flow Rate   | Dia.     | Dia.            | Mixed Dia                                | Exist.           | Length  | С                                       | Velocity   | Hyd. Grd   | Loss   | Dynamic            | LWL  | Dynamic        | Pump                                  | Required                                | Remark   |
|------|-----------------|--------------|-------------|---|----------|-----------------|--|------------------|---|---|--|--|--|--------------------|--|----------------|---------------------------------------|---|--|
| Node | <del></del> ->  | Node         |             | Q (m3/d)  |          | D (mm)          | Dma (mma)                                |                  | L (m)   |   | ν(m/sec)   | I (‰)  | h (m)  | Pressure           | HWL  | Pressure       | Турс                                  | Pump Head                               |  |
|      |                 | .,,          |             |   |          | 2,010           |  |                  |   | .,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | *****  |  | ***  | Hd (MSL)           | (MSL)  | He (m)         | 1                                     | H (m)                                   |  |
|      |                 | imrose       | (- ) ::#    | (* 1 개 원 ) (* 1 개<br>88 - 기계 (* 1 개 개 개 개 개 개 개 개 개 개 개 개 개 개 개 개 개 개 | £ 30 t   |                 | िन पुरस्ति ।<br>जन्म                     | 30 K. K.         |   | s Marsile                               |  | and the second of the second o | Material and and and and and and and and and and |                    | K 1554   | 454, 254, 254, | Terior                                |   | <u> </u>   |
| WARC | KMC_            |              | -           |   |          | 001             | -001                                     | .,,              | 500   | 1.00                                    |  | 4 500  | 0.004  | 642, 800           | 471,000  | 171.800_       |                                       | 171 0                                   | B : . B: 000   |
| KMC  | 63              | 63           | _В          | 2, 300  | 0        | 201_            | 201                                      | _K               | <u>50</u> 0   | 120                                     | 0.839  | 4, 588   | 2. 294   | 640, 506           | 635, 500   | 5, 006         | В                                     | 171.8                                   | Exist Pipe $\phi$ 200  |
|      |                 | iyagama      | 8 + j'.     | -10-12-7  |          | F 281 FE 1 FE 3 | mate / 995119273                         | 83               | i at iil  | Cartha                                  | la a razz estible  |  |  | 040.000            | 030.000  | 5.000          |                                       | 1 2                                     |  |
|      | KMC             | 1-Yagama     |             |   |          |                 | F - 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 233,111-5,111-2  | NAME OF THE PARTY | **************************************  |  | a. i.i. Arrillianii  | Note of Carlo Long                               | 557, 800           | 471,000  | 86, 800        |                                       | ; .                                     | Strain Strain  |
| KMC  | -               | 36           | В           | 9,000   | 0        | 502             | 502                                      |                  | 2,000   | 130                                     | 0, 526   | 0, 572   | 1. 144   | - 001.000          | 1717.000   | - 00. 000      | В                                     | 86.8                                    |  |
|      | 36'             |              |             |   |          |                 |  |                  |   |   |  |  |  | 556. 656           | 480.000  | 76.656         |                                       |   |  |
| 36'  | -               | 36           | (B)         | 9,000   | 0        | 350             | 350                                      |                  | 2,000   | 130                                     | 1.083  | 3. 314   | 6. 629   |                    |  |                |                                       |   | Exist Pipe φ450  |
|      | 36              |              |             |   |          |                 |  |                  |   |   |  |  |  | 550. 027           | 545, 000   | 5. 027         |                                       |   |  |
|      | KMC-KF          |              |             |   |          |                 |  | fiki keti        | 4 89  |   |  | 1.0464.55  |  |                    |  | ilidi ye dise. |                                       |   |  |
|      | KMC             |              |             |   |          |                 |  |                  |   |   |  |  |  | 575. 800           | 471.000  | 104. 800       |                                       |   |  |
| KMC  | -               | 5401         | В           | 19, 280   | 0        | 502             | 502                                      | K                | 200   | 120                                     | 1. 127   | 2. 716   | 0. 543   |                    | 100 000  | 05.055         | В                                     | 104.8                                   | Exist Pipe φ500  |
| F107 | 5401            |              |             | 10.000  |          |                 | 500                                      | 12               | 1 000   | 100                                     | 1. 127   | 0.710  | 2, 716   | 575, 257           | 480.000  | 95, 257        |                                       |   | Exist Pipe ø 500   |
| 5401 | -<br>54'        | 54'          | В           | 19, 280   | 0        | 502             | 502                                      | <sub>V</sub>     | 1,000   | 120                                     | 1. 12(   | 2, 716   | 2, 716   | 572, 540           | 485, 000   | 87, 540        | -                                     |   | EXIST Pipe Ø 500   |
| 54'  | <del>-</del> 54 | 57,          | (B)         | 14, 520   | 0        | 502             | 502                                      | - <del>v</del>   | 1,800   | 120                                     | 0. 849   | 1.608  | 2, 894   | 572, 540           | 465.000  | 61.040         | <del> </del>                          | • | Exist Pipe ø 500   |
| - 34 | 57'             | -2!          | (1)         | 14,020  |          | 302             | 302                                      | - 1/             | 1,000   | 120                                     | 0.043  | 1.000  | 2.034  | 569, 647           | 500, 000   | 69, 647        |                                       |   | Exist Tipe & coo   |
| 57'  |                 | 582          | (B)         | 14,520  | 0        | 502             | 502                                      | К                | 1,400   | 120                                     | 0.849  | 1.608  | 2. 251   | 000,01.            | 340.000  | 00.01.         |                                       |   | Exist Pipe $\phi 500$  |
|      | 582             |              | 3.27        |   |          |                 |  |                  |   |   |  |  |  | 567, 396           | 555, 000   | 12, 396        | 1                                     |   |  |
|      |                 | and are      | t also      | ig fut - Niës   |          | r erve          | Sedeserii                                | 12/11/20         | dalotti voto  | 138446                                  | offere en  | 45.  | YO WASHINGTON                                    | nariotar           |  | and Intile     |                                       |   |  |
|      | KMC             |              |             |   |          |                 |  |                  |   |   |  |  |  | 542.100            | 471,000  | 71, 100        |                                       | _                                       |  |
| KMC  |                 | 66           | В           | 2, 830  | 199      | 0               | 199                                      |                  | 900   | 130                                     | 1.053  | 6, 096   | 5. 486   |                    |  |                | В                                     | 71. 1                                   | ·  |
|      | 66              |              |             |   |          |                 | · · · · · · · · · · · · · · · · · · ·    | <del>~~~~~</del> |   |   |  |  |  | 536.614            | 531, 600   | 5.014          | <del>   </del>                        |   |  |
|      | 54'             |              | الأمقامنعكا | 5.  | <u> </u> | <u> </u>        |  | WAR.             | 1 24.11.2   | 0.1000                                  | 04 9 K C S   |  | , 17, 121 <b>6</b> 0-0010-2011                   | 570 540            | 405 000  | 97.640         | 4                                     |   |  |
| 54,  | 04              | 54           | (B)         | 4, 760  | 350      | 0               | 350                                      |                  | 1,050   | 130                                     | 0, 573   | 1,020  | 1.071  | 572, 540           | 485, 000   | 87, 540        | <del>  </del>                         |   | <del></del>  |
| 34   | 54              | - 54         | <u>(D)</u>  | 4, 700  | 300      | V               | 350                                      |                  | 1,000   | 130                                     | 0.013  | 1,040  | 1.071  | 571.469            | 570, 000   | 1. 469         |                                       | -                                       |  |
|      | - 04            | <del>,</del> | *********   | <del> </del>  |          |                 |  | 7 35 5           | 55800 Co  | 15. 54.4                                | in and the state of  | 312 × 2  | E. S.  | J11.409            | nancieni i dilitina                                | 1.403<br>Uz    | हारसङ्ग                               |   | 7.712  |
|      | 54              |              | نصند        |   |          | Sec. 9 Sec. 423 |  |                  | <u> </u>  | a jan Maranga                           | and the second s | **************************************   | 19.9 - Xr at) 1/13/2019                          | 627, 400           | 566.000  | 61. 400        | Steen of Landson                      | <u> </u>                                | .3   |
| 54   |                 | 54a          | B           | 2, 350  | 201      | 0               | 201                                      |                  | 870   | 130                                     | 0, 857   | 4, 117   | 3, 582   |                    |  |                | В                                     | 61.4                                    | DIP  |
|      | 54a             |              |             |   |          |                 |  |                  |   |   |  |  |  | 623, 818           | 576. 330   | 47. 488        |                                       |   |  |
| 54a  |                 | 55           | В           | 2,350   | 199      | 0               | 199                                      |                  | 400   | 130                                     | 0.874  | 4. 322   | 1.729  |                    |  |                |                                       |   | PVC  |
|      | 55              | ≃ Heero      | ssag        | ala (Middl  |          |                 |  |                  |   |   |  |  |  | 622, 089           | 617,000  | 5. 089         |                                       |   |  |
|      | 1               |              | 2           |   |          |                 | and a disc                               | 81.436.2         | 10.000  |   |  |  | ii ya ka ka ka ka ka ka ka ka ka ka ka ka ka     | Si Bi si da sirin. |  | n zlácni       | 9 .32                                 | 71 Z 1                                  |  |
|      | 65              |              |             |   |          |                 |  |                  |   |   | 7  |  |  | 684. 200           | 613. 000   | 71. 200        |                                       |   | DID  |
| 55   |                 | 55a          | В           | 550   | 149      | 0               | 149                                      |                  | 350   | 130                                     | 0. 365   | 1.205  | 0.422  | 600 770            | COC OFF  | 47 400         | В                                     | 71. 2                                   | NTL  |
| 55a  | 55a             | 56           | В           | 550   | 141      | 0               | 141                                      |                  | 470   | 130                                     | 0.408  | 1, 576   | 0, 741   | 683, 778           | 636. 350   | 47, 428        | <del>  </del>                         |   | PVC  |
| acc  | 56              |              |             | ala (Upper  |          |                 | 141                                      |                  | 470   | 190                                     | 0.408  | 1,510  | 0.741  | 683, 037           | 678,000  | 5, 037         | <b></b>                               |   | 1 10   |
|      | KMC-R2          | KEG          | Suga        | ara (obber  | 4        |                 |  | U 6255           | Assistant C   | 1/20 Nic.xe                             | PARAMETER :  |  | ENGRES PROTECTS                                  | 1                  | 110.000  | 0. 001         |                                       |   |  |
|      | 582             | THE O        |             | e 4 : 144 - 1 - 4 - 13  |          |                 |  | Carti            | THE MALE SHAPE  | house March 18 and 18 and               | To a Council To by California Co.  | APTEN MIRRIES .: MY AP.  | ENAMA CELL SATE LAN                              | 624, 290           | 549, 490   | 74, 800        | ** ** * * * * * * * * * * * * * * * * | <u> </u>                                | Parameter of the state of the s |
| 582  | -               | 583          | В           | 8, 230  | 0        | 328             | 328                                      | K                | 500   | 120                                     | 1. 127   | 4, 469   | 2, 235   |                    | · · <del>- · · · · · · · · · · · · · · · · ·</del> |                | В                                     | 74.8                                    | Exist Pipe $\phi 250 \times 2$   |
|      | 583             |              |             |   |          |                 |  |                  |   |   |  |  |  | 622, 055           | 617.000  | 5, 065         |                                       |   |  |
|      |                 |              |             | Mary Trade  |          |                 | 100                                      |                  | S   | , p. 1                                  |  | de Gara  |  |                    | 2.552.241.8  |                |                                       |   |  |

(Phase 2)

| Node                                   | Node<br>> |            | B/G                                      | Flow Rate<br>Q(m3/d)  | D (mm)                | Dia.<br>D(mm)      | Mixed Dia<br>Dm(mm)                    | Exist.  | Length<br>L (m)                                 | С               | Velocity<br>v(m/sec)                    | Hyd. Grd<br>I (‰)            | Loss<br>h(m)  | Dynamic<br>Pressure  | LWL                                    | Dynamic<br>Pressure | Pump<br>Type   |  | R                  | lemark   |
|--|-----------|------------|--|---|-----------------------|--------------------|--|---|---|-----------------|---|------------------------------|---|----------------------|--|---------------------|----------------|--|--------------------|----------|
|  | 582       | -          | -  |   | 2,005                 | 2,010              |  | <b></b>   |   |                 |   |                              |   | Hd (MSL)             | (MSL)                                  | He (m)              | <u> </u>       | H (m)  |                    |          |
| 582                                    | - 362     | 615        | В  | 1, 490  | 201                   | 0                  | 201                                    | ļ <u> </u>  | 860   | 130             | 0, 543                                  | 1, 772                       | 1, 524  | 647.590              | 549. 490                               | 98. 100             | В              | 00.1   |                    |          |
| 302                                    | 615       | 013        | _ <u>D</u>                               | 1, 450  | 201                   |                    | 201                                    |   | 600   | 150             | 0. 543                                  | 1.114                        | 1.524   | 646, 066             | 641, 000                               | 5, 066              | _ <u>B</u>     | 98. 1  |                    |          |
|  | 013       | 13.12.74   | 3000                                     | <del></del>   |                       | 7                  |  | 752   |   |                 |   | €0.12 Z Z Z Z                | r - papagran  | 040, 000             | 041.000                                | a. 000              |                |  |                    |          |
|  | 61S       |            | F4                                       | -   |                       |                    |  | 2 57 5 13   |   |                 |   | <u> Jaggar Bartaska</u>      | <u> </u>  | 684, 200             | 637, 000                               | 47. 200             |                | <u>.                                    </u> |                    |          |
| 615                                    |           | 61         | В  | 390   | 0                     | 199                | 199                                    | К   | 900   | 120             | 0.145                                   | 0. 181                       | 0. 163  | 301.200              | 001.000                                | 11.250              | B              | 47. 2  | Exist Pipe         | 6.225    |
|  | 61        |            | T-                                       |   |                       |                    |  |   |   |                 |   | *****                        |   | 684, 037             | 679, 000                               | 5.037               | -~~·           |  | DATE TIPE          |          |
| 2.72                                   | 7 80 10   |            |  | 11220   |                       | 511 11 11 11 11 11 |  |   | - market  |                 | Salabak                                 |                              | States St.  |                      |  | si ukiyata          | Service across |  |                    |          |
|  | 61        |            |  |   |                       |                    |  |   | A   |                 |   |                              |   | 679.000              | 675,000                                | 4, 000              | 1 —            | -  |                    |          |
| 61                                     |           | 61H        | G  | 380   | 0                     | 141                | 141                                    |   | 1,700   | 130             | 0. 282                                  | 0. 795                       | 1, 352  |                      |  |                     |                | ,,,,   |                    |          |
|  | 61H       |            |  |   |                       |                    |  |   |   |                 |   |                              |   | 677. 648             | 660.000                                | 17. 648             |                |  |                    |          |
|  |           | 5. 34 . 20 |  |   | is lar                | 100                | A Canada Ser Local Series              | 4 7 0 C 1 0 C 1 2 C 1 2 C 1 2 C 1 C 1 C 1 C 1 C 1 C | 4.7.3   | Section .       | an Section ;                            |                              | anir mor. I   | o kalanja (kada)     | tori, ke kara                          | (A. 1947, 1944)     | 3.77.5         |  | union and a second |          |
|  | 61        |            | ļ  |   |                       |                    |  |   |   |                 |   |                              | _   | 775. 100             | 675.000                                | 100.100             |                |  |                    |          |
| 61                                     | -         | HT         | В  | 130   | 0                     | 141                | 141                                    |   | 710   | 130             | 0.096                                   | 0. 109                       | 0,078   |                      |  |                     | В              | 100.1  | <u>-</u>           |          |
|  | HT        |            |  |   | - rimm-min-m rightiya |                    |  |   |   | code war in the |   |                              | Sandaharan Sandaharan Sandaharan Sandaharan Sandaharan Sandaharan Sandaharan Sandaharan Sandaharan Sandaharan S   | 775, 022             | 770.000                                | 5. 022              |                |  |                    |          |
|  | 5 (5) (6) | 1          |  | 32 <u>2</u> - 11 15 17 17 17 17 17 17 17 17 17 17 17 17 17  | 1000                  |                    | <u> </u>                               | Chill d   |   | iåi€ide:        | Sulfix Earl (Sec.)                      |                              |   | 45 9kg 20 35         |  | callaine me         | 100            | 58 <u> </u>                                  | <u> </u>           | <u> </u> |
| F00                                    | 583       | 2001       | <u> </u>                                 | 4 050   |                       | 200                |  |   |   |                 | 0.004                                   |                              | 2 255   | 617, 000             | 613.000                                | 4,000               | 1              |  |                    |          |
| 583                                    | 6001      | 6001       | G  | 4,070   | 0                     | 299                | 299                                    |   | 541   | 130             | 0.671                                   | 1.644                        | 0.889   | C1C 111              | FC0 000                                | 50 111              |                |  |                    |          |
| 6001                                   | 6001      | 6002       | (G)                                      | 4, 070  | - 0                   | 299                | 299                                    |   | 1 004   | 100             | 0. 671                                  | 1 644                        | 0.144   | 616, 111             | 560,000                                | 56. 111             |                | <del></del>                                  |                    |          |
| 0001                                   | 6002      | 0002       | (6)                                      | 4,070   |                       | 299                | 299                                    |   | 1,304   | 130             | 0.671                                   | 1.644                        | 2.144   | 613, 967             | 571, 450                               | 42.517              |                |  |                    |          |
| 6002                                   | -         | 60         | (G)                                      | 4,070   | 299                   | 0                  | 299                                    |   | 1,810   | 130             | 0, 671                                  | 1, 644                       | 2, 976  | 013, 997             | 571,400                                | 42.517              |                |  |                    |          |
| 0002                                   | 60        | -00        | (6)                                      | 4,070   | 233                   | <u>V</u>           | 255                                    |   | 1,010   | 100             | 0.071                                   | 1.044                        | 2.910   | 610. 991             | 586, 000                               | 24, 991             |                | · · · ·                                      |                    |          |
|  |           | 170 YE     | 2000                                     | ## 35-7E-450  | g.::-449¥             |                    | C. Serieski                            | 40.42   |   | 63091745c       | ෙස් මේදැන්න්                            |                              | PARTICION OF THE  | bratis asserted      | A CONTROL OF THE PARTY NAMED IN COLUMN | 5. 331              | 5747.19        | SF (1. ****                                  | 3                  | 7        |
|  | 60        | <u></u>    | SE WILLIAM SERVICE                       | Error of the San State | Maria K. Calentin     | *CressingsC 6-3    | \$1500 A 199 \$100 92 KI 30            | nitroj tragla                                       | ar all color agreement agreement                | <u> </u>        | A LUNGS - TO LEVEN NAME OF              | K. Salara salah kerasa salah | Carlo co. Obstradinació   | 621, 200             | 582, 500                               | 38, 700             | 7 . Y C. J. W  | <u>** 1.334**</u>                            | . Xansa            |          |
| 60                                     |           | 60E-1      | В  | 570   | 199                   | 0                  | 199                                    |   | 260   | 130             | 0, 212                                  | 0.314                        | 0, 082  | 0211200              | 002, 000                               | 00. 100             | В              | 38. 7  | PVC                |          |
|  | 60E-1     |            |  |   |                       |                    |  |   |   |                 |   | V 1.                         |   | 621. 118             | 555, 170                               | 65, 948             |                |  |                    |          |
| 60E-1                                  |           | 60E-2      | $\vdash$                                 | 570   | 201                   | 0                  | 201                                    |   | 3, 100  | 130             | 0,208                                   | 0.300                        | 0.929   |                      |  | <u> </u>            |                | <del></del>                                  | DIP                |          |
|  | 60E-2     |            |  |   |                       |                    |  |   |   | <u> </u>        |   |                              |   | 620. 190             | 555, 620                               | 64, 570             | 1              |  |                    |          |
| 60E-2                                  |           | 60E        |  | 570   | 199                   | 0                  | 199                                    |   | 520   | 130             | 0, 212                                  | 0, 314                       | 0.164   |                      |  |                     |                |  | PVC                |          |
|  | 60E       | (= E1h     | ena)                                     |   |                       |                    |  |   |   |                 |   |                              |   | 620, 026             | 615.000                                | 5. 026              |                |  | · ·                |          |
|  | A Mission | مند مورد   | 1 1 1 1                                  | in and a second of the second | O HAMAN TO THE        |                    |  |   | Talliano.<br>Campharail                         | igil All A      | 4000                                    |                              |   | Land and Supplied to | ALCONOMICS OF THE PROPERTY OF          |                     | 3-16-1         |  | S. 1989            |          |
|  | 60        |            |  |   |                       |                    |  |   |   |                 |   |                              |   | 723. 200             | 582, 500                               | 140, 700            |                |  |                    |          |
| 60                                     | -         | 6005       | В  | 810   | 149                   | 0                  | 149                                    |   | 1, 480  | 130             | 0, 538                                  | 2. 466                       | 3.649   |                      |  |                     | _B             | 140. 7                                       | DIP                | 5 150    |
|  | 6005      |            |  |   |                       |                    |  |   |   |                 |   |                              |   | 719, 551             | 648, 760                               | 70, 791             |                |  |                    |          |
| 6005                                   | - !       | 60+        | (B)                                      | 810   | 141                   | 0                  | 141                                    |   | 480   | 130             | 0.600                                   | 3. 226                       | 1.548   |                      |  |                     | $\sqcup$       |  | PVC g              | 160      |
|  | 60+       |            | E 1, 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 |   | gr                    |                    |  |   |   | 1 2 2 2 2 2     | NOST DE PRACEITO DE                     | S (F we) (AND                | X (00.00 - 0.00 | 718,002              | 713.000                                | 5,002               | ļ              |  |                    |          |
|  |           |            | 11.21                                    |   | S 1934                | V - 1 17 (5) (5)   | tida (sel solution)<br>Maria Republica | 2.50.000  | gariotic () and<br>Paradelic () and             | 3.64.35.        |   |                              | Service A   | 700 000              | 700 000                                | 0.000               |                | ic is  |                    |          |
| 60+                                    | 60+<br>-  | 6011       |  |   | 1.47                  |                    | 141                                    |   | 100   | 100             | 0.050                                   | 0.045                        | 0.004   | 709, 000             | 709, 000                               | 0.000               |                |  |                    |          |
| 0V+                                    |           | 60+1       | G  | 80  | 141                   | 0                  | 141                                    |   | 100   | 130             | 0.059                                   | 0.045                        | 0.004   | 708. 996             | 664. 330                               | AA 000              | <b> </b> -     |  |                    |          |
| 60+1                                   | 60+1      | 60,        |  | 80  | 79                    |                    | 79                                     |   | 190   | 130             | 0. 189                                  | 0, 748                       | 0. 142  | (08.996              | 004. 330                               | 44.666              | $\vdash$       |  |                    | <u> </u> |
| 00+1                                   | 60'       |            | Lailei                                   | lla (Low))  | (9                    | V.                 | 19                                     |   | 190   | 130             | 0. 189                                  | 0, (48                       | 0, 142  | 708, 853             | 674, 360                               | 34, 493             |                |  | <del>-</del>       |          |
| ************************************** | UV        | \-\ Mul    | Thruit                                   | ila (LOW))  | -382×.>+.2 . 100      | กระบาร             |  | South of S  |   | 325 Falls.      | territoria, complete                    | Section Control              | irisiwa waka  |                      | 014, 300                               | 34, 493             |                | 1      |                    |          |
| 12.17.11.                              | 60        |            | 2000                                     | NR. 2. 0 9-4 - 2-5  | <u>- 1,51,11,1134</u> | 2151.751-160       | philosyddyddi                          | egweyalî ê.   | C.41. C. 12 12 12 12 12 12 12 12 12 12 12 12 12 | 125 . Sec. 35   | 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | CONTRACTOR STATE             | ant 2018/99.090100  | 739,000              | 672, 500                               | 66, 500             | 72.3           | <u> </u>                                     | <u> </u>           | <u> </u> |
| 60'                                    |           | 60"        | В  | 80  | 0                     | 66                 | 66                                     | К   | 1,400   | 120             | 0. 271                                  | 2.082                        | 2, 915  | 199,000              | 012,000                                | 00.000              | В              | 66.5   | Exist Pipe of      | 5.75     |
| -00                                    | 60"       |            | <u> </u>                                 | - 30  | <del></del>           |                    |  | _ n   | 1, 100  | 120             | V. 211                                  | 4.002                        | 2.010   | 736, 085             | 731.000                                | 5. 085              | - "-           |  | OVIDE THE          | ,,,,     |
| LI                                     | 60"       | L          | L  | L   |                       |                    |  |   |   |                 |   |                              | L   | 736.085              | 731, 000                               | 5.085               |                |  |                    |          |

**~** 

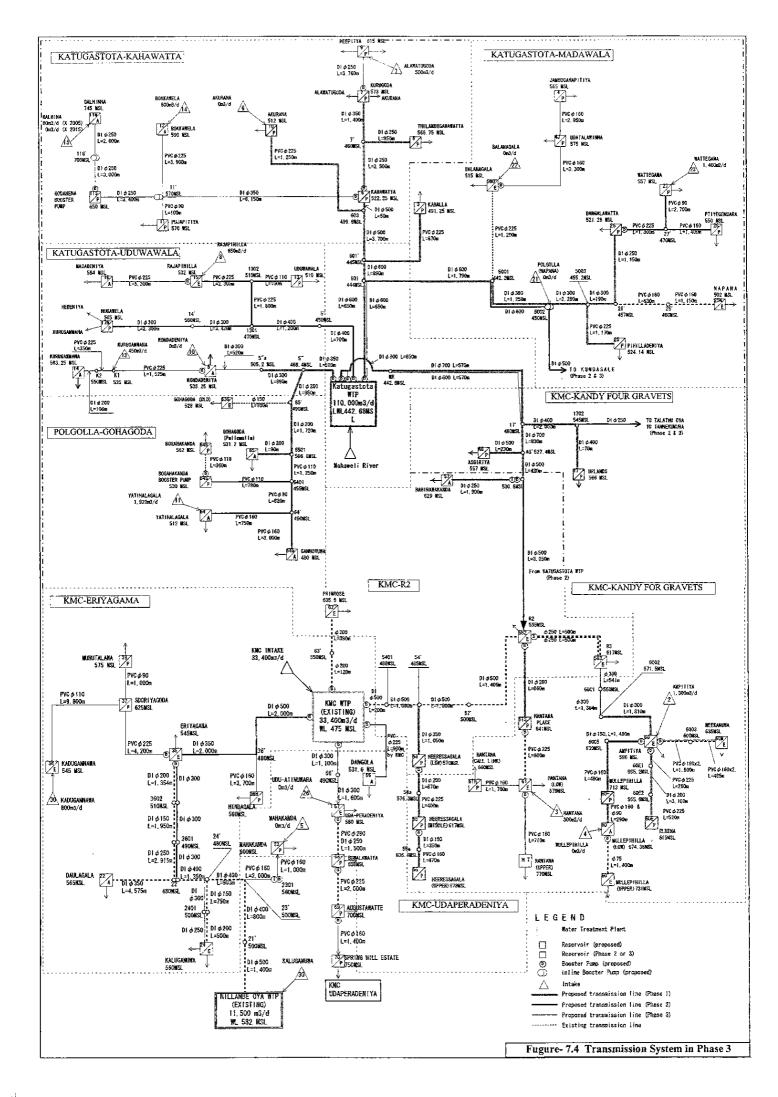
|          | Node              | <u> </u>     | B/G            | Flow Rate |             | Dia.                                  | Mixed Dia        | Exist.         | Length | С                   | Velocity  | Hyd. Grd        | Loss                                   | Dynamic            | LWL  | Dynamic                               | Pump   | Required                              | İ                   | Remark                                |
|----------|-------------------|--------------|----------------|-----------|-------------|---------------------------------------|------------------|----------------|--------|---------------------|---|-----------------|--|--------------------|--|---------------------------------------|--|---------------------------------------|---------------------|---------------------------------------|
| Node     | _ <del>&gt;</del> | Node         |                | Q(m3/d)   |             |                                       | Dm (mm)          |                | L (m)  |                     | v(m/sec)  | I (‰)           | h(m)                                   | Pressure           | HWL  | Pressure                              | Туре   | Pump Head                             |                     |                                       |
|          |                   | ļ            |                |           |             | 2,010                                 |                  |                |        |                     |   |                 |  | Hd(MSL)            | (MSL)  | He(m)                                 |  | H (m)                                 |                     |                                       |
|          | . 7.37.           | SHEET HE     | den.           |           |             | J 32 345                              | of the the sine  | my rank the fu |        | 1.323%              |   | (MM) 1 (M) (M)  |  | ter Shingur (1961) |  | ***********                           | 1.4  |                                       | Mary John Committee | 1111 304                              |
|          | 60                |              |                |           |             |                                       |                  |                |        |                     | 1   |                 |  | 648. 800           | 582. 500   | 66, 300                               |  |                                       |                     |                                       |
| 60       | -                 | 6003         | _B             | 1,770     | 0           | 141                                   | 184              | L K            | 1,500  | 120                 | 0.774   | 4. 401          | 6. 602                                 |                    |  |                                       | В  | 66.3                                  | Exist Pipe          | φ 160                                 |
| L        | 6003              |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 642. 198           | 600.000  | 42. 198                               |  |                                       |                     |                                       |
| 6003     |                   | 60M          | (B)            | 1,770     | 0           | 141                                   | 184              | K              | 485    | 120                 | 0.774   | 4. 401          | 2. 135                                 |                    |  |                                       |  |                                       | Exist Pipe          | φ 160                                 |
|          | 60M               |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 640.063            | 635, 000   | 5.063                                 |  |                                       | •                   |                                       |
|          | Katuga            | stota-l      | ladaya         | la        |             |                                       | la i i i se e ci | 14.14          |        | (Forestia           | £leveni.  |                 | Editor de la Colo                      | President?         | 100000000000000000000000000000000000000  |                                       |  |                                       |                     | =                                     |
|          | PG                |              |                |           |             |                                       |                  | 1              |        |                     |   |                 |  | 537, 180           | 442, 680   | 94, 500                               |  | Na                                    |                     |                                       |
| PG       | -                 | 601          | В              | 29, 160   | 603         | 0                                     | 603              |                | 650    | 130                 | 1. 182  | 2, 062          | 1.341                                  |                    |  |                                       | В  | 94. 5                                 |                     |                                       |
|          | 601               |              |                |           |             |                                       |                  |                | •      |                     |   |                 |  | 535, 839           | 444.020  | 91, 819                               |  |                                       | 1                   |                                       |
| 601      |                   | 5001         | (B)            | 17, 900   | 603         | 0                                     | 603              | i              | 1, 790 | 130                 | 0.725   | 0, 836          | 1. 497                                 |                    |  | · · · · · · · · · · · · · · · · · · · | <del>  </del>                                    | · · · · · · · · · · · · · · · · · · · | -                   |                                       |
|          | 5001              |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 534, 343           | 442, 250   | 92.093                                | <del>                                     </del> |                                       |                     |                                       |
| 5001     |                   | 5002         | (B)            | 16, 100   | 299         | 603                                   | 638              |                | 1, 250 | 130                 | 0, 584  | 0, 524          | 0.655                                  | 001.010            | 115. 200   | 32.000                                | -  |                                       |                     |                                       |
| 1111     | 5002              | -            |                |           |             |                                       | 000              |                | 1,200  |                     |   | 0.021           | 0.000                                  | 533, 688           | 450,000  | 83, 688                               | <del>                                     </del> |                                       |                     |                                       |
| 5002     | -                 | 5003         | (B)            | 4, 400    | 299         | 0                                     | 299              |                | 2, 280 | 130                 | 0, 725  | 1, 899          | 4, 330                                 | .000.000           | 400,000  | 00.000                                | <del>                                     </del> |                                       |                     |                                       |
| 3000     | 5003              | 1000         | 12/            |           |             | <u>×</u>                              |                  |                | 2, 200 | 100                 | 0.120   | 1,000           | 4, 000                                 | 529, 358           | 455, 220   | 74, 138                               | <del>                                     </del> | · · · · · · · · · · · · · · · · · · · | <del> </del>        | <del></del>                           |
| 5003     | -                 | 26'          | (B)            | 3, 200    | 299         | 0                                     | 299              | <del> </del>   | 190    | 130                 | 0. 527  | 1.054           | 0, 200                                 | 043. 300           | 700. 220   | 19, 196                               | <del>  </del>                                    |                                       | · · · · · ·         |                                       |
| 0000     | 26'               | -20          | (D)            | 9,200     | 200         |                                       | 233              | <del> </del>   | 150    | 130                 | 0.521   | 1.004           | 0. 200                                 | 529. 158           | 456, 990   | 72. 168                               | <del>   </del>                                   | ····                                  |                     | · · · · · · · · · · · · · · · · · · · |
| 26'      | 40                | 26           |                | 3, 200    | 252         | 0                                     | 252              | <u> </u>       | 1, 150 | 130                 | 0. 743  | 2, 423          | 2, 787                                 | 029. 100           | 400.990  | 12.100                                |  |                                       |                     |                                       |
| 20       | 26                | = Bang       | a lama         |           | 494         | · · · · · · · · · · · · · · · · · · · |                  |                | 1, 100 | 130                 | 0.143   | 2,423           | 4. (01                                 | 526, 372           | 521, 280   | 5, 092                                | <del>  </del>                                    |                                       |                     |                                       |
| -        | -40               | - Dank       | alawa          | ıta       |             | Property III.                         | 6.3.6.896        | S 25 - 77      |        | Constant in the     | re return to the second   |                 | 6.25.25.21                             |                    |  |                                       |  |                                       | 1 11 11 11 12       | <del> </del>                          |
|          | 601               | ×            | 5 40.0         |           |             | 1774                                  | 15. a. 12 "19"5  | 5. TOR. 2      |        |                     |   |                 | L1111111111111111111111111111111111111 |                    | ******   |                                       |  | <u> Yan di Ladaha</u>                 | 2 11:17 3           | 1,500 10 10 10                        |
| 601      | 001               | 201,         | (B)            | 11 000    | 600         |                                       | 603              | <del> </del>   | 200    | 100                 | 0.450   | 0.055           |  | <u>53</u> 5, 839   | 444, 020   | 91.819                                |  |                                       |                     |                                       |
| 601      | CO1'              | 601'         | (B)            | 11, 260   | 603         | 0                                     | 603              |                | 890    | 130                 | 0.456   | 0. 355          | 0.316                                  | F05 50 (           |  |                                       | ļ  |                                       |                     |                                       |
| (01)     | 601'              |              | 751            |           | 100         | <u> </u>                              | 100              | <u> </u>       | 250    |                     | 0.015   |                 |  | 535. 524           | 443.000  | 92. 524                               | <del>                                     </del> |                                       |                     |                                       |
| 601'     | <del></del>       | 3            | (B)            | 2, 190    | 199         | 0                                     | 199              |                | 870    | 130                 | 0.815   | 3. 794          | 3, 301                                 |                    |  |                                       |  | <del></del>                           | r                   |                                       |
| <u> </u> | 3                 | (= Kah       | alla)          |           | · · · · · · |                                       |                  |                |        | - <del> </del>      | 5 - 5 x - 1 x - 2 |                 |  | 532. 223           | 491. 250   | 40.973                                | <b></b> ↓  |                                       |                     |                                       |
|          |                   | <u> </u>     |                |           |             | <u> </u>                              | <u> </u>         | فستعد          |        |                     | \$ 4.50000 p.   |                 |  | and a second       | التبنين أنتيا  |                                       |  |                                       |                     |                                       |
|          | 5001              |              | -,             |           |             |                                       | ļ                |                |        |                     |   |                 |  | 534. 343           | 440,000  | 94. 343                               | <b> </b>   |                                       |                     |                                       |
| 5001     |                   | 500          | (B)            | 1,800     | 199         | 0                                     | 199              | K              | 1, 200 | 120                 | 0.670   | 3, 061          | 3. 673                                 |                    |  |                                       |  |                                       |                     |                                       |
| L        | 500               |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 530.670            | 514. 350   | 16, 320                               |  |                                       |                     |                                       |
| أنظشفتنا | 4 3 4 3 5         | مرتقين جيدنگ |                |           | 1. T. 1.    |                                       |                  | 1225 C         |        |                     |   | ે. 74છ ઉદ્દેશકા | (4) (500 E                             |                    | 25 1000 0 1000   | Signal Control                        |  | rija para                             |                     |                                       |
|          | 26                |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 575, 780           | 517, 280   | 58, 500                               |  |                                       |                     |                                       |
| 26       |                   | 27'          | В              | 1,600     | 0           | 199                                   | 199              |                | 1,300  | 130                 | 0. 595  | 2. 123          | 2. 759                                 |                    |  |                                       | В  | 58, 5                                 |                     |                                       |
|          | 27'               |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 573, 021           | 456, 990   | 116. 031                              |  |                                       |                     |                                       |
| 27'      | _                 | 27           | (B)            | 200       | 0           | 79                                    | 79               |                | 2,700  | 130                 | 0.472   | 4.075           | 11.002                                 |                    |  |                                       |  |                                       |                     |                                       |
|          | 27                |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 562, 018           | 557.000  | 5, 018                                |  |                                       |                     |                                       |
|          |                   | 2 23 25 3    |                |           | , 2 KNO     | S                                     |                  |                | 4      | 10 N H 116 M        | . Loring of the Control   |                 | Land September                         | E II. SE III.      | Maria de la compansión de la compansión de la compansión de la compansión de la compansión de la compansión de | is in the second                      |  | vi vitti i i                          | Legitor Charles Con |                                       |
|          | 27'               |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 573. 021           | 470.000  | 103. 021                              | T  |                                       |                     |                                       |
| 27'      |                   | 28           | (B)            | 1,400     | 0           | 141                                   | 141              |                | 1,400  | 130                 | 1, 038  | 8, 878          | 12. 429                                |                    |  |                                       |  |                                       |                     |                                       |
|          | 28                |              |                |           |             |                                       |                  |                |        |                     |   |                 |  | 560, 592           | 550,000  | 10.592                                |  |                                       |                     |                                       |
|          |                   |              |                |           |             |                                       |                  |                |        | A                   | Carlotte Carlotte Carlotte  | \$              | 2011 T. 1                              |                    | -  |                                       | 1  | <del>7 1 7 7 7 7</del>                | 1 7                 |                                       |
|          | 5003              |              |                |           |             |                                       |                  |                |        | - 1 1 2 C F 1 2 P 1 | 4.2135.6  | *               |  | 529. 358           | 455, 220   | 74. 138                               | 1  |                                       |                     |                                       |
| 5003     | -                 | 25-1         | (B)            | 1,200     | 201         | 0                                     | 201              |                | 410    | 130                 | 0, 438  | 1, 187          | 0.487                                  | 320,000            |  | , ,, ,, ,, ,                          | <del>   </del>                                   |                                       |                     |                                       |
| 13333    | 25-1              |              | -\ <u>-\-\</u> |           |             | · · · · · · · · · · · · · · · · · · · | . 271            |                |        |                     | 31.100  | 1.491           |  | 528, 871           | 455, 200   | 73, 671                               | <del>   </del>                                   |                                       |                     |                                       |
| 25-1     |                   | 25           |                | 1,200     | 199         | 0                                     | 199              |                | 220    | 130                 | 0. 447  | 1. 247          | 0. 274                                 | 3001011            | 100, 200   | 13.011                                | <del>  </del>                                    |                                       | <del> </del>        |                                       |
| 1 20 1   | 25                | = Pihi       | Hede           |           | 100         |                                       | 133              |                | 44.    | 100                 | 0. 31   |                 | V. 917                                 | 528, 597           | 524, 140   | 4, 457                                | <del> </del>                                     |                                       |                     |                                       |
| I        |                   | 1 1 111 1    | LAGUE          | 11.4.19   |             |                                       | J                | l- <b>-</b>    |        |                     | L   | i               | I                                      | 260.001            | J. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.  | 4. 301                                | I  |                                       | ·                   |                                       |

(Phase 2)

| Ratiographic   2,005   2,010   | Node<br>e> No |                    | B/G                                    | Flow Rate<br>Q(m3/d) | Dia.<br>D (mm) | Dia.<br>D (mm)                  | Mixed Dia<br>Dm(nm)            | Exist.   | Length<br>L (m)    | С  | Velocity<br>v(m/sec)  | Hyd. Grd<br>I (‰)                                       | Loss<br>h(m)                                   | Dynamic<br>Pressure                      | LWL<br>HWL   | Dynamic<br>Pressure                     | Pump<br>Type | Required<br>Pump Head                   | Remark  |
|--|---------------|--------------------|--|----------------------|----------------|---------------------------------|--------------------------------|--|--------------------|--|---|---|--|--|--|---|--------------|---|---|
| 601  |               | 0100 1775E         |  |                      |                |                                 |                                |  |                    |  |   |   |  |  | (MSL)  |   |              | H (m)                                   |   |
| 601 - 603 (b) 9,070 502 0 502 3,700 150 0,581 2,145 533,692 499,000 34,092 603 - 6 (b) 6,700 502 0 502 50 130 0,592 0,331 0,017 533,692 499,000 34,092 603 - 10 0 0 2,370 199 0 199 1,280 130 0,882 4,391 6,488 533,692 999,000 34,092 603 - 10 0 0 2,370 199 0 199 1,280 130 0,882 4,391 6,488 533,692 999,000 34,092 62 63 6 - 77 B 4,330 350 0 350 2,500 130 0,521 0,885 2,140 880,680 158,260 62,000 16,200 62 77 7 7 7 8 4,330 350 0 350 0 350 1,400 130 0,521 0,885 2,140 880,680 158,260 62,000 B 6 7 7 7 7 8 8 (B) 1,890 252 0 252 950 130 0,499 0,915 0,869 78,510 455,030 123,480 7 7 7 8 8 (B) 1,890 252 0 252 950 130 0,439 0,915 0,869 78,510 455,030 123,480 7 7 7 8 8 (B) 1,890 252 0 252 950 130 0,553 0,817 0,572 880,680 442,800 138,000 B 133 1301 - 14 14 (B) 4,000 0 259 259 259 3,420 130 0,553 0,817 0,572 880,680 442,800 138,000 B 130 130 14 7 17 17 18 (B) 4,000 0 259 259 259 3,420 130 0,659 1,592 8,662 570,021 565,000 130 188 11 100 1 1 1 1 1 1 1 1 1 1 1 1 1 1   |               | tota-k             | (ahaw                                  | átta –               |                |                                 | 116.9143                       | ERTERNATA  | 120 120 10.10      |  |   |   |  |  |  | 4 40 40                                 |              | en fan                                  |   |
| 603   -6 (B)   6,700   502   0   502   50   130   0.592   0.331   0.017   533,692   499,600   34,092   0   1   1   1   1   1   1   1   1   1   |               | 809                | (b)                                    | 0.070                | 502            | 0                               | Eng                            |  | 2 700              | 120  | 0 520   | A F01   | 0.149  | 535, 839                                 | 443,000  | 92. 839                                 |              |   |   |
| 603  |               | 000                | (D)                                    | 3,010                | 302            |                                 | 302                            | 1  | 3, 700             | 130  | 0, 530  | 0, 561  | 2, 140   | 533 692                                  | 499 600  | 34 092                                  |              | <del>-</del> -                          |   |
| 6  |               | 6                  | (B)                                    | 6, 700               | 502            | 0                               | 502                            | † · · · · · · ·                                  | 50                 | 130  | 0.392   | 0.331   | 0.017  | 000.002                                  | 405.000  | 54. 05 <u>L</u>                         |              |   |   |
| 603  | 6             |                    |  |                      |                |                                 |                                |  |                    |  |   |   |  | 533, 675                                 | 522. 250   | 11. 425                                 |              |   |   |
| 10   G   2,370   199   O   199   1,250   130   0.882   4.391   5.488   528.203   512.000   16.203     6  |               |                    | - 637                                  | a entr               |                |                                 |                                |  | 474.05             |  |   | 1.00  |  |  |  |   |              |   |   |
| 10   |               | 10                 |  | 2 272                |                |                                 |                                | ļ  | 1                  | 100  |   |   |  | 533. 692                                 | 499.600  | 34, 092                                 |              |   |   |
| 6  |               | 10                 | - 6                                    | 2,370                | 199            | 0                               | 199                            | -  | 1,250              | _130   | 0, 882  | 4. 391  | 5.488  | E00 0A9                                  | E10 000  | 16 202                                  |              | <del></del>                             |   |
| 6  | -             | <del>-</del> , ::: |  | ar en                | . TIE Her H    | F 4 (#1) 1                      | 1000                           | * Y' - U - T                                     |                    | 200  |   | 30  |  |  |  | 10, 203                                 | Y            |   | \$7. 37. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. |
| 6 - 7' B 4,330 350 0 350 2,500 130 0.521 0.856 2.140   | 6             |                    |  | <u> </u>             |                |                                 | e                              | .45  |                    | A. A. K. K. K. K. K. K. K. K. K. K. K. K. K. | Name of the State | Carrier Section 11 - 20 - 20 - 20 - 20 - 20 - 20 - 20 - |  |  |  | 62, 400                                 | -            |   | · · · · · · · · · · · · · · · · · · ·           |
| 7' 7   |               | 7'                 | В                                      | 4, 330               | 350            | . 0                             | 350                            |  | 2,500              | 130  | 0. 521  | 0, 856  | 2. 140   |  |  |   | В            | 62. 4                                   |   |
| 7  |               |                    |  |                      |                |                                 |                                |  |                    |  |   |   |  | 578, 510                                 | 455.030  | 123, 480                                |              |   |   |
| 7 - 8 (B) 1.890 252 0 252 950 130 0.439 0.915 0.869 578.510 455.030 123.480 7  |               | 7                  | (B)                                    | 2, 450               | 350            | 0                               | 350                            |  | 1,400              | 130  | 0, 295  | 0. 299  | 0, 418   | F. 0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 | F#A Ac-  |   | ļ            | ·                                       | ļ   |
| 7' - 8 (B) 1.890 252 0 252 950 130 0.439 0.915 0.869   |               |                    | (************************************* |                      | No. 1 . 1 . 1  | . 3 . 3 . 5 . 5 . 5 . 5 . 5 . 5 | ا<br>المام ( الأراب المعربية ) | Serioriae Se                                     | 8390323            | ja jūjošeniš                                 | Rite in Manageria   |   |  | 578.092                                  |  | *************************************** | -            | .,                                      | <del></del>                                     |
| T  | 7'            | ئىقىنى رەزانى      | كنستنا                                 | <u> </u>             | <u> </u>       | 1 1.0.00                        |                                | JD - (1996)                                      | unisasii ilulii    | S. LMCHA                                     | (14 (6) W/8 61°C  | Carl Court of A Sector                                  | MARCH 2011 (CO - 2011                          | 578 510                                  |  |   | ř            |   | Part at Great years                             |
| S  | <del>-</del>  | 8                  | (B)                                    | 1.890                | 252            | 0                               | 252                            | +  | 950                | 130  | 0. 439  | 0.915   | 0.869  | 010, 010                                 | 300,000  | 120, 400                                |              |   |   |
| PG   | 8             |                    |  |                      |                |                                 |                                |  |                    |  |   |   |  | 577. 641                                 | 566. 750   | 10.891                                  |              |   |   |
| PC   |               | tota-U             | doway                                  | vala                 | 7.553.         |                                 |                                |  |                    | 900000                                       | Ku juktu  |   |  |  |  |   | teri i       |   |   |
| 5'         -         1301         (B)         6,000         0         400         400         1,200         130         0,553         0,817         0,980         580,108         450,000         130,108         1301         -         14'         (B)         4,000         0         299         299         3,420         130         0,659         1,592         5,445         573,683         560,000         13,683         14'         -         17N         670,021         565,000         5,001         1,583         -         1,592         3,662         573,683         560,000         13,683         -         17N         570,021         565,000         5,021         565,000         5,021         570,021         565,000         5,021         567,001         565,000         5,021         567,001         565,000         5,021         567,001         567,001         567,001         567,001         567,001         560,000         500,000         500,000         8         10         547,180         442,680         194,500         8         10         547,180         442,680         194,500         8         10         547,180         442,680         194,500         8         10         547,180         442,680         194,500<  |               |                    |  |                      |                |                                 |                                |  |                    |  |   |   | L  | 580, 680                                 | 442,680  | 138.000                                 |              |   |   |
| 5' - 1301 (B) 6,000 0 400 400 1,200 130 0.553 0.817 0.980 579.128 470.000 109.128 1301 - 14' (B) 4,000 0 299 299 3,420 130 0.659 1.592 5.445   |               | <u> </u>           | R                                      | 6, 000               | 0              | 400                             | 400                            | <del> </del>                                     | 700                | 130  | 0.553   | 0, 817  | 0.572  | <b>500</b> 100                           | 450.000  |   | В            | 138.0                                   |   |
| 1301   |               | 1301               | (B)                                    | 6 000                |                | 400                             | 400                            | +  | 1 200              | 120  | 0.563   | 0.917   | 0.000  | 580, 108                                 | 450.000  | 130, 108                                |              | - · · · · · · · · · · · · · · · · · · · |   |
| 1301   |               | 1001               | \D/.                                   | 0,000                | <del>-</del>   | 400                             | 400                            | <del> </del>                                     | 1,200              | 100  | 0, 555  | 0.017   | 0.500  | 579 128                                  | 470 000  | 109 128                                 |              |   |   |
| 14'  |               | 14'                | (B)                                    | 4,000                | 0              | 299                             | 299                            | 1  | 3, 420             | 130  | 0.659   | 1.592   | 5, 445   | 010,120                                  | 110.000  | 100.120                                 |              |   |   |
| 17N  |               |                    |  |                      |                |                                 |                                |  |                    |  |   |   |  | 573, 683                                 | 560, 000   | 13. 683                                 |              |   |   |
| Katugastota   Kondadentya   Kuringaniana   |               | 17N                | (B)                                    | 4,000                | 0              | 299                             | 299                            |  | 2,300              | 130  | 0.659   | 1.592   | 3. 662   |  |  |   |              |   |   |
| PG - 5" B 4,990 350 0 350 520 130 0.600 1.113 0.579 B 10.500 B 10  5" - 5"a (B) 2,850 299 0 299 890 130 0.470 0.850 0.757  5 a - 5 (B) 2,850 184 0 184 K 520 120 1.247 10.625 5.526  5 = Kondadeniya 59.350 531.250 68.100  5 - K1 B 1,100 0 141 141 K 1,525 120 0.815 6.589 10.049  K1 - K2 (B) 1,550 0 199 199 K 350 120 0.577 2.321 0.812  K2 - 14 (B) 1,550 0 201 201 K 106 120 0.565 2.211 0.234  Katugastota-KFG, R2 576.680 442.680 134.000   |               |                    | 1 <u>9</u> 77                          | Kakhakas er s        |                |                                 |                                | L ,  | V 1 25 - 1 5 1     |  | do processor and control  | akiri di ari relah satis                                | <del></del>                                    | 570, 021                                 | 565, 000   |   |              |   | · · · · · · · · · · · · · · · · · · ·           |
| PG         -         5"         B         4,990         350         0         350         520         130         0.600         1.113         0.579         546.601         468.410         78.191           5"         -         5"a         (B)         2,850         299         0         299         890         130         0.470         0.850         0.757  |               | cota-n             | опда                                   | ieniya, kuri         | gamana         |                                 |                                |  | 1,22,49,75         | (YESKE) #                                    |   |   |  | 547 100                                  | 440 600  |   |              |   | <u> </u>  |
| 5" - 5"a (B) 2,850 299 0 299 890 130 0.470 0.850 0.757  5 a  |               | 5"                 | B                                      | 4.990                | 350            | 0                               | 350                            | †  | 520                | 130  | 0.600   | 1 113   | 0.579  | 347, 180                                 | 442.000  | 104. 500                                | R            | 104.5                                   | ·   |
| 5"         -         5"a         (B)         2,850         299         0         299         890         130         0,470         0,850         0,757         545,844         505,180         40,664         55"a         5         545,844         505,180         40,664         564,844         535,250         10,594         564,844         535,250         10,594         568,100         564,844         535,250         10,594         564,844         535,250         10,594         564,844         535,250         10,594         564,844         535,250         10,594         568,100         569,350         531,250         68,100         68,100         699,350         531,250         68,100         86,1   | 5"            |                    |  | 2,000                |                |                                 |                                |  | - 020              | -100   |   |   |  | 546, 601                                 | 468, 410   | 78, 191                                 |              | 101.0                                   |   |
| 5"a - 5 (B) 2,850 184 0 4184 K 520 120 1.247 10.625 5.526 545.844 535.250 10.594 545.845 5 | - 5           | 5″a                | (B)                                    | 2,850                | 299            | 0                               | 299                            |  | 890                | 130  | 0.470   | 0.850   | 0.757  |  |  |   |              |   |   |
| 5 = Kondadeniya  |               |                    |  |                      |                |                                 |                                |  |                    |  |   |   |  | 545, 844                                 | 505, 180   | 40.664                                  |              |   |   |
| 5  |               |                    |  |                      | 184            | 0                               | .184                           | <u>K</u>   | 520                | 120  | 1. 247  | 10.625  | 5. 526   |  |  |   |              |   | Exist Pipe ∲160×2                               |
| 5         -         K1         B         1,100         0         141         141         K         1,525         120         0.815         6.589         10.049         -         8         6         100         B         6         6         10.049         -         8         6         6         589, 301         535, 000         54, 301         58, 301         535, 000         54, 301         58, 301  |               |                    |  |                      | 17 7 828       | 4 4 T                           | क्षा प्रमुख स्टब्स्            | <u>। विकास रा</u>                                | - 127 E (\$285 SX) | A 55 354                                     | •   | v rougeweerste  |  |  |  |   |              | ST COLOR                                | Exit years to the first                         |
| 5         -         K1         B         1,100         0         141         141         K         1,525         120         0,815         6,589         10,049          B         6           K1         -         K2         (B)         1,550         0         199         199         K         350         120         0,577         2,321         0,812              588,489         550,000         38,489   | 5             |                    | 1.2005                                 | Part of Part of St.  | roled Los      | ***********                     |                                | Market Joseph                                    |                    | .s. 532.527.12                               | 1219 32 3 150)  | ALCO STORES   | THE PERSON NAMED IN                            |  |  | MALLO CALLES IN CA                      | <u> </u>     | 34 /57 - 1 35 A 5                       | N. Makana Jana                                  |
| K1 - K2 (B) 1,550 0 199 199 K 350 120 0.577 2.321 0.812 588.489 550.000 38.489<br>K2 - 14 (B) 1,550 0 201 201 K 106 120 0.565 2.211 0.234 588.255 583.250 5.005<br>K1 Katugastota-KFG, R2 576.680 442.680 134.000  | ~             | -K1                | B                                      | 1, 100               | 0              | 141                             | 141                            | К.   | 1, 525             | 120  | 0, 815  | 6, 589  | 10, 049  | 000.000                                  | 001.200  | 00.100                                  | B            | 68. 1                                   | Exist Pipe & 160 PVC                            |
| K1 - K2 (B) 1,550 0 199 199 K 350 120 0.577 2.321 0.812 588.489 550.000 38.489 K2 - 14 (B) 1,550 0 201 201 K 106 120 0.565 2.211 0.234 588.255 583.250 6.006 Katugastota KFG R2 576.680 442.680 134.000  |               |                    | _=_                                    |                      |                |                                 |                                | <del>                                     </del> |                    |  |   |   |  | 589, 301                                 | 535, 000   | 54. 301                                 | <del></del>  |   |   |
| K2   |               | K2                 | (B)                                    | 1,550                | 0              | 199                             | 199                            | K  | 350                | 120  | 0.577   | 2. 321  | 0, 812   |  |  |   |              |   | Exist Pipe \$225 PVC                            |
| K1   |               |                    |  |                      |                |                                 |                                | L  |                    |  |   |   |  | 588. 489                                 | 550, 000   | 38. 489                                 |              |   |   |
| Katugastota-KFG, R2 PG 576, 680 442, 680 134, 000  |               | 14                 | (B)                                    | 1,550                | 0              | 201                             | 201                            | K_   | 106                | 120  | 0.565   | 2, 211  | 0. 234   | FOO OFF                                  | E00 050  | C 005                                   | <b> </b>     | ·                                       | Exist Pipe φ200 DI                              |
| PG 576, 680 442, 680 134, 000  |               | to for t           | DO DO                                  | j                    | id vv .        |                                 |                                |  | Alterday .         |  | 31 11 11 11 11 11   |   | FAGE 15 18 18 18 18 18 18 18 18 18 18 18 18 18 |  |  |   |              | 1. 3. Y                                 | rittar (N.S. 1911) (S.                          |
|  |               | no en Cir          | 17.11.11.                              | <u> </u>             | <del></del>    | التند                           | فمنت المالية المالية           | فتتنج دنيتناه                                    | H5.34 . 27 (1977)  | إقلنا فسننتنا                                |   | . 1 . 1111 a 1808 (B)                                   | <u> </u>                                       |  | the fall of the control of the contr | 7                                       |              | <u></u>                                 |   |
| το   1   004,10   600   0.100   0.100   0.420   0.420   0.420   0.420   0.420   0.420   0.420   0.420   0.420  |               | MR                 | В                                      | 33, 190              | 802            | 0                               | 802                            | <del> </del>                                     | 650                | 130  | 0.760   | 0.653   | 0.425  | 3,0,000                                  | 1111.000   | 1011 000                                | В            | 134.0                                   | · · · · · · · · · · · · · · · · · · ·           |
| MR 576, 255 442, 770 133, 486  | MR            |                    |  |                      |                |                                 |                                |  |                    |  |   |   |  | 576, 255                                 | 442.770  | 133. 485                                |              | ,                                       |   |
| MR - 17' (B) 33,190 700 0 700 570 130 0,998 1.267 0.722  |               | 17'                | (B)                                    | 33, 190              | 700            | 0                               | 700                            | ļ <u> </u>                                       | 570                | 130  | 0, 998  | 1. 267  | 0.722  |  |  |   |              |   |   |
| 17' 575, 533 453, 650 121, 883   |               | ,                  | /EX                                    | 00 750               | 700            |                                 | 700                            | ļ  | - 660              |  | 0.004   | 0.000   | 0.500  | 575, 533                                 | 453.650  | 121, 883                                | <u> </u>     |   |   |
| 17' - AG' (B) 22,750 700 0 700 830 130 0.684 0.630 0.523 575.010 527.400 47.610  |               | AU                 | (B)                                    | 22, 750              | 700            | . 0                             | 700                            | <del> </del>                                     | 830                | 130  | U. 684  | 0. 630  | 0.523  | 575 010                                  | 527 400  | 47 610                                  |              | <del></del>                             | ļ   |
| AG' - AG (B) 19,610 502 0 502 230 130 1.147 2.417 0.556  |               | AG                 | (B)                                    | 19 610               | 502            |                                 | 502                            | <del> </del>                                     | 230                | 130  | 1 147   | 2 417   | 0.556  | 919,010                                  | 341.400  | 40,010                                  |              |   | <del></del>                                     |
| AG   13, 510 502 0 502 130 1.141 2.411 0.550 574.454 567.000 7.454   |               | 110                | (1)                                    | 10,010               | 502            |                                 | 002                            |  | 100                | 100  |   | <u> </u>  | V. 000   | 574, 454                                 | 567, 000   | 7, 454                                  |              |   |   |

(Phase 2)

| Node                                    | Node         |  | B/G                       | Flow Rate<br>Q(m3/d)                  |  | Dia.<br>D (mm) | Mixed Dia<br>Dm (mm)                  | Exist.         | Length<br>L(m)           | С  | Velocity<br>v(m/sec)                             | Hyd. Grd<br>I (%)             | Loss<br>h(m)                          | Dynamic<br>Pressure                      | LWL<br>HWL    | Dynamic                | Pump   | Required                              | Remark   |
|---|--------------|--|---------------------------|---------------------------------------|--|----------------|---------------------------------------|----------------|--------------------------|--|--|-------------------------------|---------------------------------------|--|---------------|------------------------|--|---------------------------------------|--|
| node                                    |              | nodo                                   |                           | eg (mo) d)                            | 2,005                                  | 2,010          | Dia (ma)                              |                | L (III/                  |  | v (m/sec/  | 1 (700)                       | 11 (01)                               | Hd (MSL)                                 | (MSL)         | Pressure<br>He (m)     | Туре   | Pump Head<br>H(m)                     |  |
| # 14. E 1 F                             |              | 72.43° () <u>6</u>                     | PUNA WAR                  |                                       | e, a a giray.                          | of a think     | A FOR THOSE DECIMEN                   | altat ve       |                          |  | regardan çxi                                     |                               |                                       | 100000000000000000000000000000000000000  |               |                        | 75. T  |                                       | e jako e i jereta.   |
| 10'                                     | AG'          | (TD)                                   | (7)                       | 0.150                                 | -500                                   |                |                                       | ļ              |                          |  |  |                               |                                       | 575, 010                                 | 527, 400      | 47.610                 |  |                                       |  |
| AG'                                     | (IB)         | (IB)                                   | (B)                       | 3, 150                                | 502                                    | .0             | 502                                   |                | <u>4</u> 30              | 130                                      | 0.184  | 0.082                         | 0.035                                 | F  | F00 000       |                        | (B)  |                                       |  |
| (IB)                                    | (1D)         | 57                                     | В                         | 2, 150                                | 252                                    | 0              | 252                                   |                | 1, 900                   | 130                                      | 0. 499   | 1, 161                        | 2, 206                                | 574. 975                                 | 530, 630      | 44. 345                | В  | 61.3                                  |  |
| (10)                                    | 57           | 01                                     | + "                       | 2, 100                                | 202                                    | Ų.             | 202                                   | · · · · - ·    | 1, 900                   | 130                                      | 0.499  | 1, 161                        | 2.200                                 | 634, 069                                 | 629. 000      | 5. 069                 | В  | 61.3                                  |  |
|   |              |  |                           |                                       |  | 1 1 1 1        |                                       |                | 81                       | u. i iyesa                               | ari degatira                                     | laksaakii.                    | es india                              | 004.005                                  | 02,3,000      | 3,005                  |  |                                       |  |
|   | (IB)         |  |                           |                                       |  | <u> </u>       |                                       |                | ************             |  |  | H                             | <u> </u>                              | 574. 975                                 | 530, 630      | 44. 345                | -  |                                       | · · · · · · · · · · · · · · · · · · ·                        |
| (IB)                                    |              | 582                                    | (B)                       | 1,000                                 | . 0                                    | 502            | 502                                   |                | 3, 050                   | 130                                      | 0.058  | 0.010                         | 0.030                                 |  |               |                        |  |                                       |  |
|   | 582          |  |                           |                                       | 3 "                                    |                | 1 124.75                              |                | ***** ** C. ***          |  |  |                               |                                       | 574, 945                                 | 555, 000      | 19.945                 |  |                                       |  |
|   | 17'          |  | المناب                    |                                       |  |                |                                       | فسنسف          | 2 2 2                    | L. S. 1922                               |  |                               |                                       |  | 150 050       | 200                    |  |                                       |  |
| 17'                                     | - 17         | 1702                                   | (B)                       | 10, 440                               | 400                                    | 0              | 400                                   |                | 2,000                    | 130                                      | 0. 962   | 2, 276                        | 4, 552                                | 575. 533                                 | 453, 650      | 121. 883               |  |                                       | <u> </u>   |
|   | 1702         | 1102                                   | (D)                       | 10, 770                               | -400                                   | •              | 400                                   |                | 2,000                    | 130                                      | 0. 902   | 2.270                         | 4, 552                                | 570, 980                                 | 545, 000      | 25. 980                |  |                                       |  |
| 1702                                    | -            | 17                                     | (B)                       | 6, 440                                | 400                                    | 0              | 400                                   |                | 70                       | 130                                      | 0.593  | 0, 931                        | 0.065                                 | 010, 500                                 | 040.000       | 20. 500                | $\vdash$   |                                       | <del> </del>   |
|   | 17           |  |                           |                                       |  |                |                                       |                |                          |  | 21.000   | 3, 7,52                       | ******                                | 570. 915                                 | 566,000       | 4. 915                 | $\Box$   |                                       |  |
|   |              | 3                                      | 5.X12.32                  |                                       |  |                |                                       | S 0.3          | de cusa a                |  | AR CARREST                                       | นาน เป็นสียน                  | ni châlet                             | Y 12 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | Ya daga da la | 365 Charles (1820)     |  |                                       |  |
|   | 1072         |  |                           |                                       |  |                |                                       |                |                          |  |  |                               |                                       | 570, 980                                 | 545, 000      | 25. 980                |  |                                       |  |
| 1072                                    |              | 18'                                    | (B)                       | 4,000                                 | 0                                      | 252            | 252                                   |                | 1,500                    | 120                                      | 0. 928   | 4. 246                        | 6.369                                 |  | ļ             |                        |  | -                                     |  |
| 18'                                     | 18,          | 10                                     | 1/5                       | 1 000                                 |  |                | 050                                   |                | 4 250                    | 150                                      |  |                               |                                       | 564, 612                                 | 480, 000      | 84.612                 |  |                                       |  |
| 18                                      | 18           | 18                                     | (B)                       | 4,000                                 | 0                                      | 252            | 252                                   |                | 1,350                    | 120                                      | 0. 928   | 4. 246                        | 5. 732                                | 558. 880                                 | F40 000       | 10.000                 |  |                                       |  |
|   |              | etara-6                                | in his ov                 | da                                    | 25003513190                            | A. Cran        | A) 11 - 32 & 4                        | 523(VA)U, L.   | Lew Mari                 | at 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |  | ar and a fall                 | TWENTS:                               | 558.880                                  | 540.000       | 18, 880                | , <u>.</u>                                       | FT 1513 - 1413 - 14                   | , 15,51  |
|   | 5″           | a: 612:954 ; 5                         | o trags                   | 23.44                                 | 28 (10 au 1                            | **.c           | er supplication of the                | N. S. S. S.    | SET GARAGETY             | <u> 1960 (1889)</u>                      | 20.00  | <u> </u>                      | 11-71 Table 6969A                     | 546, 601                                 | 456, 990      | 89, 611                |  | <u> </u>                              | <u> </u>   |
| 5″                                      | -            | 65'                                    | (B)                       | 2, 140                                | 252                                    | 0              | 252                                   |                | 950                      | 130                                      | 0.497  | 1, 151                        | 1.094                                 | 040.001                                  | 400.330       | 03, 011                |  |                                       | <del></del>  |
|   | 65',         |  |                           |                                       |  |                |                                       |                |                          |  |  |                               |                                       | 545, 508                                 | 490, 310      | 55. 198                |  |                                       |  |
| 65'                                     | _            | 6501                                   | (B)                       | 1, 200                                | 201                                    | 0              | 201                                   |                | 1,720                    | 130                                      | 0. 438   | 1. 187                        | 2.042                                 |  |               |                        |  |                                       |  |
| dros                                    | 6501         | 0.404                                  | (5)                       |                                       |  |                |                                       |                |                          |  |  |                               |                                       | 543, 465                                 | 506, 600      | 36. 865                |  |                                       |  |
| 6501                                    | 6401         | 6401                                   | (B)                       | 100                                   | 0                                      | 97             | 97                                    |                | 1, 250                   | 130                                      | 0. 157   | 0.416                         | 0.520                                 |  |               |                        |  |                                       |  |
| 6401                                    | - 0401       | 64S                                    | (B)                       | 100                                   | 0                                      | 97             | 97                                    |                | 780                      | 130                                      | 0, 157   | 0, 416                        | 0.324                                 | 542, 945                                 | 455. 000      | 87. 945                |  |                                       |  |
| 0401                                    | 64S          | 045                                    | (1)                       | 100                                   | Ÿ ·-                                   | - 31           | 31                                    |                | 100                      | 130                                      | 0, 197   | 0.410                         | 0.324                                 | 542. 621                                 | 530, 000      | 12. 621                |  |                                       |  |
| *************************************** | T P          |  | 200                       |                                       | 21.7533                                | i de l'accepto |                                       |                | ST SPECT                 |  | eran erang                                       |                               |                                       | 042.041                                  | 030.000       | 12.021                 | 5.2  | 7.17.00 C                             |  |
|   | 65'          |  |                           |                                       |  |                | N 107 1131 300, 2901, 27              | ×-30000000     | 1,070.000                |  |  | ana saya na an an an an an an |                                       | 545. 508                                 | 490, 310      | 55, 198                |  | 2.7.2.2.2.                            | SSE 4 - 54 No. 1 April 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 |
| 65'                                     | -            | 65G                                    | (B)                       | 950                                   | 0                                      | 149            | 201                                   | K              | 100                      | 120                                      | 0. 347   | 0.894                         | 0,089                                 |  |               |                        |  |                                       | Exist Pipe $\phi$ 150  |
|   | 65G          |  |                           |                                       |  |                |                                       |                | Q-11 11.00 07 - 11.00 07 | · · · · · · · · · · · · · · · · · · ·    |  | PAGE 18 100 VIII.             |                                       | 545, 418                                 | 528,000       | 17. 418                |  |                                       |  |
|   | CFOI         | مقتنين أوكا                            | - 20 X - 15 - 1           |                                       | \$200.000                              |                |                                       | 124 G. 35      |                          |  | 275 7 3 1 2 1 5 1 5<br>6 5 7 3 1 4 5 4 5 1 5 1 3 | Cas in the                    |                                       |  | FOR COO       | 22.025                 |  |                                       |  |
| 6501                                    | 650 <u>1</u> | 65                                     | (B)                       | 1, 100                                | 201                                    |                | 963                                   | <sub>v</sub> - | - nó                     | 120                                      | 0.401  | 7 011                         | 0.001                                 | 543, 465                                 | 506, 600      | 36, 865                |  |                                       |  |
| 0001                                    | 65           | 00                                     | (D)                       | 1, 100                                | 201                                    | - 0            | 201                                   | К              | 90                       | 130                                      | 0, 401   | 1.011                         | 0.091                                 | 543, 374                                 | 531. 200      | 12. 174                |  | · · · · · · · · · · · · · · · · · · · | <del></del>  |
|   |              | ja de vo                               |                           | Sa                                    | and a                                  |                |                                       | 3              | F5. Jellenin             |  | 11.500000  |                               |                                       | 543.314                                  | 531. 200      | 12.114                 | <del>                                     </del> |                                       |  |
|   | 64           | <u> </u>                               | A4450 IRK                 | <u> </u>                              | ************************************** | 13. ac         | · · · · · · · · · · · · · · · · · · · | 25-21-22-2-23  | 2 - 3 - X 5KB (2-K-X)2   | <u>28</u> 28                             | r : //24/19 Janua 94 Ga                          | OL ' No Medical Add C         | Participation of the Property of Ship | 512.000                                  | 512,000       | 0,000                  |  | <u> </u>                              |  |
| 64                                      | -            | 64                                     | G                         | 1,020                                 | . 0                                    | 141            | 141                                   |                | 750                      | 130                                      | 0, 756   | 4. 942                        | 3. 706                                |  |               | 2,000                  |  |                                       |  |
|   | 64'          |  |                           |                                       |  |                |                                       |                |                          |  |  |                               |                                       | 508. 294                                 | 460.000       | 48. 294                |  |                                       |  |
| 64'                                     |              | 64G                                    | (B)                       | 1,020                                 | 0                                      | 141            | 141                                   |                | 3,000                    | 130                                      | 0.756  | 4. 942                        | 14. 825                               |  |               |                        |  |                                       |  |
| <del> </del>                            | 64G          | ************************************** |                           |                                       |  |                |                                       | 2F-254-15      | 51 Jay 21 July 2 July 2  |  | Grand and Statement                              | 8, 3******* K.J. 7.**         | 50 88 tex                             | 493, 469                                 | 480,000       | 13. 469                |  |                                       |  |
| <u> </u>                                |              | ng san till                            | ê(L)jerî                  |                                       | 1348 (44-149                           |                | y y Kall Abad of                      | instric        | an mark                  | Marin Cold                               | TECTES   | Arigidas s                    | in said un                            | FOT DOO                                  | For Ann       | 2 3 3 2 2              |  | 3, 4                                  |  |
| 64S                                     | 64S          | 64B                                    | В                         | 100                                   | 0                                      | 97             | 97                                    | · · · · · ·    | 360                      | 120                                      | 0, 157   | 0.482                         | 0.174                                 | 567, 200                                 | 526, 000      | 41, 200                | В  | 41 9                                  | Exist Pipe ø110  |
| 040                                     | 64B          | 0.40                                   | <del></del>               | 100                                   | · <del></del>                          | 91             | 71                                    |                | 300                      | 140                                      | ν, τοι   | U. 40Z                        | U. 174                                | 567. 026                                 | 562, 000      | 5. 026                 | D  | 41.2                                  | Exist ripe wito  |
|   | 7 T T T      | 897.Da                                 | Sa. 151                   | 1,33                                  | En Adjub                               |                |                                       | 0.503          |                          | e Principali                             | Period Confra                                    | 38. j. 1714. liji             |                                       | 207.020                                  |               |                        |  | The street                            |  |
|   |              | فأحض بهدائد                            | <u>التنافية الاعتبارا</u> | e e e e e e e e e e e e e e e e e e e |  | التناعة متم من | الانتيانية والمعاومة والمعاودة        |                |                          | <u>گا_ دلامتین به م</u>                  | الكة عندات الاطمال ومعدوسا                       | A 44-1 W. 1186-1 418          | en renewater is a state and the       | makardarana                              |               | متأعاتك تعددك كستفعاته | المنتقس محسد                                     | <del></del>                           |  |



# (Phase 3)

|          | Node          |                 | B/G               | Flow Rate     |             | Dia.         |                   | Mixed Dia           | Exist.       | Length       | С             |                       |              | Loss              | Dynamic          | LWL      | Dynamic  |              | Required   | Remark            |
|----------|---------------|-----------------|-------------------|---------------|-------------|--------------|-------------------|---------------------|--------------|--------------|---------------|-----------------------|--------------|-------------------|------------------|----------|----------|--------------|--|-------------------|
| Node     | >             | Node            |                   | Q (m3/d)      |             |              |                   | Dm(mm)              |              | L (m)        |               | v(m/sec)              | I (‰)        | h (m)             | Pressure         | HWL      | Pressure | Type         | Pump Head  |                   |
|          |               | an violent in a | k: ^ :- 1         |               | 2,005       |              | 2,015             | 11 2 1888 ST        | 12/25/12/22  | . 1098)      | THE RESERVE   |                       | Marian III y | N. E.N. NOW HEAD. | Hd(MSL)          | (MSL)    | He (m)   | 1,111        | H (m)  | y                 |
|          | KMC-P±<br>KMC | imrose          |                   |               |             |              | ET III.           |                     |              |              |               | - 1-4,                |              |                   | 643, 000         | 471.000  | 172, 000 | ·            | CS - 25 /2                                       |                   |
| KMC      | - KMC         | 63              | В                 | 2, 360        | 0           | 0            | 201               | 201                 | v            | 500          | 120           | 0, 861                | 4.812        | 2, 406            | 043,000          | 471.000  | 172,000  | В            | 172 0  | Exist Pipe φ200   |
| Nate     |               | (= Pri          |                   |               |             |              | 201               | 201                 |              | - 300        | 120           | 0.001                 | 4,012        | 2, 400            | 640, 594         | 635.500  | 5. 094   |              | 112.0  | DAID TIPE WEST    |
| 1 1 1 1  | KMC-Pt        | ivaxam          | i A M             | indagala      | 7 - 2 7 - 3 | A. 10.       |                   | # 15 to 16 (24)     | 1443034      | £ 375 4. 7 5 | u silve i Dia |                       | 1944 F 20    |                   | 010.001          | 300.000  | 0.001    | \$ 4 E       |  |                   |
|          | KMC           | 1.7 048 004110  | 1                 | Tring Grant . |             |              | plid 'Sai India'd | Ballio IVV III Cove |              | 2            | a demand      | ALTO LOCALITE SECURIO | 11           | 2.30.4851433      | 582. 000         | 471.000  | 111.000  |              |  |                   |
| KMC      | -             | 36'             | В                 | 13, 700       | 0           | 502          | 0                 | 502                 | · · · · ·    | 2,000        | 130           | 0.801                 | 1. 245       | 2. 490            |                  |          |          | В            | 111.0  |                   |
|          | 36'           |                 |                   |               |             |              | ·                 |                     |              |              |               |                       |              |                   | 579, 510         | 480.000  | 99. 510  |              |  |                   |
| 36'      | _             | 36              | В                 | 900           | 0           | 0            | 141               | 141                 |              | 3, 700       | 130           | 0.667                 | 3.920        | 14. 505           |                  |          |          | <u> </u>     | ļ <u>.                                    </u>   |                   |
|          | 36            |                 |                   |               |             |              |                   |                     |              |              |               |                       |              |                   | 565. 005         | 560, 000 | 5. 005   |              |  |                   |
|          | KMC-Uda       | aperder         | ıiya∗             |               |             |              |                   |                     |              | <u> </u>     | >             |                       |              |                   | ·                |          |          | ļ            |  |                   |
|          | KMC           |                 |                   |               |             |              |                   | - 1- 1-             |              |              |               |                       | 1 500        |                   | 589. 30 <u>0</u> | 471.000  | 118. 300 | -            | 110.0  |                   |
| _KMC_    |               | 66'             | В                 | 4, 000        | 0           | 0            | 299               | 299                 |              | 1, 100       | 130           | 0. 659                | 1, 592       | 1. 751            | 607 C40          | 490,000  | 97, 549  | В            | 118.3  |                   |
| 66'      | 66'           | 67              | (B)               | 4, 000        | 0           | 0            | 299               | 299                 | <del></del>  | 1,600        | 130           | 0, 659                | 1, 592       | 2. 547            | 587. 549         | 490.000  | 91. 049  |              | <del> </del>                                     |                   |
| - 66     |               | (= Uda          |                   |               | 0           |              | 299               | 299                 |              | 1,000        | 130           | 0.009                 | 1, 592       | 2. 347            | 585, 002         | 580.000  | 5, 002   |              | <del></del>                                      |                   |
|          | 01            | (- uaa          | perae             | auran/        | ٠.          |              |                   |                     |              |              |               |                       | ·            |                   | 500.002          | 300.000  | 3,002    | <u> </u>     | · <del>-</del>                                   |                   |
| -        | 67            |                 | -                 |               |             |              |                   |                     |              | <del></del>  |               | 1                     |              |                   | 636, 100         | 576, 000 | 60. 100  |              |  |                   |
| 67       | -             | 68              | B                 | 3, 000        | 0           | 0            | 325               | 325                 | K            | 1,500        | 120           | 0.418                 | 0.718        | 1, 077            |                  | 0.0.00   | 00.100   | В            | 60. 1  | Exist Pipe φ280 & |
|          | 68            | (= Uda          |                   |               |             |              | - 020             |                     | <u> </u>     | 1,000        | 124           |                       |              |                   | 635, 023         | 630, 000 | 5. 023   |              |  | φ 250             |
|          |               | 1 044           | 70, 41            | ,,,,,,,       |             |              |                   |                     |              |              | - 1           |                       |              |                   |                  |          |          |              |  |                   |
|          | 68            |                 |                   |               |             |              |                   |                     |              |              |               |                       |              |                   | 712, 500         | 626.000  | 86. 500  |              |  |                   |
| 68       | -             | 69              | В                 | 2,000         | 0           | 0            | 199               | 199                 | K            | 2,000        | 120           | 0.744                 | 3.719        | 7. 439            |                  |          |          | В            | 86. 5  | Exist Pipe φ225   |
|          | 69            | (= Bow          | alawa             | atta)         |             |              |                   |                     | _            |              |               |                       |              |                   | 705, 061         | 700.000  | 5, 061   |              |  |                   |
|          |               |                 |                   |               |             |              |                   |                     |              |              |               |                       |              |                   |                  |          |          | <u></u>      |  |                   |
|          | 69            |                 |                   |               |             |              |                   |                     | <u> </u>     |              |               |                       |              |                   | 761.700          | 696, 000 | 65. 700  |              |  |                   |
| 69       |               | 70              | В                 | 1,000         | 0           | 0            | 141               | 141                 | 1            | 1,400        | 130           | 0.741                 | 4.764        | 6, 669            |                  |          |          | В            | 65. 7  |                   |
|          |               |                 | ing               | nill estate   | <u>e)</u>   |              |                   |                     |              |              |               |                       |              |                   | 755. 031         | 750, 000 | 5. 031   |              |  |                   |
| ļ        | KMC-KFC       | j               | ļ <u> —</u>       |               |             |              |                   | <u> </u>            |              |              |               |                       |              |                   | 576, 100         | 471.000  | 105. 100 |              | <del></del> -                                    |                   |
| KMC      | KMC           | 6401            |                   | 10, 480       | 0           | Ö            | 502               | 502                 | K            | 200          | 120           | 0, 613                | 0, 879       | 0, 176            | 910, 100         | 471.000  | 105. 100 | В            | 105.1  | Exist Pipe φ500   |
| VMC      | 5401          | 5401            | В                 | 10, 480       |             | <u> </u>     | 502               | 502                 | _ v          |              | 120           | 0.613                 | 0.819        | 0.170             | 575, 924         | 480.000  | 95, 924  | ь            | 100.1  | Exist Tipe \$ 000 |
| 5401     | - 5401        | 54'             | В                 | 10, 480       | 0           | 0            | 502               | 502                 | K            | 1,000        | 120           | 0, 613                | 0, 879       | 0. 879            | 010. 524         | 480.000  | JO. J.L. |              |  | Exist Pipe φ500   |
| 10201    | 54'           | <i>□</i> -1;    | - <del>''</del> - | 10, 100       | υ           | <del></del>  | 502               | - 502               | 1            | 1,000        | 140           |                       | 0.017        | 0.010             | 575, 045         | 485, 000 | 90. 045  |              |  |                   |
| 54'      | -             | 57'             | (B)               | 5, 280        | 0           | 0            | 502               | 502                 | K            | 1,800        | 120           | 0, 309                | 0, 247       | 0. 445            |                  |          |          |              | 1  | Exist Pipe φ500   |
| <u> </u> | 57'           | <del></del>     | , <u>/</u>        |               | <u> </u>    | <u>~</u> -   |                   |                     |              |              |               |                       |              |                   | 574. 599         | 500.000  | 74, 599  |              |  |                   |
| 57'      | - *! -        | 582             | (B)               | 5, 280        | 0           | 0            | 502               | 502                 | K            | 1,400        | 120           | 0.309                 | 0. 247       | 0.346             |                  |          |          |              |  | Exist Pipe φ500   |
|          | 582           | = R2            | 1                 |               |             |              |                   |                     |              |              |               |                       |              |                   | 574, 253         | 555, 000 | 19, 253  |              |  |                   |
|          |               |                 |                   |               |             |              |                   |                     |              |              |               |                       |              |                   |                  |          |          |              | <u> </u>   |                   |
|          | KMC           |                 |                   |               |             |              |                   |                     |              |              |               |                       |              |                   | 542, 300         | 471.000  | 71. 300  |              | ļ  |                   |
| KMC      |               | 66              | В                 | 2, 870        | 199         | 0            | 0                 | 199                 | L            | 900          | 130           | 1,068                 | 6. 256       | 5, 631            |                  |          |          | В            | 71.3   |                   |
|          | 66            | = Dang          | ola               |               |             |              |                   |                     | ļ            |              |               |                       |              |                   | 536, 669         | 531, 600 | 5, 069   | <u> </u>     | <u> </u>   |                   |
|          |               |                 |                   |               | ļ           | L            | ļ <u>.</u>        |                     | ļ            |              | ļ             | ļ                     |              |                   | 545 D.5          | 105 000  | 00.045   | ļ            |  |                   |
| <u> </u> | 54'           |                 | <u> </u>          |               |             | ļ <u>.</u> - |                   |                     | ļ            | 1 050        | 100           | 0.005                 | 1 500        | 1 000             | 575. 045         | 485.000  | 90, 045  |              | <del> </del>                                     |                   |
| 54'      |               | 54              | (B)               | 5, 210        | 350         | 0            | 0                 | 350                 |              | 1, 050       | 130           | 0.627                 | 1.206        | 1. 266            | 573. 779         | 570.000  | 3. 779   |              | ļ  | <del></del>       |
| <b></b>  | 54            | = Heer          | essa              | gala low      |             | <del></del>  |                   |                     | <del> </del> |              |               |                       |              |                   | ərə, 119         | 910.000  | 3,119_   | <del> </del> | <del>                                     </del> |                   |
| L        | L             |                 |                   |               |             | l <u> </u>   | L.—.—             | l                   | J            |              | l             | L                     | l            |                   |                  | <b> </b> |          |              | <del></del>                                      | <del></del>       |

(Phase 3)

|       | Node         |                   | B/G  | Flow Rate               |  |  |  | Mixed Dia             | Exist.   |                        | С                   |  |                  | Loss                          | Dynamic  | LWL                                     | Dynamic   |  | Required   | Remark  |
|-------|--------------|-------------------|--|-------------------------|--|--|--|-----------------------|--|------------------------|---------------------|--|------------------|-------------------------------|--|---|---|--|--|---|
| Node  | >            | Node              |  | Q(m3/d)                 |  |  |  | Dm (mm)               |  | L(m)                   |                     | v(m/sec)   | I (‰)            | h (m)                         | Pressure   | HWL                                     | Pressure  | Type   | Pump Head  |   |
|       |              |                   |  |                         | 2,005  | 2,010  | 2,015  |                       |  |                        |                     |  |                  |                               | Hd (MSL)   | (MSL)                                   | He(m)   |  | H (m)  |   |
| _     | <u>5</u> 4   |                   |  |                         |  |  |  |                       |  |                        |                     |  |                  |                               | 629. 100   | 566,000                                 | 63. 100   |  |  |   |
| 54    |              | 54a               | B  | 2, 740                  | 201  | 0  | 0  | 201                   |  | 870                    | 130                 | 0.999  | 5. 469           | 4. 758                        |  |   |   | В  | 63. 1  |   |
|       | 54a          |                   |  |                         |  |  |  |                       |  |                        |                     |  |                  |                               | 624. 342   | 576. 330                                | 48. 012   |  |  |   |
| 54a   |              | 55                | В  | 2,740                   | 199  | 0  | 0  | 199                   |  | 400                    | 130                 | 1,020  | 5.742            | 2, 297                        |  |   |   |  |  |   |
|       | 55           |                   |  | ala (Midd               |  |  |  |                       |  |                        |                     |  |                  |                               | 622, 045   | 617,000                                 | 5.045   |  |  |   |
|       |              |                   |  | ,                       | Ť  | F  | 4  |                       | MGC 4-4  | 4.5.3 Res 18           | a Name of           |  | eren er          |                               | n ki z kiji jili jili i ne                       |   |   |  |  |   |
|       | 55           | N                 |  | <u> </u>                |  |  |  |                       | . <u> </u>                                       | the constitution of    | 3x 4,73 50          | 1,8  |                  |                               | 684, 900   | 613.000                                 | 71.900  |  |  |   |
| 65    | -            | 55a               | В  | 700                     | 149  | 0  | 0  | 149                   |  | 350                    | 130                 | 0.465  | 1.882            | 0, 669                        | 001,000  | 010, 000                                | 71.000  | В  | 71.9   | DIP   |
| 00    | 55a          | UUA               | n  | 100                     | 173  | ··· ·  |  | 143                   |  | , 000                  | 100                 | 0, 400   | 1,002            | 0,005                         | 684. 241   | 636, 350                                | 47. 891   |  |  | D11   |
| 55a   | - 554        | 56                | B  | 700                     | 141  | 0  | 0  | 141                   | _  | 470                    | 130                 | 0, 519   | 2, 463           | 1. 157                        | 004, 241   | 000,000                                 | 11.031  |  | <del> </del>                                     | PYC   |
| ออุน  |              |                   |  |                         |  | <u> </u>   | <del>-</del> -                                   | 141                   |  | 410                    | 150                 | 0.019  | 2.403            | 3. 101                        | 683.084  | 678, 000                                | 5, 084  | _  | -  | 110   |
|       |              |                   | essar  | ala (Uppe               |  | W/11 - 2 - 3 - 1                                 | 5 5 5 5 5  | OTTO STROMRORY        | SIRM HANDON                                      | 14 13,-13 - W - W - 10 | : X1.05(0.0)        | A STATE OF S |                  | 97569 (114581) × 11           |  | 254                                     | 5.004   | -  |  |   |
|       | KMC-R2       |                   |  | h diam                  | #1   | 84-304   | GY TOWARD C                                      |                       | مقطعتم   |                        |                     |  | 51, 10 TO        | 259 (546) X (                 | 606 100  | ** ** ** ** ** ** ** ** ** ** ** ** **  | 76 700  |  | <u> </u>   | Carlo |
|       | <del> </del> | = R2              |  |                         |  | 11   | T. C. Lawrence                                   |                       |  |                        |                     | 1 501  | 2 100            | 1 202                         | 626, 190   | 549, 490                                | 76, 700   |  |  | D 1 . D1  |
| 582   |              | 583               | В  | 11, 420                 | 0  | 0  | 328  | 328                   | K  | 500                    | 120                 | 1.564  | 8. 192           | 4, 096                        | 0.00   | 7.7 00-                                 |   | В  | 76, 7  | Exist Pipe φ250×2   |
|       | 583          | = R3              | LI   |                         |  |  |  |                       | ļ  |                        |                     |  |                  |                               | 622, 094   | 617.000                                 | 5. 094  | ļ  |  |   |
|       |              |                   | 100  |                         |  |  |  | and Company           | 35000  | No. 10 I test          | Moral Local         | nor vir similaridade estas.  |                  | Section of the section in the |  |   |   | L.,.   |  | \$15  |
|       | 582          |                   |  |                         |  |  |  |                       |  |                        |                     |  |                  |                               | 648, 590   | 549, 490                                | 99. 100   |  |  |   |
| 582   |              | 61S               | В  | 1, 960                  | 201  | 0  | 0  | 201                   |  | 860                    | 130                 | 0, 715   | 2. 943           | 2. 531                        |  |   |   | В  | 99.1   |   |
|       | 61S          | = Hant            | ana r  | lace                    |  |  |  |                       |  |                        |                     |  |                  |                               | 646.059  | 641.000                                 | 5.059   |  |  |   |
| 1.75  | ing May 1993 |                   |  |                         |  |  |  | a was a last the      |  | tura natificación      | de inici            | 1 2 4 114  | and and a        |                               |  |   |   | 4  |  |   |
|       | 61S          |                   |  | <u> </u>                | 1  |  |  |                       |  |                        | 1 12 . 12 . 12 . 12 | A STATE OF THE STA |                  |                               | 684, 700   | 637,000                                 | 47, 700   |  |  |   |
| 61S   |              | 61                | R  | 820                     | -0   | 0  | 199  | 199                   | К  | 900                    | 120                 | 0, 305   | 0,715            | 0, 643                        |  |   |   | В  | 47. 7  | Exist Pipe $\phi$ 225   |
| 015   |              | = Hant            |  |                         | <del> ~</del>                                    | <u>'</u>   | 100  | Ca. 3 CT 17 SH-MAN(EX |  | 500                    | 1,50                | .01000   |                  | 0.010                         | 684. 057   | 679,000                                 | 5. 057  |  |  |   |
|       | - 91         | - Hant            | ana i  | .ur                     | a contract                                       | 1  | Jan Baran  | VICENS AND A          | ( Q2 a ) .                                       |                        | e esie              | **************************************   |                  | [[]* 12]-(22]-1-1             | 1001, 001<br>101 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 0.5.000                                 |   | <del></del> .                                    | <del>†</del>                                     |   |
|       | <u> </u>     | 33 (Se 11 Se 11 ) |  |                         | 0.300  | 1          | ATA - WE TIME. The                               | 2002 C                | F . 33   |                        | Signification       | Letter 1.  | 2 2 37 20 .04 .5 | S. Chalens and                |  | 675.000                                 | 4.000   | . s. <u>. 7 5</u>                                | <del></del>                                      |   |
|       | 61           |                   | <del>   </del>                               |                         | ļ. —,-   | 7.47   |  | 1.11                  |  | 1.700                  |                     |  | 0.147            | 0.050                         | 679.000  | 010.000                                 | 4.000   |  | <b>_</b>   |   |
| 61    |              | 61H               |  | 650                     | 0  | 141  | 0  | 141                   |  | 1, 700                 | 130                 | 0. 482   | 2. 147           | 3, 650                        | 055 050  | 000 000                                 | 15.050  |  |  |   |
|       | 6111         | = Hant            | ana c  | all link                | ļ  |  |  | <u> </u>              |  |                        | ar Jane             |  | 2                | 3723.2                        | 675. 350   | 660.000                                 | 15, 350   |  |  |   |
| 1     |              |                   | امحنت  | تغفيت والمراجع والمراجع |  | 8  |  | 201                   | Zeil Con   |                        | \$101,000.2         | A CONTRACTOR   | Sod N            |                               |  | *************************************** | أح والمنطقة المنطقة الم |  |  |   |
|       | 61           |                   |  |                         |  |  |  |                       |  | ļ                      |                     |  |                  |                               | 775, 200   | 675, 000                                | 100, 200  |  |  |   |
| 61    |              | HT                | В  | 190                     | 0  | 141  | 0  | 141                   |  | 710                    | 130                 | 0. 141   | 0, 221           | 0.157                         |  |   |   | В  | 100. 2   |   |
|       | HT           | = Hant            | ana i  | pper                    |  | Γ  | l  |                       |  |                        |                     |  |                  |                               | 775. 043   | 770,000                                 | 5. 043  |  |  |   |
|       | - 3          |                   |  |                         | 1 .:   |  |  |                       | f. a.  |                        | 2                   |  |                  |                               |  | 1 14.0                                  | estant Bress F  |  |  |   |
|       | 583          | = R3              |  |                         |  |  |  |                       |  |                        |                     |  |                  |                               | 617.000  | 613, 000                                | 4, 000  |  |  |   |
| 583   |              | 6001              | G  | 5, 210                  | 0  | 299  | 0  | 299                   |  | 541                    | 130                 | 0, 859   | 2. 596           | 1.404                         | -  |   |   |  |  |   |
|       | 6001         |                   | <del>  -</del> +                             |                         | <del>                                     </del> | †  |  |                       | <del>                                     </del> |                        |                     |  |                  |                               | 615, 596   | 560,000                                 | 55, 596   |  |  |   |
| 6001  | -            | 6002              | (G)  | 5, 210                  | 0  | 299  | 0  | 299                   | <del>                                     </del> | 1, 304                 | 130                 | 0.859  | 2, 596           | 3. 385                        |  |   |   |  | _  |   |
| 5001  | 6002         | 3002              | <del>       </del>                           | 0, 410                  | <del> </del>                                     |  | <u>`</u>   |                       | <b> </b>   | -,,,,,,,,              | ****                | 0.000  | 2.000            | 5.,000                        | 612. 211   | 571, 450                                | 40. 761   | <del>                                     </del> |  |   |
| 6002  | 0002         | 60                | (G)  | 5, 210                  | 299  | 0  | 0  | 299                   | <del> </del>                                     | 1,810                  | 130                 | 0,859  | 2. 596           | 4, 699                        | VID: 011   | 0111300                                 |   |  |  |   |
| 0002  |              |                   |  |                         | 433  | <del>                                     </del> | U  | 499                   | <del> </del>                                     | 1,010                  | 100                 | 0,009  | 2. 000           | 4,000                         | 607. 512   | 586, 000                                | 21, 512   | <u> </u>   | <del></del>                                      |   |
|       | 60           | =Amp              | 10178  | ·                       | ļ  |  |  |                       |  | <del></del>            | <del></del>         |  |                  |                               | 007.012  | 360.000                                 | 21. 712   |  |  |   |
|       |              | <u> </u>          |  |                         | ļ  | <u> </u>   | ļ  | <u> </u>              |  | Z                      |                     |  | 1                |                               | 604.700  | E00 E00                                 | 40 800  |  | <del>                                     </del> |   |
|       | 60           | L                 | <u>                                     </u> |                         | ļ  |  |  |                       | ļ  | <u></u>                |                     | 0  | ļ                |                               | 624, 700   | 582, 500                                | 42. 200   |  |  |   |
| 60    |              | 60E-1             | B_   | 1,200                   | 199  | 0  | 0  | 199                   | L  | 260                    | 130                 | 0.447  | 1. 247           | 0.324                         |  | \ <u></u>                               |   | В  | 42. 2  |   |
|       | 60E-1        |                   |  |                         |  |  | L  |                       |  | <u></u>                |                     |  |                  |                               | 624. 376   | 555. 170                                | 69. 206   |  | L  |   |
| 60E-1 |              | 60E-2             |  | 1,200                   | 201  | 0  | 0  | 201                   | L  | 3, 100                 | 130                 | 0. 438   | 1. 187           | 3. 681                        |  | L                                       | L <u></u>   | l  | <u> </u>   |   |
|       | 60E-2        |                   |  |                         | 1  |  |  |                       | L  |                        |                     |  |                  |                               | 620, 695   | 555. 620                                | 65, 075   |  | ļ  |   |
| 60E-2 |              | 60E               |  | 1,200                   | 199  | 0  | 0  | 199                   |  | 520                    | 130                 | 0. 447   | 1.247            | 0.648                         |  |   | ,   |  |  |   |
|       | 60E          | (= Elh            | ena)   | <u></u>                 | T  |  |  |                       |  |                        |                     |  |                  |                               | 620, 047   | 615,000                                 | 5. 047  |  |  |   |
|       |              | 2111              |  |                         |  | ·····  |  |                       | <del></del>                                      | <del></del>            |                     |  |                  |                               |  | \                                       |   |  |  |   |
|       | 60           |                   | <del></del>                                  |                         | <del> </del>                                     | <del> </del>                                     | <del>                                     </del> |                       |  | <del></del> -          |                     |  |                  |                               | 725, 400   | 582, 500                                | 142, 900  |  | 1  |   |
| 60    |              | 6005              | В  | 980                     | 149  | 0  | 0  | 149                   | <del>                                     </del> | 1, 480                 | 130                 | 0.651  | 3. 508           | 5, 191                        | . 201 100  |   | 1.2,000   | В  | 142. 9   | DIP φ 150   |
| -00   |              | 0000              | - D  | 900                     | 149  | <u> </u>   | · ·  | 143                   | <del></del>                                      | 1, 1200                | 100                 | 0.001  | 0.000            | 3, 151                        | 720, 209   | 630, 000                                | 90. 209   | <del></del>                                      |  | - ¥ 100   |
| 2005  | 6005         | <u> </u>          | 1  |                         | 141  | <del>                                     </del> |  | 141                   |  | 400                    | 120                 | 0.700  | 4. 589           | 9 202                         | 120.209  | 000.000                                 | 30, 203   | <del></del>                                      | <del></del>                                      | PVC φ 160   |
| 6005  | _            | 60+               | В  | 980                     | 141  | 0  | 0  | 141                   | <del></del>                                      | 480                    | 130                 | 0.726  | 4. 589           | 2, 203                        | 710 000  | 710 000                                 | C 000   | <u> </u>   | 1  | φ100  |
|       | 60+          | = Mull            | epihi  | IIIa                    | I  | l  | l  |                       | L  |                        |                     |  |                  | l                             | 718, 006   | 713, 000                                | 5.006   | L  |  |   |

(Phase 3)

|                                       | Node       |   | D/ U:           | Flow Rate       | Dia.     | Dia.       | Dia.        | Mixed Dia    | Exist.         | Length   | С               | Velocity                              | Hvd. Grd            | Loss                                   | Dynamic        | LWL                   | Dynamic  | Pump   | Required   | Remark                                |
|---------------------------------------|------------|---|-----------------|-----------------|----------|------------|-------------|--------------|----------------|--|-----------------|---------------------------------------|---------------------|--|----------------|-----------------------|----------|--|--|---------------------------------------|
|                                       | >          |   |                 | Q (m3/d)        |          |            |             |              |                | L (m)  |                 | v(m/sec)                              | I (%)               | h (m)                                  | Pressure       | HWL                   | Pressure |  | Pump Head  |                                       |
|                                       |            |   |                 |                 | 2,005    |            |             |              |                |  |                 |                                       |                     |  | Hd (MSL)       | (MSL)                 | He(m)    |  | H (m)  |                                       |
|                                       |            |   |                 |                 |          |            |             |              |                | Control of the contro |                 |                                       |                     |  |                |                       |          | N. B. Mari                                       |  |                                       |
|                                       | 60+        |   |                 |                 |          |            |             |              |                |  |                 | · · · · · · · · · · · · · · · · · · · |                     |  | 709. 000       | 709,000               | 0.000    |  |  |                                       |
|                                       | -          | 60+1                                    | G               | 100             | 141      | 0          | 0           | 141          |                | 100  | 130             | 0.074                                 | 0.067               | 0, 007                                 | <b>7.0</b> 000 | 704 000               |          |  |  |                                       |
|                                       | 60+1       | 201                                     |                 | 7.00            |          |            |             | 70           |                | 100  | 100             | 0 505                                 | 7 100               | 0.015                                  | 708. 993       | 664, 330              | 44, 663  | <u> </u>   |  |                                       |
| 60+1                                  | 60'        | 60'                                     | 1 21 2          | 100             | 79       | 0          | 0           | 79           |                | 190  | 130             | 0. 236                                | 1, 130              | 0. 215                                 | 708. 993       | 674, 360              | 34, 633  |  |  |                                       |
|                                       | 60'        | *************************************** | ipin:           | illa (Low))     |          |            |             |              | rijeto tellini |  | Se ser Silveria |                                       |                     | Johanna (j                             |                | 674.300               | 34, 633  |  |  |                                       |
|                                       | 60'        | أتت في نيس                              |                 | k i de e i j    | 15 4 5 4 |            |             | 1.4 mg/2.4   |                | 100 Sept 2 1881  | i wildbydig     | and the second second                 | Every leader of the | ** *********************************** | 740, 500       | 672.500               | 68. 000  |  |  |                                       |
| · · · · · · · · · · · · · · · · · · · | - 00       | 60″                                     | В               | 100             | · · ·    | ō          | 66          | 66           | К              | 1, 400   | 120             | 0, 338                                | 3, 146              | 4. 405                                 | 140, 500       | 012.000               | 00.000   | B  | 68.0   | Exist Pipe ø75                        |
|                                       |            |   |                 | lla upper)      |          |            | - 00        | - 00         | 11             | 1, 100   | 120             | 0,000                                 | 0, 140              | 4, 400                                 | 736, 095       | 731.000               | 5. 095   | <del></del> -                                    | - 00.0   | DAISO LIPO W TO                       |
|                                       |            | 1 1102                                  |                 | dill dppci      |          | 7.24       |             | 4 M. Jag     | WALE IN        |  | 6.20.30         | 7.875 TEST                            |                     | 1 (4) (5)                              |                |                       |          |  |  | · · · · · · · · · · · · · · · · · · · |
|                                       | 60         |   |                 |                 |          |            |             | 27 27 242 25 | . 5.22         | g 11 ng gleigte we's   |                 |                                       |                     |  | 652, 600       | 582, 500              | 70. 100  |  |  |                                       |
|                                       |            | 6003                                    | В               | 2, 150          | 0        | 141        | 141         | 184          | К              | 1, 500   | 120             | 0.941                                 | 6, 308              | 9.461                                  |                |                       |          | В  | 70. 1  | Exist Pipe ø 160                      |
| 6                                     | 5003       |   |                 |                 |          |            |             |              |                |  |                 |                                       | 1                   |  | 643. 139       | 600.000               | 43. 139  |  |  |                                       |
| 6003                                  | - 1        | 60M                                     | (B)             | 2, 150          | . 0      | 141        | 141         | 184          | К              | 485  | 120             | 0. 941                                | 6. 308              | 3. 059                                 |                |                       |          |  |  | Exist Pipe ø160                       |
|                                       | 60M        | (≃ Meel                                 | kanuv           | va)             |          |            |             |              |                |  |                 |                                       |                     |  | 640.080        | 635.000               | 5. 080   |  |  |                                       |
|                                       | 11.00      | milkelid                                |                 | 55.00 (St.00.2) | 100      |            | a i lake vi | ar Single    | 101 TO 10      |  | On H            | <u>Edboata</u>                        | Transaction in      | Maria i                                |                | Service of the Artist | a a and  | , i e ji ii                                      |  |                                       |
|                                       | .,         |   |                 |                 |          |            |             |              | 200 TO TO TO   | action read to   |                 | 7°785 :: 28 #                         |                     | v                                      |                | Sala Saran Tari       |          |  | 2  |                                       |
|                                       |            | tota-M                                  | adaw            | ala 😓 💮         |          | St. Christ | i sulfat    |              |                | ting the Salatin   | D. Alexander    |                                       | 20-N.17-16          |  |                | algot-life            |          | 2.115  | <u> </u>   | <u> </u>                              |
|                                       | PG         |   | _               |                 |          |            |             |              |                |  | 120             |                                       |                     | 4 0 70                                 | 540. 780       | 442.680               | 98. 100  | <u> </u>   |  |                                       |
|                                       | -          | 601                                     | В               | 44, 240         | 592      | 0          | 592         | 771          |                | 650  | 130             | 1.098                                 | 1. 351              | 0.878                                  | 500 000        | 444 000               | 05.000   | В  | 98, 1  |                                       |
| <del></del>                           | 601        | 5001                                    | (D)             | 99 400          | 500      |            |             |              |                | 1 700 :  | 100             | 0.004                                 | 1 501               | 0.600                                  | 539, 902       | 444. 020              | 95, 882  |  | -  |                                       |
| 001                                   | 5001       | 5001                                    | (B)             | 23, 400         | 592      | 0          | 0           | 592          |                | 1, 790   | 130             | 0.984                                 | 1, 501              | 2. 688                                 | 537. 214       | 442, 250              | 94. 964  | <b></b>  |  |                                       |
|                                       |            | 5002                                    | 7p)             | 20, 300         | 299      | 592        | 0           | 628          |                | 1, 250   | 130             | 0.760                                 | 0, 869              | 1,086                                  | 557.214        | 442, 250              | 94, 904  |  |  |                                       |
|                                       | 5002       | 0VV2                                    | \D/             | 20, 300         | 299      | 994        | U           | 040          |                | 1, 230   | 130             | 0.700                                 | 0.809               | 1,000                                  | 536, 128       | 450.000               | 86, 128  | <del>                                     </del> |  |                                       |
|                                       |            | 5003                                    | (B)             | 5, 100          | 299      |            | 0           | 299          |                | 2,280  | 130             | 0, 841                                | 2, 495              | 5, 690                                 | 550. 125       | 300.000               | 00, 120  |  |  |                                       |
|                                       | 5003       | 0000                                    | \D <sub>Z</sub> | 3, 100          |          | <u>v</u>   |             | 200          |                | 2,200  | 100             | 0,011                                 | 2, 100              | 0.000                                  | 530, 439       | 455, 220              | 75. 219  |  |  |                                       |
|                                       | -          | 26'                                     | (B)             | 3,900           | 299      | 0          | 0           | 299          |                | 190  | 130             | 0.643                                 | 1, 519              | 0. 289                                 | 000, 100       |                       |          |  |  |                                       |
|                                       | 26'        |   | 127             |                 |          |            |             |              |                |  |                 |                                       |                     |  | 530, 150       | 456, 990              | 73. 160  |  |  |                                       |
|                                       | -          | 26                                      | (B)             | 3, 300          | 252      | 0          | 0           | 252          |                | 1, 150   | 130             | 0.766                                 | 2. 565              | 2, 950                                 |                |                       |          |  |  |                                       |
|                                       | 26         | (= Ban                                  |                 |                 |          |            |             |              |                | <del></del>  |                 |                                       |                     |  | 527, 200       | 521. 280              | 5, 920   |  |  | _                                     |
|                                       | 7.         |   |                 | , 4 D. 13 Jen 4 | si, 5    | JA 1       | (4)         |              |                |  | 035, 435        |                                       |                     |  |                |                       |          | L.   |  | <u> </u>                              |
| $\epsilon$                            | 601        |   |                 |                 |          |            |             |              |                |  |                 |                                       |                     |  | 539, 902       | 444.020               | 95, 882  |  |  |                                       |
| 301                                   |            | 601'                                    | (B)             | 20, 850         | 592      | 0          | 0           | 592          |                | 890  | 130             | 0.877                                 | 1, 213              | 1.079                                  |                |                       |          | ļ <u> </u>                                       |  |                                       |
|                                       | 601        |   |                 |                 |          |            |             | L            |                |  |                 |                                       |                     |  | 538, 822       | 443.000               | 95. 822  |  |  | <u></u>                               |
|                                       |            |   | (B)             | 2, 340          | 199      | 0          | 0           | 199          |                | 870  | 130             | 0.871                                 | 4. 288              | 3, 731                                 |                |                       | 45.6:-   |  |  |                                       |
|                                       | 3          | (= Kah                                  | alla)           |                 |          |            |             |              |                |  |                 |                                       |                     |  | 535, 091       | 491. 250              | 43. 841  | ļ  |  |                                       |
|                                       |            |   |                 |                 |          |            |             |              |                |  |                 |                                       |                     |  | 507 014        | 440 000               | 04 064   | <b></b> -  |  |                                       |
|                                       | 5001       | 500                                     | (D)             | 0.100           |          |            | 100         | 100          | 1/             | 1 000  | 100             | 1 154                                 | 8. 367              | 10, 040                                | 537, 214       | 442. 250              | 94, 964  | $\vdash$   | <del></del>                                      | Exist Pipe φ225                       |
| 4441                                  |            | 500                                     |                 | 3, 100          | 0        | 0          | 199         | 199          | K              | 1, 200   | 120             | 1. 154                                | 8.307               | 10.040                                 | 527, 174       | 514. 350              | 12. 824  |  |  | Extat Fibe @220                       |
|                                       | 500        | (= Bala                                 | anga.           | ıa)             |          |            |             | <del> </del> | <del> </del>   | <del>,</del>   |                 | <u> </u>                              | <del> </del>        |  | 341,114        | 014.000               | 12.024   | <del> </del>                                     | <del>                                     </del> | <del></del>                           |
| <del> </del>                          | 500        |   |                 |                 |          |            | ļ           | <del> </del> |                | <del></del>  |                 |                                       | <u> </u>            | <del> </del>                           | 605, 550       | 510.350               | 95, 200  |  | 1  |                                       |
| h                                     | -          | 4.1                                     | В               | 1,300           | 0        | 0          | 141         | 141          | <del></del>    | 3,300  | 130             | 0.964                                 | 7, 740              | 25. 543                                | 330, 500       | 0101000               | 50, 200  | B  | 95. 2  | <del></del>                           |
|                                       | <b>4</b> J | *1,1                                    | , <u>u</u>      | 1, 500          |          |            | 171         | 1.11         |                | 0,000  | -100            | 0.004                                 | 1, 1, 20            | 20.010                                 | 580.007        | 575.000               | 5, 007   |  |  | <del></del>                           |
| <del></del>                           | - J.       |   |                 |                 |          |            | <del></del> | <del> </del> | -              |  |                 | <del></del>                           |                     |  |                |                       | 2. 251   | ļ  |  |                                       |
|                                       | 4J         | · · · · ·                               |                 |                 |          |            |             | <del> </del> | <del></del>    |  |                 |                                       |                     |  | 575.000        | 571.000               | 4,000    |  |  |                                       |
|                                       |            | 4                                       | G               | 700             | - 5      | 0          | 141         | 141          | -              | 2,950  | 130             | 0. 519                                | 2. 463              | 7. 265                                 |                |                       |          |  |  |                                       |
|                                       |            |   |                 |                 |          |            |             | <del> </del> |                |  | · ·             |                                       |                     |  | 567, 735       | 565, 000              | 2, 735   |  |  |                                       |

# (Phase 3)

|           | Node                |                | B/G   | Flow Rate                                |            | Dia.          |                  | Mixed Dia               | Exist.   |   | С            | Velocity           | Hyd. Grd      | Loss                        | Dynamic  | LWL      | Dynamic  | Pump           | Required        | Remark            |
|-----------|---------------------|----------------|---|--|------------|---------------|------------------|-------------------------|--|---|--------------|--------------------|---------------|-----------------------------|----------|----------|----------|----------------|-----------------|-------------------|
| Node      | <del>&gt;</del>     | Node           |   | Q (m3/d)                                 |            |               |                  | Dm(mm)                  |  | L(m)  |              | v(m/sec)           | I (%)         | h (m)                       | Pressure | HWL      | Pressure | Туре           | Pump Head       |                   |
|           | EE/Left Lef         | F12. 7. 13 No. | 22078   | Sala and Sala                            |            | 2,010         | <del></del>      | 22 72 EE2 EE2           | #125107D   | Est. Caraca Caraca Caraca<br>Caraca Caraca SPECIAL SEC  |                    |               | TO BE 379 - 35.50           | Hd (MSL) | (MSL)    | He(m)    | - 11 n         | H (m)           |                   |
| 7, 7,449  | 26                  | <u> </u>       |   |  | J Car day  | (B): 12-3     | æ.4711           | S. Harris               | det itte   | _oranielticki   | ele.Ske      |                    | 40 W. G PTM   | ALOREST CHICAN              | 573, 680 | 517. 280 | 56, 400  | <u>.</u>       |                 | 111 . J. 111 . 14 |
| 26        |                     | 27'            | В   | 1, 700                                   | 0          | 199           | 0                | 199                     |  | 1, 300  | 130          | 0, 633             | 2. 374        | 3, 087                      | 973,080  | 317. 200 | 30. 400  | В              | 56. 4           |                   |
|           | 27'                 | 21             | υ   | 1, 100                                   | · ·        | 199           | v                | 133                     |  | 1, 500  | 130          | 0.000              | 2.014         | 3.001                       | 570, 593 | 456, 990 | 113. 603 |                | 50. 4           |                   |
| 27'       |                     | 27             | (B)   | 300                                      | 0          | 97            | 0                | 97                      |  | 2, 700  | 130          | 0.470              | 3, 175        | 8, 573                      | 510,033  | 450, 550 | 110.000  |                |                 |                   |
|           | 27                  | 21             | (0)   |  | <u>v</u> . |               | · · · ·          | 31                      | -  | 2,100   | 100          | 0.410              | 0, 110        | 0,010                       | 562, 020 | 557.000  | 5, 020   |                |                 |                   |
|           | 7.9                 | 10.53.75.0     | E - 1   | a. 2 - 1965. j                           | J 2007     |               | STORE STARTS     |                         | 2.37 5.30  | 41/41/14/15   | 862.813S     | a samanar.         | 354M6R.1      |                             |          | 001.000  | 2.020    | 7.             |                 |                   |
|           | 27'                 | sour manyages  |   | ( ' لِيَقَالُهُ <u>هِي هِ حِا</u> مِ ' ح |            | (%)()         | 81 I - 2 - 200 K | 98500031 ftgr., g0- n i | P.R. 113111  | 200 J. d. 27 (200 to 101)   | Carries same |                    |               | 1500 - 510 1 1 - 2500 - 110 | 570, 593 | 470,000  | 100, 593 |                |                 |                   |
| 27        | -                   | 28             | (B)   | 1, 400                                   | 0          | 141           | 0                | 141                     |  | 1, 400  | 130          | 1.038              | 8. 878        | 12, 429                     | 0.000    |          | 200,000  |                |                 | - · · · · -       |
|           | 28                  |                | (2)   |  |            |               | ·                |                         |  | -,  |              |                    |               |                             | 558, 165 | 550, 000 | 8. 165   |                |                 |                   |
|           | 7 T T T T           | 127 7 7 7      | 1000  | 1.5                                      | 33, 37, 77 | 8 T. T. T. T. | 7,13,13,13       |                         | 931511 gr  | 16. 20.000 1 100<br>2 10 10 10 10 10 10 10 10 10 10 10 10 10  |              | 4, 16, 11, 17, 13, | Mark to built | 12.55 EVE                   |          |          | ,        |                |                 |                   |
|           | 5003                | ·              |   |  |            |               |                  |                         | -  |   | 37.1.55      |                    |               |                             | 530, 439 | 450, 000 | 80, 439  |                |                 |                   |
| 5003      |                     | 25             | (B)   | 1, 200                                   | 199        | 0             | 0                | 199                     |  | 1, 170  | 130          | 0.447              | 1.247         | 1.459                       |          |          |          |                |                 |                   |
|           | 25                  | (= Pih         | illac   | leniya)                                  |            |               |                  |                         |  |   |              |                    |               |                             | 528. 980 | 524. 140 | 4.840    |                |                 |                   |
|           |                     |                |   |  |            |               |                  | . 7.00                  | a de la composición dela composición de la composición de la composición de la composición dela composición dela composición dela composición de la composición de la composición de la composición dela composición de la composición dela composición dela composición dela composición dela composición dela composición dela composición dela composición dela composición dela composición dela c |   | £            | 2.5.5.5            |               |                             |          |          |          |                |                 |                   |
|           | 26'                 |                |   |  |            |               |                  |                         |  |   |              | _                  |               |                             | 530, 150 | 456. 990 | 73. 160  | L              |                 |                   |
| 26'       | -                   | 25'            | (B)   | 600                                      | 0          | 0             | 141              | 141                     | K  | 630   | 120          | 0.445              | 2. 147        | 1. 353                      |          |          |          |                |                 | Exist Pipe φ160   |
|           | 25                  |                |   |  |            |               |                  |                         |  |   |              |                    | Ì             | _                           | 528, 797 | 460.000  | 68, 797  |                | -               |                   |
| 25'       | -                   | 25N            | (B)   | 600                                      | 0          | Ö             | 141              | 141                     | K  | 1, 150  | 120          | 0,445              | 2. 147        | 2. 469                      |          |          |          |                |                 | Exist Pipe φ160   |
|           | 25N                 | (= Nap         |   |  |            |               |                  |                         |  |   |              |                    | Ĭ             | -                           | 526. 328 | 502.000  | 24. 328  |                | •               |                   |
|           | Katuga              | stota K        | ahaw  | atta                                     |            |               |                  | 100                     |  | for Alfred  | Mail 67      | La Jakara          |               |                             |          |          |          |                |                 |                   |
|           | 601'                |                |   |  |            |               |                  |                         |  |   |              |                    |               |                             | 538. 822 | 443, 000 | 95, 822  |                |                 |                   |
| 601       |                     | 603            | (B)   | 18, 510                                  | 502        | 0             | 0                | 502                     |  | 3, 700  | 130          | 1,082              | 2. 172        | 8, 038                      |          |          |          |                |                 |                   |
|           | 603                 |                |   |  |            |               |                  |                         |  |   |              |                    |               |                             | 530. 784 | 499. 600 | 31. 184  |                |                 |                   |
| 603       |                     | 6              | (B)   | 16, 110                                  | 502        | 0             | 0                | 502                     |  | 50  | 130          | 0.942              | 1.680         | 0.084                       |          |          |          |                |                 |                   |
|           | 6                   | (= Kah         | awatt   | :a)                                      |            |               |                  |                         |  |   |              |                    |               |                             | 530. 700 | 522, 250 | 8. 450   | <u></u>        |                 |                   |
|           |                     | 20.1           |   |  |            |               |                  |                         | 2.2.   |   |              |                    |               |                             | 1.2      |          |          |                |                 |                   |
|           | 6                   |                |   |  |            |               |                  |                         |  |   |              |                    |               |                             | 585, 500 | 516. 000 | 69, 500  |                |                 |                   |
| 6         |                     | 7'             | В   | 7, 310                                   | 350        | 0             | 0                | 350                     |  | 2,500   | 130          | 0.879              | 2. 256        | 5. 639                      |          |          |          | В              | 69. 5           |                   |
|           | 7,                  |                |   |  |            |               |                  |                         |  |   |              | <u>_</u>           |               |                             | 579. 861 | 455.030  | 124. 831 |                |                 |                   |
| 7'        | ~                   |                | (B)   | 5, 400                                   | 350        | 0             | 0                | 350                     |  | 1,400   | 130          | 0,650              | 1. 288        | 1. 803                      |          |          |          |                |                 |                   |
|           | 7                   | (= Kur         | ugoda   | 1)                                       |            |               |                  |                         |  |   |              |                    |               |                             | 578, 057 | 573.000  | 5, 057   | ļ              |                 |                   |
|           |                     |                | <u> </u>                                      |  |            |               |                  |                         |  |   |              |                    |               | <u> </u>                    |          |          |          |                |                 |                   |
|           | 603                 |                |   |  |            |               | <b>-</b>         |                         |  |   | 15-          |                    |               |                             | 530, 700 | 499.600  | 31. 100  |                | ļ <del></del> - |                   |
| 603       | -                   | 10             | В   | 2, 400                                   | 199        | 0             | 0                | 199                     |  | 1, 250  | 130          | 0, 893             | 4. 494        | 5. 617                      | FOE 053  | F15 000  | 10.000   | <b> </b>       |                 |                   |
|           | 10                  | (= Aku         | rana)   |  |            |               |                  |                         |  |   | <u> </u>     |                    |               |                             | 525, 083 | 512.000  | 13.083   | ļ <u>-</u> -   |                 |                   |
|           |                     |                |   |  | L          |               |                  |                         | ļ  |   | ļ            |                    |               |                             | 20. 22.  | F10 222  | 100.000  |                |                 |                   |
| <u></u> _ | 6                   |                |   |  |            |               |                  | ····                    |  |   | 155-         |                    | L             | 10.010                      | 624, 800 | 516, 000 | 108,800  |                | 100-0           |                   |
| _6        |                     | 11'            | В   | 6, 400                                   | 0          | _0            | 350              | 350                     | <u> </u>   | 6, 150  | 130          | 0,770              | 1.764         | 10, 848                     |          |          | 10 050   | В.             | 108.8           |                   |
|           | 11                  | <u> </u>       | <u>  ,                                   </u> |  |            |               |                  | <del></del>             | ļ  |   |              |                    |               | 10.000                      | 613, 952 | 570,000  | 43, 952  |                | -               |                   |
| 11'       |                     |                | (B)   | 2, 500                                   | 0          | 0             | 199              | 199                     | <u> </u>   | 3, 900  | 130          | 0.930              | 4. 847        | 18.901                      | F05 050  | 500 000  | F 000    |                |                 |                   |
|           | 12                  | (= Bol         | lawel   | .a)                                      | i          |               |                  |                         |  | ļ   | ļ            |                    |               | <del></del>                 | 595, 050 | 590.000  | 5. 050   | <del>  -</del> |                 |                   |
| ļ         |                     |                | $\vdash$                                      |  |            |               |                  |                         | <u> </u>   |   | ļ            | ļ                  |               |                             | 610.050  | F70 00   | 40.050   | <u> </u>       |                 |                   |
| · ,·.,-   | 11'                 |                | - <del></del>                                 | 4 100                                    |            | <u> </u>      |                  |                         | ļ. <u>-</u>  | 100   | 100          | 0 505              | 05 450        | 0 545                       | 613, 952 | 570.00   | 43. 952  | -              |                 |                   |
| 11'       | -                   | 11             | (B)   | 1,100                                    | 0          | 0             | 79               | 79                      |  | 100   | 130          | 2.597              | 95, 453       | 9. 545                      | 604, 407 | 570.00   | 34. 407  |                |                 |                   |
|           | 11                  |                |   | ·  | ļ          | <u></u>       | <b></b>          |                         | ļ  | <del></del>   |              |                    |               |                             | 004, 407 | 570.00   | 34.407   | <u> </u>       |                 | <del></del>       |
| · · · · - | ļ. <del>.</del> .,. |                | <b>├</b> -                                    |  |            | <u> </u>      |                  |                         |  |   |              |                    |               |                             | 660, 652 | 566, 00  | 94. 652  |                |                 |                   |
| 1.7       | 11'                 | 110            | 122   | 0.000                                    |            |               | 0.50             | 050                     |  | 2 400   | 120          | 0, 603             | 1,650         | 5, 611                      | 00V. 03Z | 300,00   | 94.002   | İB             | 46. 7           |                   |
| 11'       | - 110               | 115            | IB  | 2, 600                                   | 0          | 0             | 252              | 252                     | ļ <u>.</u>   | 3, 400  | 130          | 0, 603             | 1, 000        | 5, 011                      | 655, 041 | 650.00   | 5. 041   | _ <u>ID</u> -  | 40. /           |                   |
|           | 115                 | L              | LL  |  | l          |               |                  |                         |  | L   | 1            | L                  | Ll            |                             | 055.041  | 000.00   | 3.041    | 1              | · · ·           | 1                 |

(Phase 3)

|                                       | N . J .     |                      | D/C  | El D-4  | Di-      | D/-                      | D:-          |                          | r             | 1 7 - 11 - 12 1          |                | V-1  | Hard Card                                    | Laav                |   | LWL      |                     | D        | Required     | Remark               |
|---------------------------------------|-------------|----------------------|--|---|----------|--------------------------|--------------|--------------------------|---------------|--------------------------|----------------|--|--|---------------------|---|----------|---------------------|----------|--------------|----------------------|
| Node                                  | Node_       | Node                 | B/ G   | Flow Rate<br>Q(m3/d)  |          |                          |              |                          | Exist.        | Length<br>L(m)           | С              | Velocity<br>v(m/sec)   | Hyd. Grd<br>I (‰)                            | Loss<br>h(m)        | Dynamic<br>Pressure                     | HWL      | Dynamic<br>Pressure |          | Pump Head    | кенагк               |
| Hode                                  | r           | Noue                 |  | eg (mo/ u)  | 2,005    |                          |              | Dir (mir)                |               | 1. (III)                 |                | V (III/ Sec)   | 1. (700)                                     | 11 (11)             | Hd (MSL)                                | (MSL)    | He (m)              | Турс     | H(m)         |                      |
| 719 F.S.                              | AAN KAA     | 18 EV 5              | 15 D.  |   | 2,000    | 2,010                    | 2,010        | 50183.2                  | 1954LE-45     |                          | Marra          |  |  | Marian - 13         |   |          | TIO VIII)           | Salah :  |              | 1 Mar 1 Mar 1 M      |
| · · · · · · · · · · · · · · · · · · · | 115         |                      | , ac.c                                       | 1) 1 <sub>1</sub> 1 <sub>1</sub> 1 <sub>1</sub> 1 <sub>1</sub> 1 <sub>1</sub> 1 <sub>1</sub> 1 <sub>1</sub> 1 <sub></sub> |          | to te Almino obstitution | 1.15.1.5.27  | . ST. ATALIN, KARRANERS. | A.A.C. MC4177 | VT / / EDD // 4.X        | X / 10/ (12/0) | 100,000,000,000  | P. M. C. C. C. C. C. C. C. C. C. C. C. C. C. | . 1523 1. 5 mg-13 - | 710.000                                 | 646.00   | 64, 000             |          |              |                      |
| 11S                                   |             | 11G                  | В  | 2,600   | 0        | 0                        | 252          | 252                      |               | 3,000                    | 130            | 0,603  | 1,650  | 4.951               |   |          |                     | В        | 64.0         |                      |
|                                       | 11G'        |                      |  |   |          |                          |              |                          |               |                          |                |  |  |                     | 705, 049                                | 700, 00  | 5.049               |          |              |                      |
|                                       |             | 10000                | 200 c  | 1   |          | 11.00                    |              |                          | The realist   |                          |                | geriğ telliği.   |  |                     | الله الله الله الله الله الله الله الله |          | N                   |          |              |                      |
|                                       | 11G'        |                      |  |   |          |                          |              |                          |               |                          |                |  |  |                     | 754. 349                                | 700.00   | 54. 349             |          | <u> </u>     |                      |
| 11G'                                  | -           | 11G                  | IB   | 2,600   | 0        | 0                        | 252          | 252                      |               | 2, 600                   | 130            | 0.603  | 1.650  | 4. 291              | 222 222                                 |          |                     | IB       | 49.3         | <del></del>          |
|                                       | 11G         |                      | ļ.,ļ   | <del>-, -, -, -</del> ,   | ,        |                          |              |                          |               | 10-10- <del>2</del> 00-0 |                | v v.hegisze  |  |                     | 750, 059                                | 745. 00  | 5. 059              |          |              | <u> </u>             |
|                                       | 7'          | -                    |  |   |          |                          | (11.135)     |                          |               |                          | <u> </u>       | The Mark Waller Committee of the Committ |  |                     | 579.861                                 | 455, 030 | 124. 831            | ļ        | <del> </del> | ·                    |
| 7,***                                 |             | 8                    | (B)  | 1, 910  | 252      | 0                        | 0            | 252                      |               | 950                      | 130            | 0.443  | 0.933  | 0, 886              | 219.001                                 | 455, 050 | 144. 031            | -        |              |                      |
|                                       | 8           |                      |  | ıgahawatta)   | 232      | U                        | \ \ \ \ \ \  | 404                      |               | 930                      | 130            | 0.443  | 0.933  | 0.800               | 578, 975                                | 566, 750 | 12. 225             |          | <del> </del> |                      |
| <del></del>                           | 0           | (- 1116              | Tallin                                       | iganawatta,   | /<br>    | (14-23                   | Control (ex) |                          | T. T. F.      |                          | ្នាលក្នុងរប    |  |  |                     | 7 4 4 7 7 7 7 7                         | 000. 100 | 12. 220             |          |              |                      |
|                                       | 7           | <u>`</u>             | N. 49.                                       |   |          | <u> </u>                 |              | A Warran Mr.             | <u> </u>      | 1124024000               | 10.000 11003   | 85.5 55. 45.453.6  | t . n. jarrainler. markr                     | <u> </u>            | 628, 100                                | 569.000  | 59. 100             |          | i            |                      |
| 7                                     | <u> </u>    | 9                    | В  | 3,000   | 0        | 0                        | 252          | 252                      | <u> </u>      | 3, 760                   | 130            | 0. 696   | 2.150  | 8, 085              | 0,000,100                               |          |                     | В        | 59.1         |                      |
|                                       | 9           | <u> </u>             | -  | .,  | -        |                          |              |                          |               |                          |                |  |  |                     | 620, 015                                | 615, 000 | 5, 015              |          |              |                      |
|                                       | Katuga      | stota-l              | duwa   | wala  |          |                          |              | SENS COLE                | 2000          | 6 - 2 3354               |                |  |  | an Louis and A      |   | 94       |                     | <u> </u> |              |                      |
|                                       | PG          |                      |  |   |          |                          | 1            | <del></del>              |               |                          |                |  |  |                     | 584.980                                 | 442, 680 | 142. 300            |          |              |                      |
| PG                                    | _           | 5'                   | В  | 8, 800  | 0        | 400                      | 0            | 400                      |               | 700                      | 130            | 0,811  | 1.659  | 1. 161              |   |          |                     | В        | 142.3        |                      |
|                                       | 5'          |                      |  |   |          |                          |              |                          |               |                          |                |  |  |                     | 583, 819                                | 450.000  | 133, 819            |          |              |                      |
| 5'                                    |             | 1301                 | (B)  | 8, 800  | 0        | 400                      | 0            | 400                      |               | 1,200                    | 130            | 0,811  | 1.659  | 1. 991              |   |          |                     |          | ļ <u>-</u>   | <u> </u>             |
|                                       | 1301        |                      | (0)  |   |          |                          | ļ            |                          |               |                          |                | 0 77-0   |  | 7 071               | 581, 827                                | 470.000  | 111. 827            |          | ļ            |                      |
| 1301                                  |             | 14'                  | (B)  | 4, 600  | 0        | 299                      | 0            | 299                      |               | 3, 420                   | 130            | 0, 758   | 2, 062                                       | 7, 051              | 554 550                                 | 500 000  | 1 / 650             | _        | ļ            |                      |
|                                       | 14'         | 153                  | (D)  |   |          | 200                      | <u> </u>     | 000                      |               | 0.000                    | 100            | 0, 758   | 2, 062                                       | 1 710               | 574. 776                                | 560,000  | 14, 776             |          |              |                      |
| 14'                                   | 17N         | 17N                  | (1)  | 4, 600  | 0        | 299                      | 0            | 299                      |               | 2, 300                   | 130            | 0, 158   | 2,002  | 4.742               | 570.034                                 | 565, 000 | 5, 034              |          |              |                      |
|                                       |             | ctotori              | ondo   | deniya, Kur   | Hannana  |                          | <del> </del> |                          |               |                          |                |  | <del>!</del>                                 | <del>,,,</del>      | 310.034                                 | 303.000  | 3, 034              |          | <del></del>  |                      |
|                                       | PG          | 30000                | Ollur  | deni ya, Kuz  | renum    |                          | <u> </u>     |                          |               |                          | M              | · · · · · · · · · · · · · · · · · · ·  |  | <del></del>         | 544. 580                                | 442, 680 | 101. 900            |          |              |                      |
| PG                                    |             | 5″                   | В  | 5, 870  | 350      | 0                        | 0            | 350                      |               | 520                      | 130            | 0.706  | 1.503  | 0, 782              | 011.000                                 | 112, 000 | 101,000             | В        | 101.9        |                      |
|                                       | 5"          | <del> <u>~</u></del> |  | 2,0.0   | 500      | <u>-</u> -               | <u>-</u>     |                          |               |                          |                |  | 11,000                                       |                     | 543. 798                                | 468, 410 | 75. 388             |          |              |                      |
| 5"                                    | -           | 5″a                  | (B)  | 3,050   | 299      | 0                        | 0            | 299                      |               | 890                      | 130            | 0,503  | 0,964  | 0.858               |   |          |                     |          |              |                      |
|                                       | 5 a         |                      |  |   |          |                          | 1            |                          |               |                          |                |  |  |                     | 542, 940                                | 505, 180 | 37, 760             |          |              |                      |
| 5″a                                   | -           | 5                    | (B)  | 3,050   | . 0      | 0                        | 299          | 299                      |               | 520                      | 130            | 0,503  | 0.964  | 0. 501              |   |          |                     |          |              |                      |
|                                       | 5           | = Kond               | aden   | í ya  |          |                          |              |                          |               |                          |                |  |  |                     | 542. 940                                | 535, 250 | 7. 690              |          |              |                      |
|                                       |             |                      |  |   |          |                          |              |                          | - :           |                          |                |  |  |                     |   |          |                     |          |              |                      |
|                                       | 5           |                      |  |   |          |                          |              |                          |               |                          |                |  |  | 4 655               | 591. 150                                | 531. 250 | 59, 900             |          |              |                      |
| 5                                     | -           | K1                   | В  | 1, 150  | 0        | 0                        | 199          | 199                      |               | 1,525                    | 130            | 0.428  | 1. 152                                       | 1. 757              | <b>500</b> 000                          | 505 000  | C4 B00              | В        | 59.9         |                      |
|                                       | K1          | 1.0                  | (0)  | 1 000   |          |                          | 100          | 100                      |               | 350                      | 120            | 0, 595   | 2. 461                                       | 0, 861              | 589, 393                                | 535, 000 | 54. 393             | <u> </u> | <del> </del> | Exist Pipe φ225 PVC  |
| К1                                    | -<br>k2     | k2                   | (B)  | 1,600   | 0        | 0                        | 199          | 199                      | <u> </u>      | 350                      | 120            | 0,595  | 4.401  | 0, 861              | 588. 531                                | 550, 000 | 38. 531             |          | <del> </del> | EXIST TIPE # 225 FYC |
| k2                                    | - KZ        | 14                   | /p)  | 1,600   | 0        | 0                        | 201          | 201                      | K             | 106                      | 120            | 0. 584   | 2. 344                                       | 0, 249              | 380. 331                                | 330,000  | 30, 331             |          | <del> </del> | Exist Pipe φ200 DI   |
| K2                                    | 14          | (= Kur               |  |   |          | <u> </u>                 | 401          | 201                      | - 1\          | 100                      | 140            | 0.004  | 2.011  | 0. 413              | 588, 283                                | 583, 250 | 5. 033              |          |              | LATER TIPE WHOU DI   |
|                                       |             | stota-l              |  |   |          |                          | <del> </del> |                          |               | <del> </del>             |                |  |  |                     |   | 300, 200 | 2, 200              |          | <del></del>  | <del></del>          |
|                                       | PG          | 20001                | <u>;                                    </u> |   |          |                          | <u> </u>     |                          | <u> </u>      |                          |                |  |  |                     | 576, 880                                | 442, 680 | 134, 200            |          | · · · · · ·  |                      |
| PG                                    | <del></del> | MR                   | В  | 51, 110   | 802      | 0                        | 0            | 802                      | l             | 650                      | 130            | 1.171  | 1, 452                                       | 0. 944              |   |          | _                   | В        | 134. 2       |                      |
|                                       | MR          |                      |  |   |          |                          | Ī            |                          |               |                          |                |  |  |                     | 575, 936                                | 442.770  | 133, 166            |          |              |                      |
| MR                                    |             | 17'                  | (B)  | 51, 110   | 700      | 0                        | 592          | 846                      |               | 570                      | 130            | 1.053  | 1. 122                                       | 0, 640              |   |          |                     | ļ        | 1            |                      |
|                                       | 17'         |                      |  |   |          |                          |              |                          |               |                          |                |  | ļ  |                     | 575. 296                                | 453.650  | 121, 646            | L        | <u> </u>     |                      |
| 17'                                   |             | AG'                  | (B)  | 3 <u>9, 92</u> 0  | 700      | 0                        | 0            | 700                      |               | 830                      | 130            | 1. 201   | 1. 783                                       | 1, 480              |   | F05 :00  | 10 12 1             | <u> </u> |              | <del> </del>         |
|                                       | AG'         | ,                    | ļ.,  |   | <u>-</u> |                          |              |                          |               |                          | 100            |  | <u></u> -                                    | 0.000               | 573, 816                                | 527. 400 | 46. 416             | ļ        | 1            | <del> </del>         |
| AG'                                   | (+=)        | (IB)                 | (B)  | 18, 180   | 502      | 0                        | 0            | 502                      | <b> </b>      | 430                      | 130            | 1.063  | 2. 101                                       | 0. 904              | <b>670</b> 019                          | E20 620  | 42, 282             |          | <del> </del> |                      |
| /775                                  | (IB)        | F.00                 |  | 15 000  |          |                          | <u> </u>     | FÀO                      |               | 2 050                    | 130            | 0.930  | 1.640  | 5, 002              | 572. 912                                | 530. 630 | 44, 484             | <u> </u> | <del></del>  |                      |
| (IB)                                  | 500         | 582                  | _G   | 15, 900   | 502      | 0                        | 0            | 502                      |               | 3, 050                   | 130            | 0.930  | 1.040  | 5,002               | 567 911                                 | 555.000  | 12. 911             |          | <del> </del> |                      |
|                                       | 582         | (= R2)               | L  |   |          | L                        | J            | L                        | 1             | <del></del>              | └──            | l <del></del>  |  |                     | 001.911                                 | 300.000  | 12. 511             | <b></b>  | ·            |                      |

(Phase 3)

|                     | Node     |             | B/G            | Flow Rate            | Dia.            | Dia.                                    | Dia.            | Mixed Dia  | Exist.         | Length   | С   | Velocity                      | Hyd. Grd   | Loss                      | Dynamic         | LWL             | Dynamic  | Pump         | Required     | Remark  |
|---------------------|----------|-------------|----------------|----------------------|-----------------|---|-----------------|--|----------------|--|---|-------------------------------|--|---------------------------|-----------------|-----------------|----------|--------------|--------------|---|
| Node                | >        | Node        | Πİ             | Q (m3/d)             | D (mm)          | D (mm)                                  | D (mm)          |  |                | L (m)  |   | v(m/sec)                      | 1 (%)  | h (m)                     | Pressure        | HWL             | Pressure | Туре         | Pump Head    |   |
|                     |          |             | П              |                      |                 | 2,010                                   |                 |  |                |  | i   |                               |  |                           | Hd (MSL)        | (MSL)           | He (m)   |              | H (m)        |   |
|                     |          |             | 3:51           |                      | 2 3 3 3         |   |                 |  | 200 E 75       |  |   |                               |  |                           |                 | \$ 3.00         |          |              |              |   |
|                     | AG'      |             |                |                      |                 |   |                 |  | -              |  |   |                               |  |                           | 573, 816        | 527.400         | 46. 416  |              |              |   |
| AG'                 | -        | AG          |                |                      | 502             | 0                                       | 0               | 502  |                | 230  | 130   | 1. 271                        | 2.925  | 0.673                     |                 |                 |          | Г            |              |   |
|                     | AG       | (= Asg      | iriy           | a)                   |                 |   |                 |  |                |  |   |                               |  |                           | 573. 143        | 567.000         | 6. 143   |              |              |   |
|                     | 4.46     |             |                | 200                  | 1, 201          |   |                 | a a she a mili na ma sa  | s Ze ku        |  | O. A. H. MARIA                                | 4 1                           |  |                           | and the markets | Karana.         |          |              |              |   |
|                     | (IB)     |             |                |                      |                 |   |                 |  |                |  |   | _                             |  |                           | 572. 912        | 530.630         | 42. 282  |              |              |   |
| (IB)                | _        | 57          | В              | 2, 280               | 252             | 0                                       | 0               | 252  |                | 1,900  | 130   | 0, 529                        | 1. 294   | 2. 459                    |                 |                 |          | В            | 63.6         |   |
|                     | 57       | (⇒ Bah      | iraw           | akand)               |                 |   |                 |  |                |  |   |                               |  |                           | 634. 053        | 629,000         | 5. 053   |              |              |   |
| 5 5 5               | 44.0     | 1.56M       | 111            | l Arangada d         | Padent          | 4.75 <u>.</u> ),                        | 75 1 30         |  | 872            | Commence of the commence of th | rg-n-re                                       |                               |  | Gazi Printe               |                 |                 |          |              |              |   |
|                     | 17'      |             |                |                      |                 |   |                 |  |                |  |   |                               |  |                           | 575, 296        | 453, 650        | 121.646  |              |              |   |
| 17'                 |          | 1702        | (B)            | 11, 200              | 400             | 0                                       | 0               | 400  |                | 2,000  | 130   | 1. 032                        | 2, 592   | 5. 185                    |                 |                 |          |              |              |   |
|                     | 1702     |             |                |                      |                 |   |                 |  |                |  |   |                               |  | ,                         | 570. 112        | 545.000         | 25. 112  |              |              |   |
| 1702                | -        | 17          | (B)            | 7, 200               | 400             | 0                                       | 0               | 400  |                | 70   | 130   | 0.663                         | 1.145  | 0, 080                    |                 |                 |          |              |              |   |
|                     |          | (= Up1      |                |                      |                 |   |                 |  |                |  |   | ·                             |  |                           | 570.032         | 566.000         | 4.032    |              |              |   |
|                     | Katuga   | stota 1     | alat           | hu Oya               |                 |   | nagrati (Jana   | The state of the s | ¥ 3.5          |  |   |                               | a village  | 3.61                      |                 | Ellar.          |          |              |              |   |
|                     | 1702     |             |                |                      |                 |   |                 |  |                | 1  |   |                               |  |                           | 570, 112        | 545.000         | 25. 112  |              |              |   |
| 1702                | -        | 18'         | (B)            | 4,000                | 0               | 252                                     | 0               | 252  |                | 1,500  | 130   | 0.928                         | 3.661  | 5. 492                    |                 |                 |          |              |              |   |
|                     | 18'      |             | <u> </u>       |                      |                 |   |                 |  |                | - · · · · · · · · · · · · · · · · · · ·  |   |                               | 1  |                           | 564, 620        | 480, 000        | 84, 620  |              |              |   |
| 18'                 |          | 18          | (B)            | 4,000                | 0               | 252                                     | 0               | 252  |                | 1, 350   | 130   | 0. 928                        | 3, 661   | 4, 943                    |                 |                 |          |              |              |   |
|                     | 18       | (Talaw      |                |                      |                 |   |                 |  |                |  |   |                               |  | -,                        | 559, 677        | 540.000         | 19.677   |              |              | ···   |
| rend. 4             |          |             |                | oda 🐇                | 47 Januari      | 18372876G                               | 1               | roduktere ia   | ga wat         | Zarek Küğle (K   |   |                               | in ohtessi   | Surgice Sec               | Sagarage Sagar  | AS THE WISE BUT |          | . 4          | 6            |   |
| ب نیک شنانک به محمد | 5″       |             | r - 1          | 2.00                 |                 | 100000000000000000000000000000000000000 | 3.28.252.252.20 |  | lecientalica.  | **************************************   | SEAST MERCHANIS                               | Militario desirate a series   | Secretary States   |                           | 543.798         | 456. 990        | 86. 808  | السنانات     | <u> </u>     | 200 - |
| 5″                  | _        | 65'         | (B)            | 2, 820               | 252             | 0                                       | - 0             | 252  |                | 950  | 130   | 0.654                         | 1.918  | 1. 822                    |                 |                 |          |              |              |   |
|                     | 65'      |             | <del>``~</del> | W, 024               |                 | <u> </u>                                |                 |  | · · · -        |  |   |                               | 2. 3.25  |                           | 541. 976        | 490, 310        | 51, 666  |              |              |   |
| 65'                 |          | 6501        | (B)            | 1,600                | 201             | 0                                       | 0               | 201  |                | 1,720  | 130   | 0, 584                        | 2. 022   | 3, 477                    |                 |                 |          |              |              |   |
| 70                  | 6501     | 0001        | 12,            | 1,000                |                 | Ť                                       | Ť               |  |                | 2, . 2,  | 100   | 0,001                         | 1,022  |                           | 538, 499        | 506, 600        | 31. 899  |              |              |   |
| 6501                |          | 6401        | (B)            | 200                  | 0               | 97                                      | 0               | 97   |                | 1, 250   | 130   | 0. 313                        | 1, 500   | 1.875                     |                 |                 |          |              | -            |   |
| 3001                | 6401     | 0101        | 12/            | 244                  |                 |   |                 |  |                | 1, 200   | 100   | 0.020                         | 2,000  |                           | 536, 625        | 455. 000        | 81, 625  | -            |              |   |
| 6401                |          | 648         | (B)            | 200                  | 0               | 97                                      | 0               | 97   | <b></b>        | 780  | 130   | 0.313                         | 1.500  | 1. 170                    |                 | 1,00,000        | 31.020   |              |              |   |
| 0.101               | 64S      |             | (3)            |                      | <u>_</u> _      |   | -               |  | <u> </u>       |  | 100   | 0.010                         | 1.000  | 1.1.0                     | 535, 465        | 530, 000        | 5. 455   |              |              |   |
| <del></del>         |          |             |                |                      |                 |   | in the stage of | - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1  | 35 77          |  | , è   | i isa - isawei                | F. 9.48 00 1   | 4-1-3940                  | ja v Agy 11     | . (7.           | 2.8 **   |              | 4            |   |
|                     | 65'      |             | <del></del>    |                      | <u> </u>        | F 1 1 1 1                               |                 | A Country of the Coun | G 1. A 1. 3A 2 | Sept. 1, 138 to 71   | <u>, , , , , , , , , , , , , , , , , , , </u> | . 10 Kg 12 (985-191)          | 1 - 1 - 1 - 2 - 12 - 13 - 13 - 13 - 13 -   | <u>a ara a suatarna d</u> | 541, 976        | 490. 310        | 51.666   |              |              | · · · · · · · · · · · · · · · · · · ·   |
| 65'                 | -        | 65G         | (R)            | 1, 220               | 0               | 0                                       | 149             | 149  | К              | 100  | 120   | 0.810                         | 6, 100   | 0.610                     | 311.010         | 100.010         | 51.555   |              |              | Exist Pipe φ200   |
| <del></del>         | 65G      | - 555       | (4)            | 1,000                |                 | <u> </u>                                | 1.13            | 110  |                |  |   |                               | <u> </u>   | <u> </u>                  | 541, 366        | 528. 410        | 12, 956  |              |              |   |
| <del> </del>        | 000      | 7           | 200            | <del>,</del>         | - '             | v (                                     |                 | tus inclárd  | (35,70         |  | 6-18-19-es                                    |                               | 20 July 18 18 18   | n independe               | 541.656         | 320. 110        | 12,500   |              | - :          | <del></del>   |
|                     | 6501     |             |                |                      | اند به فتما     |   |                 | <u>ئىنىڭ ئىزىنى ئىرىن</u>  | مدموسفاسيم     | A CONTRACTOR   | N 20 M. 3897                                  | <u> namalika, ili Tabbisi</u> | a de la Carlo de l | S. 22115-1-1-188-25       | 538, 499        | 506, 600        | 31.899   |              |              | x × · · ·   |
| 6501                | -        | 65          | (B)            | 1, 400               | 201             | 0                                       | 0               | 201  | K              | 90   | 130   | 0.511                         | 1.579  | 0, 142                    | 0001 100        | 300,000         |          |              |              |   |
| 0001                | 65       |             |                | Pallemulla           |                 | <u>-</u>                                | - V             | 201  | <del>,</del> - |  | 100   | 0.011                         | 1,010  | 0, 1,2                    | 538, 357        | 531, 200        | 7. 157   |              |              |   |
|                     |          | COHAR       | Oua (          | INTIEMOTIA           | ,               |   |                 | 41 - 25 - 27 - 43  | 10 150         | \$0,800,000,000.000.000.000.000.000.000.00   | 10000   |                               | Jak Bis  | 1                         | 330, 331        | 301.200         | 1.101    |              |              |   |
|                     | 64       | 251         |                | 2.35801 03.55, No. 1 | 70              |   | 11.1.1781       | 50.5.70 prom   |                |  | <u> </u>                                      | F A + 18 T (120 SQR (13 T     | - A10150 - G-02010   |                           | 512,000         | 512, 000        | 0,000    |              |              |   |
| 64                  |          | 64'         | G              | 1, 100               | 0               | 141                                     | 0               | 141  |                | 750  | 130   | 0. 815                        | 5. 682   | 4, 262                    | 012,000         | 014.000         | 0.000    |              |              |   |
| 04                  | 64'      | 04          | 4              | 1, 100               | <u> </u>        | 141                                     | ·               | 1.11   |                | 100  | 130   | V. 010                        | 0.002  | 4. 204                    | 507, 738        | 460, 000        | 47. 738  | -            |              |   |
| 64'                 | <u> </u> | 64G         | G              | 1, 100               | 0               | 141                                     | 0               | 141  | <del> </del>   | 3,000  | 130   | 0, 815                        | 5. 682   | 17. 047                   | 5011100         | 100.000         | 21.100   |              |              |   |
| 04                  | 64G      | 040         | - 4            | 1, 100               | - <del></del> - | 121                                     | ·               | 141  |                | 3,000  | 100   | 0,010                         | 0,002  | 11.041                    | 490, 691        | 480.000         | 10.691   | <u> </u>     |              |   |
| <b></b>             | 040      | <del></del> |                |                      |                 | ļ ——                                    | <del> </del>    | ļ  | <del></del>    | <del> </del>   |   |                               |  |                           | 100,001         | 300.000         | 10.031   | <del></del>  | -            |   |
|                     | 64S      |             |                |                      |                 | <del> </del>                            | <del> </del>    | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  |                |  | <u> </u>                                      | 1 8 2 81                      |  | ļ                         | 567, 700        | 526, 000        | 41.700   | <del> </del> | <del> </del> |   |
| 64S                 | 045      | 64B         | В              | 200                  | 0               | 0                                       | 97              | 97   | - <sub>K</sub> | 360  | 120   | 0, 313                        | 1.739  | 0. 626                    | 301,100         | 020.000         | 41.100   | В            | 41 7         | Exist Pipe $\phi$ 110   |
| 045                 | 64B      | Q4D         | ₽┼             | 200                  | — <u>"</u>      | - ·                                     | - 31            | - 31   | <u>v</u>       | 200  | 120   | 0, 010                        | 1.103  | V. 040                    | 567, 074        | 562.000         | 5, 074   | <u></u> .    | 71.1         | DYTO LYPE ATTO  |
| L                   | OAD      | L           |                |                      | L               | L                                       | L               |  | <u> </u>       | l  | I   |                               |  |                           | 001,014         | 1 000.000       | 1 0.014  |              |              |   |

| 04 | Distribution System Calculations |
|----|----------------------------------|
|    |                                  |
|    |                                  |
|    |                                  |

## **Distribution System Calculation**

#### 1. General

This working paper as a report presents the methodology, basic conditions and design criteria, applied for the pipe network analysis for present study.

The network analysis is carried out using US software, which is a user-friendly program based on Kypipes and operated on MS-dos.

And the results of pipe network analysis are described in the following section.

Outline of work procedure for network analysis is presented in Figure 1-1.

## 2. Condition of Analysis

#### 2.1 Methodology

In the JICA F/S Report on Greater Kandy Water Supply Augmentation Project, prepared in 1999, twenty (20) Service Reservoirs (S.R.) which are shown in Table 2.1-1, were proposed to be constructed newly or expanded for storing the water for distribution. This water is distributed to the consumers in the Phase 1 served area, through the new distribution feeder main, which is planned be installed from S.R. to the existing pipe and/or existing pipe network. To determine the proper pipe diameter of feeder main and pipelines in the distribution network for water supply scheme, the hydraulic network analysis is carried out to meet the design criteria.

The outline of methodology on distribution network analysis for Greater Kandy Water Supply Augmentation Project is presented in the following. Figure 1-1 shows the flow diagram for present pipe network analysis.

## 2.1.1 Existing Distribution Network of Each Water Scheme

The existing pipeline data is essential matter for analyzing the future pipeline network. For that purpose, the following data are required.

- Drawings of existing distribution pipe network for each water supply scheme together with list of pipe length for each diameter and each material were collected.
- 2) Location of present reservoirs were put on the map of 1:10,000 scale..
- 3) High water, Low water and Ground elevation of existing reservoir were obtained.

#### 2.1.2 Water Demand

The future water demand that was predicted by the F/S is reviewed by taking into account of the latest water consumption data. The water demand required in the new development area, which are not expected in the F/S, will be taken into consideration for the pipe network analysis. However, in principle, the predicted total water demand for Phase 1 project is not changed. Based on the projected and fixed future demand of each water supply scheme, in the years 2005, 2010 and 2015, water demand is distributed in the served area considering the population density, commercial demand, large size consumers and other water demand factors.

#### 2.1.3 Future Distribution Pipeline

The NWSDB's water supply planning for the pipeline expansion for each Water Supply Scheme by the project's target year is indicated on the available map. Distribution pipeline routes from the new Service Reservoirs (SR) to pipe connection points are investigated and used as present data for the pipe network analysis.

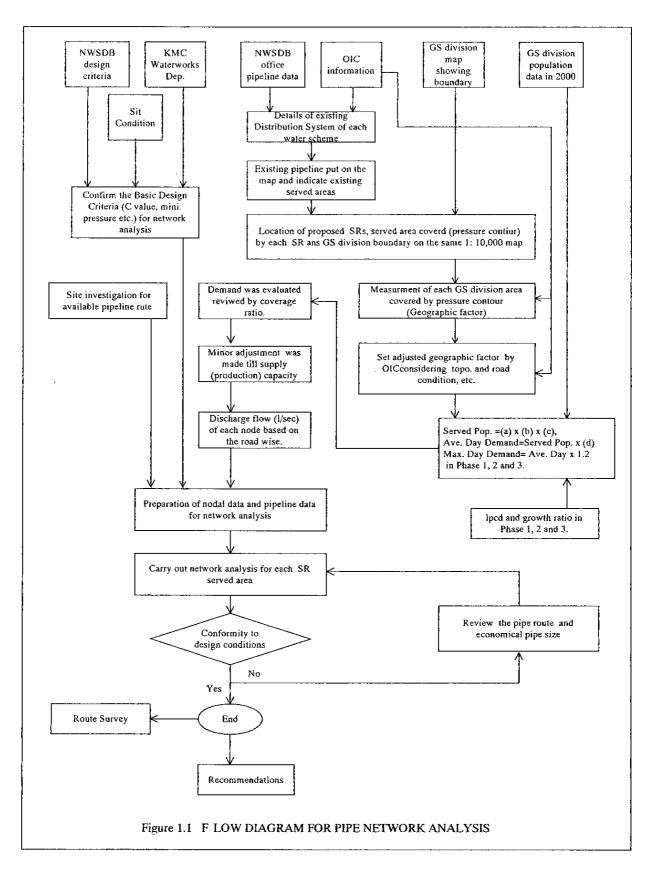


Table 2.1-1 Capacities and Elevations of Proposed Service Reservoirs in Phase 1

| SR    | Name of Service Resevoir  | Water L | evel (m) | Capacity | Туре     |
|-------|---------------------------|---------|----------|----------|----------|
| No.   |                           | LWL     | HWL      | (m3)     |          |
| SR-1  | Asgiriya                  | 561.50  | 567.00   | 4,100    | Ground   |
| SR-2  | Bahirawakanda             | 625.00  | 629.00   | 600      | Elevated |
| SR-3  | Bangalawatta              | 518.28  | 521.28   | 300      | Ground   |
| SR-4  | Dangolla                  | 527.60  | 531.60   | 500      | Ground   |
| SR-5  | Elhena                    | 611.00  | 615.00   | 300      | Ground   |
| SR-6  | Gohagoda (Paliemulla New) | 527.20  | 531.20   | 200      | Ground   |
| SR-7  | Hantana Place             | 637.00  | 641.00   | 200      | Ground   |
| SR-8  | Heerassagala Low          | 566.00  | 570.00   | 200      | Ground   |
| SR-9  | Heerassagala Middle       | 613.00  | 617.00   | 250      | Ground   |
| SR-10 | Heerassagala Upper        | 674.00  | 678.00   | 200      | Ground   |
| SR-11 | Kahalla                   | 485.00  | 491.25   | 600      | Elevated |
| SR-12 | Kahawatta                 | 516.00  | 522.25   | 600      | Elevated |
| SR-13 | Kondadeniya               | 531.25  | 535.25   | 200      | Ground   |
| SR-14 | Kulugammana               | 579.25  | 583.25   | 100      | Ground   |
| SR-15 | Kurugoda                  | 569.00  | 573.00   | 600      | Ground   |
| SR-16 | Mullepihilla Low New      | 709.00  | 713.00   | 100      | Ground   |
| SR-17 | Pihilladeniya             | 522.14  | 524.14   | 200      | Ground   |
| SR-18 | Thelambugahawatta         | 561.50  | 566.75   | 500      | Elevated |
| SR-19 | Uplands                   | 560.09  | 566.00   | 2,960    | Ground   |

# 2.1.4 Network Analysis

Such design criteria as C value, minimum pressure at the end of network and others, were studied for the present pipe network analysis. Nodal data and pipeline data were also prepared, based on the available information, as shown below.

The network analyses for each water scheme for Full Target Year 2015 (Phase 3) were carried out.

To design the proper diameter of new distribution feeder main/s, pipe route condition and economical pipe size are taken into consideration for the most economical and technically acceptable design.

Distribution of water demands to each node in pipe network is conducted as shown below. The Greater Kandy varies its population, in general, by the class of alongside roads in the district/area. Therefore, the projection of served population by the water system is considered to follow and depend on this characteristic.

The water demand distribution for pipe network analysis was made taking into account the above specialty, and the water demand density per 100m length of main road or pipeline was estimated with the method presented below, for demand distribution to the pipe network.

- 1. Classify the roads in the respective network, into the three classes, (1) Main road, (2) General road, and (3) Foot-pass.
- 2. Estimate the population per above classes as unit population per 100m pipelines.
- Calculate the water demand, applying the length of pipeline, unit population density and the unit per capita water demand.
- 4. Each node's demand distribution was calculated basically as described in the above. And, the demand for such node, which has intersection of plural number of roads, was calculated by applying the proportional distribution.

## 2.1.5 KMC Network Analysis

Regarding the KMC distribution network, the Feasibility Study on Water Supply Augmentation and Distribution for Kandy (ADB LOAN NO.1632-SRI [SF]), prepared by Engineering

Consultants Limited in September 2000, has been reviewed. Distribution feeder mains to be implemented by the Phase 1 project were designed based on the result of discussion with KMC officials concerned.

#### 2.2 Basic Conditions

#### 2.2.1 Coverage of Distribution Pipe Design

Distribution feeder main pipe from the new Service Reservoirs (SR) to connected point of the nearby pipe network and the fundamental pipelines for strength or augmentation of network were selected and made detailed design.

## 2.2.2 Design Criteria for Distribution Network Analysis

The following design criteria for distribution network analysis are applied:

#### 1) Peak Factor

- Maximum daily demand / average daily demand is 1.2
- Hourly demand / Maximum daily demand is 1.78
- Hourly demand / average daily demand is 2.0
- The required hourly peak demand for distribution network analysis of 10 WSS is presented in Table 2.1-2.

## 2) Node and Pipeline Data

- Discharge flow of each node is hourly demand (l/sec).
- In case of PVC, internal diameter is applied.

#### 3) Software Program

The network analysis is carried out using US software, which is a user-friendly program based on Ky-pipes and operated on MS-dos.

#### 4) C value of Hazen-Williams Formula

| Material      | DCIP     | PVC | ACP | SS or GI |
|---------------|----------|-----|-----|----------|
| New Pipe      | 140      | 140 |     |          |
| Existing Pipe | (CI=) 90 | 120 | 120 | 120      |

#### 5) Residual Pressure

Minimum pressure is at the end of network is 0.1 Mpa (= 1.0 kgf/cm<sup>2</sup>), ant any node. 0.6bar (6m water head) residual pressure at the house connection is designed.

## 6) Break Pressure Tank (BPT)

At the location where dynamic pressure is exceeding 0.7 Mpa (= 7.0 kgf/cm<sup>2</sup>) break pressure tank facilities are designed.

## 3. Existing Distribution Network

## 3.1 Alawathugoda WSS

The present situation of Alawatthugota Water Supply Scheme is briefly presented below. In this scheme, the existing two water reservoirs of Villana with 75 m<sup>3</sup> water capacity and Owissa that with 50 m<sup>3</sup> is covering the Alwathugoda Scheme distribution system. The far north and the southern part distribution areas are supplied water via break pressure tank/s (BPT) by reducing the pipe system pressure.

#### 3.2 Akurana WSS

The existing Akurana water system has a water reservoir with capacity 600m<sup>3</sup>, which is receiving the water from two boreholes and supplying to this entire scheme.

#### 3.3 Balanagala WSS

The existing Balanagala water system is located adjacent to the Polgolla Scheme and has a water reservoir with capacity 450m<sup>3</sup>, which is supplying to the pipe network of this entire scheme.

#### 3.4 Polgolla WSS

In this Scheme, there exist two water reservoirs of Bagalawatta: 100 m<sup>3</sup> and Pihilladeniya: 100 m<sup>3</sup>, located in the Madawale area in north. These two reservoirs cover the entire supply area and have almost the same water level.

Further, there is another water reservoir at Napana: 150 m<sup>3</sup>, in this Scheme, which is not used at present but, be re-used in the future. This reservoir has its water level/elevation 20m lower than that of the other two reservoirs.

And in the south area, there is an existing Polgolla reservoir, which is planned not be used in the future. As described in the above, this Scheme is adjacent to the Balanagala Scheme.

#### 3.5 Kulugammana WSS

The Existing Kulugammana Service Reservoir (300m³) is covering this entire scheme's water system.

## 3.6 Kondadeniya WSS

In this Scheme, the existing Kondadeniya Service Reservoir (300m³) is covering the entire system water.

## 3.7 Gohagoda WSS

In this Scheme, the entire system is covered by the following two sub-systems, which are separated by the gate valve:

- (1) Gohagoda Wegiriya Service Reservoir (Old: 300m³) & Gohagoda Low Service Reservoir (Pallemulla: 150m³)
- (2) Yatihagala Service Reservoir: 150m<sup>3</sup>

# 3.8 Ampitiya WSS

This Scheme's entire system is covered by the following two sub-systems:

- (1) Existing Ampitiya Service Reservoir (900m³), which covers the southern part of this Scheme,
- (2) Existing Meekanuwa Service Reservoir (225 m<sup>3</sup>), which covers the northern part.

This Scheme has not sufficiently developed the pipe network system, compared to the other Scheme. Further, along the trunk main road (Ampitiya Road) in this area, there exists asbestos cement pipe (AC pipe) with 6.1km in length. It is necessary be replaced with the other pipe material for this AC pipe, which has disadvantages as high rate carcinogenic material and less durability for heavy traffic load.

#### 3.9 Mullepihilla WSS

In this Scheme, the entire system is covered by the following two sub-systems:

- (1) Mullepihilla Low Service Reservoir (25 m<sup>3</sup>) for lower elevation service area, and
- (2) Mullepihilla High Service Reservoir (25 m<sup>3</sup>) for higher elevation service area.

This Scheme has the most simple service system, as one distribution pipeline. And, the pipeline in high service area is functioning both as transmission and distribution pipeline.

#### 3.10 Hantana WSS

This Scheme's entire system is covered by the following two sub-systems:

Hantana Low/R4 Service Reservoir (1365m<sup>3</sup>), which covers the lower area this Scheme, and (2) Hantana High/R2 Service Reservoir (25m<sup>3</sup>), which covers the high area.

## 3.11 Heeresasagala WSS

This Scheme is the newly included scheme for the present Design Study, for which water supply system is entirely less developed compared to the other WSS. The present water system is composed of as follows:

- (1) Untreated spring water supply for Heeresasagala Low SR, which is diverted from KMC system.
- (2) Treated spring water supply for Heeresasagala Middle SR, which is diverted from KMC system.
- (3) Untreated spring water supply for Heeresasagala Upper SR, which is diverted from the Regional Council.

## 4. Future Improvement Plan for Distribution Networks

## 4.1 General

Based on the preceding development plan for distribution system and existing network analysis,

the future distribution network improvement has reviewed and studied for design as presented in the following.

4.2 Vilana & Owissa SR and Kurugoda SR Network (See Appendix- 5.1 Improvement of Distribution Network in 2015)

For this Scheme, a new Kurugoda Service Reservoir (SR) with the capacity 600 m<sup>3</sup> is designed in the south. From the system pressure contour line, the distribution area/s covered by the existing and new SRs are identified as follows:

- (1) Area covered by Vilana & Owissa (SR):
  - Northern part of Alawathugoda,
- (2) Area covered by Kurugoda SR:
  - Southern part of Alawathugoda and
  - A part of northern part of Akurana.

By the above improvement, the coverage or lord for water distribution for two SRs Vilana and Owissa could be reduced or eased. And, in the northern part of Akurana, the higher elevation (GL above 510m) than that water elevation of Akurana SR, could be supplied from this improved system.

Through this pipe hydraulic analysis, a pipe system to connect the Kurugoda SR via A9 Road and to the east could be designed. That target is to improve the total system pressures, and to supply water not only the nearby SR but also to cover the higher elevation area.

4.3 Akurana SR, Thelambugahawatta SR and Kahawatta SR Network (See Appendix- 5.2 Improvement of Distribution Network in 2015)

For this Scheme following two new service reservoirs have been planned and designed:

- (1) Thelambugahawatta SR (500 m<sup>3</sup>) in the north-east of Akurana, and
- (2) Kahawatta SR (600 m<sup>3</sup>) in the south of Akurana.

In this Scheme, due above improvement, the existing Borehole system is considered as it could be used as the standby system in the future. From the system pressure contour line, the Thelambugahawatta SR is observed capable to supply water to the north-east of Akurana area.

The majority part of this Scheme has high potentiality of future water demand increase. Even though, this area has not covered by the existing pipe system from the Akurana SR.

Some part of this area has rather high ground elevation (GL540m above), compared to the proposed Service Reservoir. Due mainly this reason, it is observed hydraulically difficult to supply water from the proposed entire system. Considering this background, it is urgently required to improve the water system in this service area.

Under the present design/planning, the service reservoir in this area is proposed be elevated from the ground to meet the required system pressure for the Scheme. And, by forming the pipe mesh network, the total system could be analyzed hydraulically in flexible manner, which results for the optimum operation of the distribution network.

While, the system pressure contour line produced by the Akurana SR indicates that, the water supply boundary could be extended/covered to the southern part of this network. This is interpreted that, the present Borehole system, which supply water to almost all the existing system, could be substituted by the gravity/reservoir supply system. The gravity system supply system produces hydraulically more economical and stable water supply in the Scheme.

The network Nodes: 2080 – 2081 could be connected by pipeline, which objects the expanded water supply to the residents in/along this pipe line area. Further, the existing SR Akurana system pressure contour line indicated that, this SR could cover the northern part of Akurana.

As mentioned in the above section, the new construction of Thelambugahawatta and Kahawatta SRs could improve the water supply situation to the north of Akurana from Kurugoda SR. And the burden of the distribution load/coverage was eased or reduced from Akurana SR.

4.4 Balanagala SR and Kahalla SR Network (See Appendix- 5.3 Improvement of Distribution Network in 2015)

This Scheme is planned and designed to be constructed a new Kahalla Service Reservoir (600 m<sup>3</sup>) in the western part of this Scheme/service area.

The system pressure contour line for this network indicates that, the water distribution coverage areas are:

- (1) Kahalla SR could extend and serve to the Balanagala Scheme and the western part of service area where pipe network is not developed yet, and
- (3) The existing Balanagala SR is planned be connected to the existing pipe network which is covered by the Polgolla SR. These networks are planned/designed to be combined to form bigger size of pipe network, which create more rational and practical water use.
- 4.5 Bangalawatta SR and Pihilladeniya SR Network (See Appendix- 5.4 Improvement of Distribution Network in 2015)

For this Scheme, any new reservoir construction is not planned. However, the existing two reservoirs are to be expanded: Bangalawatta is planed to expand its capacity by 300m<sup>3</sup> to 400 m<sup>3</sup>, and that of Pihilladeniya by 200 m<sup>3</sup> to 300 m<sup>3</sup>, respectively.

From the system pressure contour line, the all area in this Scheme is observed capable for water supply from the existing/expanded SRs except for the southeastern part of the scheme. It is found that, in future, the Napana SR could be revived its use. Then, the nearby service area only is

capable for service from this SR. Since, the water elevation of this SR is not high enough to cover far/remote area from this reservoir. Therefore, two options for the future have been proposed. (See Appendix 5.4, Option 1 & Option 2).

The above plan would result that, the Balanagala SR could be eased from heavy burden/load to cover larger service area.

While the Polgolla SR is scheduled be abandoned in the future, the connected pipe network should be combined with the aforementioned Balanagala SR service network to form larger pipe network for optimum operation.

4.6 Kulugammana SR Network (See Appendix- 5.5 Improvement of Distribution Network in 2015)

For this Scheme, any new reservoir construction is not planned. However, the existing reservoir Kulugammana SR is planed be expanded its capacity by 300m<sup>3</sup> to 400 m<sup>3</sup>.

From the system pressure contour line, the all area in this Scheme is observed capable for water supply from the existing/expanded SRs, except for the northeastern part of the scheme. This particular area has now been proposed to be isolated and served using an in-line booster station as an interim measure until the proposed SR at Nugawela (Phase 2) is in place. Many reinforcements for the other areas have been proposed to enhance the performance of the scheme.

4.7 Kondadeniya SR Network (See Appendix- 5.6 Improvement of Distribution Network in 2015)

For this Scheme network, any new reservoir construction is not planned. However, the existing reservoir Kondadeniya SR could be expanded its capacity by 200m<sup>3</sup> to 500m<sup>3</sup>.

From the system pressure contour line, the all area in this Scheme is considered as capable for water supply from the existing/expanded SRs. The existing pipe system of this Scheme forms tree-blanch structure. Further, from the geographical location, it is rather difficult to structure

mesh type pipe network.

4.8 Gohagoda SR Network (See Appendix - 5.7 Improvement of Distribution Network in 2015)

For this Scheme network, a new service reservoir Gohagoda New SR (with capacity 200m<sup>3</sup> and elevation GL= 524m) is designed next to the existing Gohagoda Low SR, and total capacity is expanded to 350 m<sup>3</sup>.

From the system pressure contour line, the all area in this Scheme is capable be supplied water from the existing/expanded SRs. However, the Yatihagala sub-system is not included but isolated with the boundary valve. With the pipe network analysis, the service areas of the respective SR were demarcated and the existing Gohagoda Low SR has been proposed to serve the low elevated areas in the southern part of the scheme. At the same time the New Gohagoda SR will contribute to reduce the service coverage burden for Gohagoda Wegiriya (Old) SR while serving the high elevated areas. Furthermore, in case of emergency, the service water could hydraulically be supplied to the Yatihagala Scheme.

4.9 Elhena SR Network (See Appendix- 5.8 Improvement of Distribution Network in 2015)

For this Scheme, a new service reservoir Elhena SR (with capacity 300m<sup>3</sup> and elevation GL=611m) is designed in the eastern part.

From the system pressure contour line, the Elehena SR is capable to cover nearby this SR, which has comparatively higher elevation than that of western part of Ampitiya. With the pipe network analysis, it has been observed that certain areas in the vicinity of the SR would experience excessive pressures. Therefore, Elhena SR is proposed to serve only the high elevated areas in the northeastern and southwestern parts of the existing Ampitiya Scheme. The rest of the service area would continue to be served by the Ampitiya SR.

Further, The existing AC pipe augmenting pipeline (Node 8042 – 8045 line) could be improved, to increase the system pressure. At the same time, this will contribute to reduce the service coverage burden for Ampitiya SR. Furthermore, the aforementioned existing AC pipeline should replaced or improved to keep stable and safe water to the service.

4.10 Mullepihilla SR Network (See Appendix- 5.9 Improvement of Distribution Network in 2015)

For this Scheme, a new service reservoir Mullepihilla New SR (with capacity 100m<sup>3</sup> and elevation GL= 710.5m) is designed next to the existing Mullepihilla Low SR(capacity 25 m<sup>3</sup>), and total capacity is expanded to 125 m<sup>3</sup>. From the system pressure contour line, it is observed that geographically capable service area is Mullepihilla Low area in this Scheme.

The existing Mullepihilla High SR could cover the Mullepihilla High area. Further, this could serve rationally to these area covered by Ampitiya SR which has the most highest elevation (GL = 586m).

4.11 Hantana Place SR Network (See Appendix- 5.10 Improvement of Distribution Network in 2015)

Under this Scheme network, a new service reservoir Hantana Place SR (with capacity 200m<sup>3</sup>) in the south-west.

From the system pressure contour line, it is observed that hydraulically capable service area by Hantana Place SR is the very limited area of south-western part of existing Hantana Scheme. This will contribute to the Hantana Low/R4 to ease and reduce its load of water service coverage.

On the other hand, the Hantana SR could cover the central part of this Scheme and the Hantana High/R2 could cover the higher elevation area with its elevation potential. Therefore, it has now been proposed to serve only the southwestern part of the existing scheme by this new SR. However, at the request of the KMC, some provision have been made to serve the Kandy

Hospital Quarters and the Nagastenna area which lie within the KMC limits.

4.12 Heeresasagala Middle and Upper SRs Network (See Appendix- 5.11 Improvement of Distribution Network in 2015)

For this Scheme, two new service reservoirs (1) Heeressagala Upper SR (200m³) and Heeresasagala Middle SR (250m³) are planned/designed.

From the system pressure contour line, it is geographically observed that the capable area covered by the two reservoirs is:

- (1) Heeressagala Middle SR: Northern part of this Scheme, and
- (2) Heeressagala Upper SR: Southern part of this Scheme.

The distribution networks are planned be supplied by the separate two systems.

One system: Heeresasagala Middle, will be constructed and operated by NWSDB.

From the pipe network analysis for the above, it could be expected the two separate systems will operate the stable and optimum water supply, from each SR respectively.

From the Heeressagala Upper SR, as requested by the KMC, supply to be extended to feed the existing Elagolla SR via a gravity distribution main.

5. Phase 1 Distribution Pipeline

The proposed pipelines in the outside of KMC service area and KMC area are presented in Table 5.1 shown below.

Distribution trunk feeder pipe from the new or expanded SR to the connection point to the distribution network shall be selected considering the economical size, and have some allowance taking consideration on unforeseen future water demand.

In addition, some new distribution pipes which are required to strengthen the existing distribution network and expanded service area, shall also be selected taking into account the opinions given by the OIC of present WSS, for such as future development area, area where ground well yield are poor, intermitted supply area, etc. Among such pipelines, high priority pipe that is quite effective for hydraulically might be selected and included in the detailed design.

The each service zone will be formed the independently of distribution network with existing and new pipelines, and as the result, the following improvement or betterment are predicted.

- (1) Many houses which has been waiting the connection to water supply, can be connected and get clean water.
- (2) Present intermittence water supply condition will be improved to supply continuously.
- (3) Low or negative pressure area will be dissolved and appropriate pressure will be kept.
- (4) Development and expanded area will get water anytime.

Table 5.1 Phase 1 Distribution Pipelines

(1/3)

| Name of           | Drawing | Route  | Pipe     | Material | Pipeline |
|-------------------|---------|--------|----------|----------|----------|
| Service Reservoir | Number  | Number | Diameter | DI/PVC   | Length   |
|                   |         |        | (mm)     |          | (m)      |
| Kurugoda          | 40-C-01 | 1      | 250      | DI       | 1,090    |
|                   |         |        | 225      | PVC      | 760      |
|                   |         |        | 160      | PVC      | 210      |
|                   | 40-C-02 | 2      | 225      | PVC      | 220      |
|                   |         |        | 110      | PVC      | 660      |
|                   | 40-C-03 | 3      | 90       | PVC      | 1,030    |
|                   | 40-C-04 | 4      | 225      | PVC      | 230      |
|                   | 40-C-05 | 5      | 160      | PVC      | 560      |
|                   | 40-C-06 | 6      | 160      | PVC      | 420      |
|                   | 40-C-07 | 7      | 90       | PVC      | 440      |

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|                           | ··· <del>- · · · · · · · · · · · · · · · · ·</del> |        | ·        |          | (2/3)    |
|---------------------------|--|--------|----------|----------|----------|
| Name of                   | Drawing  | Route  | Pipe     | Material | Pipeline |
| Service Reservoir         | Number   | Number | Diameter | DI/PVC   | Length   |
|                           | ļ  |        | (mm)     | ļ        | (m)      |
| Thelambugahawatta         | 40-C-08  | 8      | 225      | PVC      | 200      |
|                           |  |        | 160      | PVC      | 880      |
|                           | 40-C-09  | 9      | 110      | PVC      | 890      |
|                           | 40-C-10  | 10     | 160      | PVC      | 1,400    |
|                           |  |        | 90       | PVC      | 750      |
|                           | 40-C-11  | 11     | 160      | PVC      | 290      |
| Kahawatta                 | 40-C-12  | 12     | 110      | PVC      | 560      |
|                           |  |        | 100      | DI       | 30       |
|                           | 40-C-13  | 13     | 110      | PVC      | 340      |
|                           | 40-C-14  | 14     | 225      | PVC      | 800      |
|                           | 40-C-15  | 15     | 300      | DI       | 220      |
|                           |  |        | 225      | PVC      | 670      |
| Kahalla                   | 40-C-16  | 16     | 300      | DI       | 580      |
|                           |  |        | 160      | PVC      | 640      |
|                           | 40-C-17  | 17     | 250      | DI       | 130      |
|                           |  |        | 225      | PVC      | 720      |
|                           | ]  |        | 160      | PVC      | 470      |
|                           | 40-C-18  | 18     | 160      | PVC      | 440      |
|                           |  |        | 110      | PVC      | 250      |
|                           |  |        | 100      | DI       | 100      |
|                           |  |        | 90       | PVC      | 880      |
|                           | 40-C-19  | 19     | 90       | PVC      | 300      |
| Bangalawatta &            | 40-C-20  | 20     | 250      | DI       | 240      |
|                           |  |        | 225      | PVC      | 1,030    |
| Pihilladeniya             | 40-C-21  | 21     | 225      | PVC      | 1,090    |
| Kurugammana               | 40-C-22  | 22     | 250      | DI       | 170      |
| -                         | 40-C-23  | 23     | 100      | DI       | 100      |
|                           |  |        | 90       | PVC      | 430      |
| Kondadeniya               | 40-C-24  | 24     | 250      | DI       | 60       |
|                           | •  |        | 225      | PVC      | 170      |
| Gohagoda New (Pallemulla) | 40-C-25  | 25     | 300      | DI       | 70       |
|                           | 40-C-26  | 26     | 225      | PVC      | 340      |
| Elhena                    | 40-C-27  | 27     | 250      | DI       | 140      |
|                           |  |        | 225      | PVC      | 670      |
|                           | 40-C-28  | 28     | 160      | PVC      | 430      |
|                           | 40-C-29  | 29     | 160      | PVC      | 540      |
| Mullepihilla Low New      | 40-C-29  | 30     | 160      | PVC      | ) J-0    |
| Hantana Place             | 40-C-31  | 31     | 225      | <b> </b> | 380      |
| Hamalia Fiace             | 140-0-31   | 21     | 223      | PVC      | 360      |

|                     |         |        |          |          | (3/3)    |
|---------------------|---------|--------|----------|----------|----------|
| Name of             | Drawing | Route  | Pipe     | Material | Pipeline |
| Service Reservoir   | Number  | Number | Diameter | DI/PVC   | Length   |
|                     |         |        | (mm)     |          | (m)      |
| Heerassagala Upper  | 40-C-32 | 32     | 160      | PVC      | 340      |
|                     | 40-C-33 | 33     | 225      | PVC      | 140      |
|                     |         |        | 160      | PVC      | 370      |
|                     | 40-C-34 | 34     | 110      | PVC      | 590      |
| Heerassagala Middle | 40-C-35 | 35     | 250      | DI       | 220      |
|                     |         |        | 200      | DI       | 40       |
|                     | 40-C-36 | 36     | 110      | PVC      | 160      |
| Bahirawakanda       | 40-C-37 | 37     | 250      | DI       | 120      |
| Asgiriya            | 40-C-38 | 38     | 250      | DI       | 190      |
|                     | 40-C-39 | 39     | 500      | DI       | 680      |
|                     |         |        | 450      | DI       | 1,210    |
|                     | 40-C-40 | 40     | 400      | DI       | 330      |
| Heerassagala Low    | 40-C-41 | 41     | 250      | DI       | 280      |

Total 27,690

## 6 Recommendation/Comment

## 1) Thelambugahawatta and Kahalla Service Zones

These two service zones are installed less existing pipelines, hence new pipelines and house connections are required to meet the water demand in Phase 1.

When it is necessary, in addition to the pipes, which will be procured under the proposed Phase 1 Project, NWSDB is recommended to prepare the additionally required pipe materials and house-connection piping materials for future installation.

## 2) High Elevation Area

The Kandy District is geographically comprised of hilly terrain, with elevation varying from 300m to 2,000m above mean sea level (MSL). The major perennial river in this district is the Mahaweli Ganga (River), which has many tributaries in the district. In the service zones in Kandy, there exist some higher elevation areas where water cannot be supplied by gravity. Even in such

areas, water is acutely needed for the resident's daily life. In such case, booster pump/s is required for water distribution.

#### 3) Isolation Valve

This valve is designed for functioning not only isolation of the service zones, but also interconnection of each service zone, in the case of emergency. Therefore, the installed valve location shall be recorded and valve conditions shall be maintained properly, for normal future operation.

#### 4) Reformation of WSS

The present water supply scheme/s might be reformed on the basis of the new service area. If, any scheme has necessary been reformed, a new organization shall be considered.

# 5) Supply Amount Measurement

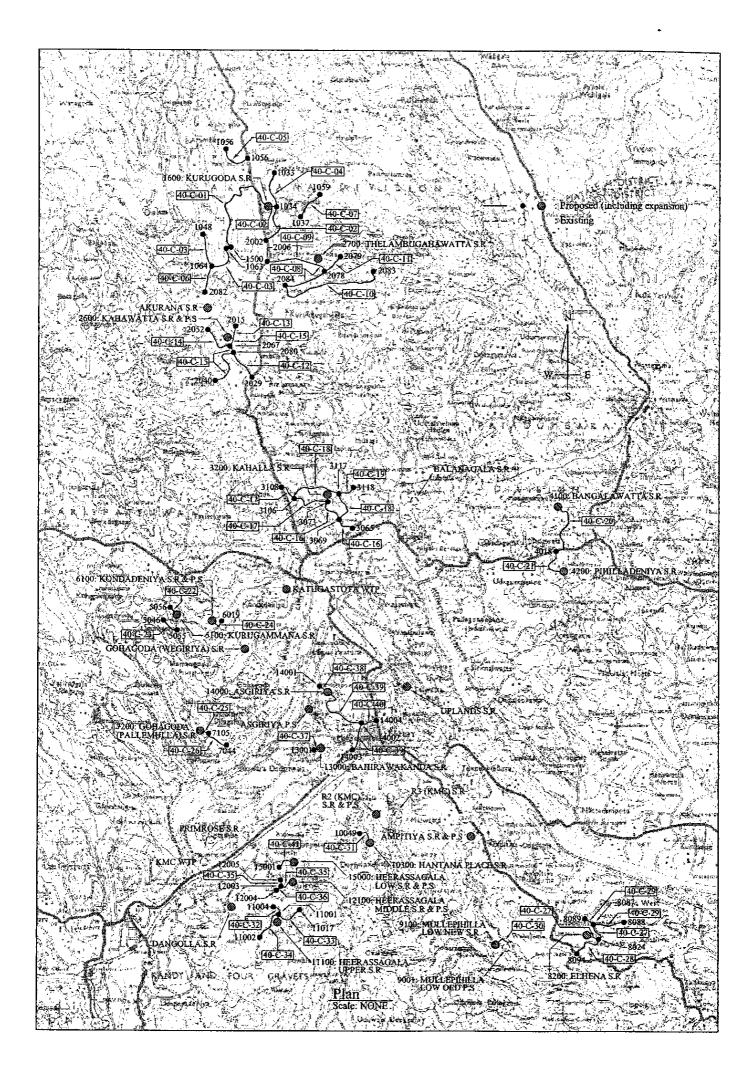
To monitor the total water amount supplied to the consumers and bulk supply to KMC area, flow meters shall be equipped, at the outlet pipe of service reservoirs.

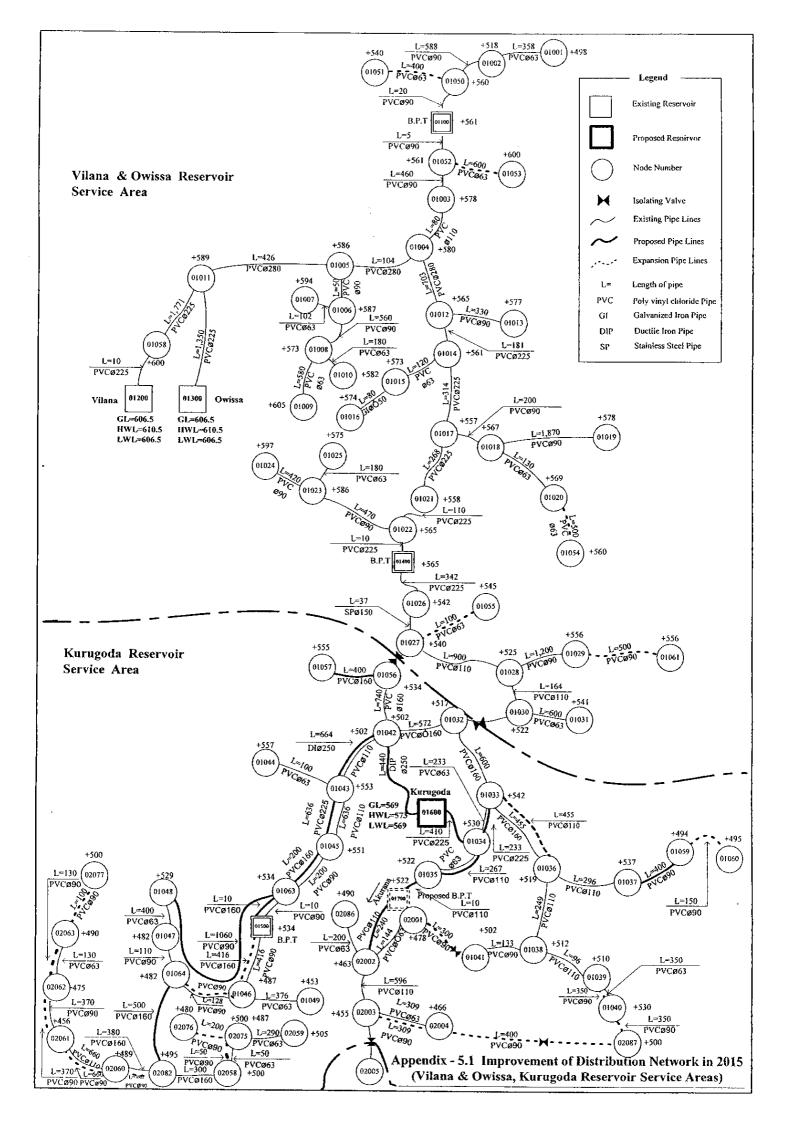
Further, the water amount supplied to each service zone shall be recorded, and analyzed for the water demand situations, which could be reviewed for future water demand projections as well.

## 6) ACP in Ampitiya Service Area

In this Water Supply Scheme, many AC pipelines were installed and are existing in use, which are weak material compare with PVC or DCIP, thus it is deteriorated and broken easily affected by external load.

In the future, these AC pipes are recommended replaced with PVC pipes or DCIP, to avoid leakage from broken pipes and to reduce pipe repair works, under a plan for strengthening pipeline.





DATE: 3/ 7/2002 TIME: 10:29:32

INPUT DATA FILENAME ----- c:\D\_nets\2015\KURU2015.DAT TABULATED OUTPUT FILENAME ---- c:\D\_nets\2015\KURU2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\KURU2015.RES

#### UNITS SPECIFIED

FLOWRATE .... = liters/second

HEAD (HGL) ..... = meters PRESSURE .... = kpa

#### REGULATING VALVE DATA

| VALVE | POSITION | CONTROLLED | VALVE      |
|-------|----------|------------|------------|
| TYPE  | JUNCTION | PIPE       | SETTING    |
|       |          |            | (m or 1/s) |
| PRV-1 | 1500     | 14         | 534.00     |
| PRV-1 | 1500     | 47         | 534.00     |
| PRV-1 | 1700     | 59         | 525.30     |

#### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE   | NODE | NOS. | LENGTH (m) | DIAMETER | ROUGHNESS | MINOR LOSS | FGN-H |
|--------|------|------|------------|----------|-----------|------------|-------|
| NUMBER | #1   | #2   |            | (cm)     | COEFF.    | COEFF.     | (m)   |
| 1      | 2077 | 2063 | 100 0      | 7 9      | 130 00    | 00         |       |

569. 569.

| 2     | 2063 | 2062 | 130.0  | 5.5  | 120.00 | .00 |
|-------|------|------|--------|------|--------|-----|
| 3     | 2062 | 2061 | 370.0  | 7.9  | 120.00 | .00 |
| 4     | 2061 | 2060 | 660.0  | 9.7  | 120.00 | .00 |
| 5     | 2060 | 2082 | 380.0  | 14.0 | 120.00 | .00 |
| 6     | 2082 | 2058 | 300.0  | 14.0 | 120.00 | .00 |
| 7     | 2058 | 2075 | 50.0   | 5.5  | 120.00 | .00 |
| 8     |      |      |        | 5.5  |        |     |
|       | 1048 | 1047 | 400.0  |      | 120.00 | .00 |
| 9     | 1064 | 1046 | 128.0  | 7.9  | 120.00 | .00 |
| 10    | 1064 | 2082 | 500.0  | 14.0 | 130.00 | .00 |
| 11    | 2076 | 2075 | 200.0  | 7.9  | 130.00 | .00 |
| 12    | 1046 | 1049 | 376.0  | 5.5  | 120.00 | .00 |
| 13    | 2075 | 2059 | 290.0  | 5.5  | 120.00 | .00 |
| 14-RV | 1500 | 1046 | 416.0  | 7.9  | 120.00 | .00 |
| 15    | 1045 | 1063 | 200.0  | 7.9  | 120.00 | .00 |
| 16    | 1045 | 1043 | 636.0  | 9.7  | 120.00 | .00 |
| 17    | 1043 | 1044 | 100.0  | 5.5  | 120.00 | .00 |
| 18    | 1043 | 1042 | 664.0  | 9.7  | 120.00 | .00 |
| 19    | 1042 | 1056 | 740.0  | 14.0 | 120.00 | .00 |
| 20    | 1056 | 1057 | 400.0  | 7.9  | 130.00 | .00 |
| 21    | 1042 | 1032 | 572.0  | 14.0 | 120.00 | .00 |
| 22-FG | 0    | 1042 | 440.0  | 25.0 | 130.00 | .00 |
| 23-FG | 0    | 1042 |        |      |        |     |
|       |      |      | 410.0  | 19.8 | 130.00 | .00 |
| 24    | 1034 | 1035 | 267.0  | 5.5  | 120.00 | .00 |
| 25    | 1035 | 1700 | 10.0   | 9.7  | 130.00 | .00 |
| 26    | 2001 | 2002 | 144.0  | 5.5  | 120.00 | .00 |
| 27    | 2002 | 2003 | 396.0  | 9.7  | 120.00 | .00 |
| 28    | 2003 | 2004 | 309.0  | 5.5  | 120.00 | .00 |
| 29    | 1032 | 1033 | 600.0  | 14.0 | 120.00 | .00 |
| 30    | 1033 | 1034 | 233.0  | 5.5  | 120.00 | .00 |
| 31    | 1033 | 1036 | 455.0  | 14.0 | 120.00 | .00 |
| 32    | 1036 | 1037 | 296.0  | 9.7  | 120.00 | .00 |
| 33    | 1037 | 1059 | 400.0  | 7.9  | 130.00 | .00 |
| 34    | 1059 | 1060 | 150.0  | 7.9  | 130.00 | .00 |
| 35    | 1036 | 1038 | 249.0  | 9.7  | 120.00 | .00 |
| 36    | 1038 | 1039 | 96.0   | 9.7  | 120.00 | .00 |
| 37    | 1039 | 1040 | 350.0  | 5.5  | 120.00 | .00 |
| 38    | 1038 | 1041 | 133.0  | 7.9  | 120.00 | .00 |
| 39    | 1063 | 1041 | 1060.0 |      |        |     |
|       |      |      |        | 7.9  | 130.00 | .00 |
| 40    | 1063 | 1500 | 10.0   | 7.9  | 120.00 | .00 |
| 41    | 1034 | 1035 | 267.0  | 9.7  | 130.00 | .00 |
| 42    | 1039 | 1040 | 350.0  | 5.5  | 120.00 | .00 |
| 43    | 1043 | 1042 | 664.0  | 25.0 | 130.00 | .00 |
| 44    | 2003 | 2004 | 309.0  | 7.9  | 130.00 | .00 |
| 45    | 1045 | 1043 | 636.0  | 19.8 | 130.00 | .00 |
| 46    | 1045 | 1063 | 200.0  | 14.0 | 130.00 | .00 |
| 47-RV | 1500 | 1046 | 416.0  | 14.0 | 130.00 | .00 |
| 48    | 2058 | 2075 | 50.0   | 7.9  | 130.00 | .00 |
| 49    | 2062 | 2061 | 370.0  | 7.9  | 130.00 | .00 |
| 50    | 2063 | 2062 | 130.0  | 7.9  | 130.00 | .00 |
| 51    | 1033 | 1034 | 233.0  | 19.8 | 130.00 | .00 |
| 52    | 1063 | 1500 | 10.0   | 14.0 | 130.00 | .00 |
| 53    | 1064 | 1047 | 110.0  | 7.9  | 120.00 | .00 |
| 54    | 2002 | 2086 | 200.0  | 9.7  | 120.00 |     |
| JŦ    | 2002 | 2000 | 200.0  | 9.1  | 120.00 | .00 |

JOB NAME = GKWSAP - JICA - Kurugoda SR

| 55-XX | 2001 | 1041 | 300.0 | 7.9 | 130.00 | .00 |
|-------|------|------|-------|-----|--------|-----|
| 56-XX | 2004 | 2087 | 400.0 | 7.9 | 130.00 | .00 |
| 57    | 2087 | 1040 | 350.0 | 7.9 | 130.00 | .00 |
| 58    | 1039 | 1040 | 350.0 | 9.7 | 130.00 | .00 |
| 59-RV | 1700 | 2002 | 240.0 | 9.7 | 130.00 | .00 |
| 60    | 2060 | 2061 | 660.0 | 7.9 | 130.00 | .00 |
| 61    | 2082 | 2060 | 380.0 | 7.9 | 130.00 | .00 |
| 62    | 1046 | 1064 | 120.0 | 7.9 | 130.00 | .00 |
| 63    | 1033 | 1036 | 455.0 | 9.7 | 130.00 | .00 |

# $\hbox{\tt J} \ \hbox{\tt U} \ \hbox{\tt N} \ \hbox{\tt C} \ \hbox{\tt T} \ \hbox{\tt I} \ \hbox{\tt O} \ \hbox{\tt N} \qquad \hbox{\tt N} \ \hbox{\tt O} \ \hbox{\tt D} \ \hbox{\tt E} \qquad \hbox{\tt D} \ \hbox{\tt A} \ \hbox{\tt T} \ \hbox{\tt A}$

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | JUNCTION<br>ELEVATION<br>(m) | CONN | ECTING | PIPI | s<br> |    |
|--------------------|-------------------|-----------------------------|------------------------------|------|--------|------|-------|----|
| 1032               |                   | 5.14                        | 517.00                       | 21   | 29     |      |       |    |
| 1033               |                   | .78                         | 542.00                       | 29   | 30     | 31   | 51    | 63 |
| 1034               |                   | .81                         | 530.00                       | 23   | 24     | 30   | 41    | 51 |
| 1035               |                   | .57                         | 522.00                       | 24   | 25     | 41   |       |    |
| 1036               |                   | .53                         | 519.00                       | 31   | 32     | 35   | 63    |    |
| 1037               |                   | .65                         | 537.00                       | 32   | 33     |      |       |    |
| 1038               |                   | .45                         | 512.00                       | 35   | 36     | 38   |       |    |
| 1039               |                   | .36                         | 510.00                       | 36   | 37     | 42   | 58    |    |
| 1040               |                   | .32                         | 530.00                       | 37   | 42     | 57   | 58    |    |
| 1041               |                   | .19                         | 502.00                       | 38   | 55     |      |       |    |
| 1042               | 3                 | 2.74                        | 502.00                       | 18   | 19     | 21   | 22    | 43 |
| 1043               |                   | .90                         | 553.00                       | 16   | 17     | 18   | 43    | 45 |
| 1044               |                   | .05                         | 557.00                       | 17   |        |      |       |    |
| 1045               |                   | .44                         | 551.00                       | 15   | 16     | 45   | 46    |    |
| 1046               |                   | 2.23                        | 487.00                       | 9    | 12     | 14   | 47    | 62 |
| 1047               |                   | .71                         | 482.00                       | 8    | 53     |      |       |    |
| 1048               |                   | .44                         | 529.00                       | 8    | 39     |      |       |    |
| 1049               |                   | .71                         | 453.00                       | 12   |        |      |       |    |
| 1056               |                   | 1.34                        | 534.00                       | 19   | 20     |      |       |    |
| 1057               |                   | .14                         | 555.00                       | 20   |        |      |       |    |
| 1059               |                   | .18                         | 494.00                       | 33   | 34     |      |       |    |
| 1060               |                   | 4.95                        | 495.00                       | 34   |        |      |       |    |
| 1063               |                   | 1.19                        | 534.00                       | 15   | 39     | 40   | 46    | 52 |
| 1064               |                   | .85                         | 482.00                       | 9    | 10     | 53   | 62    |    |
| 1500               |                   | .00                         | .00                          | 14   | 40     | 47   | 52    |    |
| 1700               |                   | .00                         | .00                          | 25   | 59     |      |       |    |
| 2001               |                   | .21                         | 478.00                       | 26   | 55     |      |       |    |
| 2002               |                   | . 93                        | 463.00                       | 26   | 27     | 54   | 59    |    |
| 2003               |                   | 2.20                        | 455.00                       | 27   | 28     | 44   |       |    |
| 2004               |                   | 3.25                        | 466.00                       | 28   | 44     | 56   |       |    |
| 2058               |                   | .42                         | 500.00                       | 6    | 7      | 48   |       |    |
| 2059               |                   | .31                         | 505.00                       | 13   |        |      |       |    |
| 2060               |                   | .87                         | 489.00                       | 4    | 5      | 60   | 61    |    |
| 2061               |                   | 3.70                        | 456.00                       | 3    | 4      | 49   | 60    |    |

DATE = 03-07-2002 PAGE NO. 4 JOB NAME = GKWSAP - JICA - Kurugoda SR

2062 1.41 475.00 2 3 49 50 2063 .65 490.00 2 50 1 2075 .84 7 11 13 500.00 48 .10 2076 480.00 11 500.00 2077 .44 1

61

 2076
 .10
 480.00
 11

 2077
 .44
 500.00
 1

 2082
 1.06
 495.00
 5
 6
 10

 2086
 .17
 490.00
 54
 50
 50
 50
 57

#### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

### SYSTEM CONFIGURATION

THE RESULTS ARE OBTAINED AFTER 8 TRIALS WITH AN ACCURACY = .00246

#### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1              | 2077      | 2063          | 44       | .02                 | .00                 | .00                  | .09                    | .1                  |
| 2              | 2063      | 2062          | 29       | .07                 | .00                 | .00                  | .12                    | .5                  |
| 3              | 2062      | 2061          | -1.20    | .51                 | .00                 | .00                  | .24                    | 1.3                 |
| 4              | 2061      | 2060          | -3.80    | 2.82                | .00                 | .00                  | .51                    | 4.2                 |
| 5              | 2060      | 2082          | -5.70    | .58                 | .00                 | .00                  | .37                    | 1.5                 |
| 6              | 2082      | 2058          | 1.67     | .05                 | .00                 | .00                  | .11                    | .1                  |
| 7              | 2058      | 2075          | .33      | .04                 | .00                 | .00                  | .14                    | . 7                 |
| 8              | 1048      | 1047          | 3.46     | 22.82               | .00                 | .00                  | 1.46                   | 57.0                |
| 9              | 1064      | 1046          | -3.72    | 1.43                | .00                 | .00                  | .76                    | 11.1                |

| 10       | 1064 | 2082 | 9.80   | 1.78  | .00 | .00 | .64  | 3.5         |
|----------|------|------|--------|-------|-----|-----|------|-------------|
| 11       | 2076 | 2075 | 10     | .00   | .00 | .00 | .02  | .0          |
| 12       | 1046 | 1049 | .71    | 1.14  | .00 | .00 | .30  | 3.0         |
| 13       | 2075 | 2059 | .31    | .19   | .00 | .00 | .13  | . 6         |
| 14-RV    | 1500 | 1046 | 1.84   | 1.26  | .00 | .00 | .38  | 3.0         |
| 15       | 1045 | 1063 | 2.71   | 1.24  | .00 | .00 | .55  | 6.2         |
| 16       | 1045 | 1043 | -2.03  | .85   | .00 | .00 | .27  | 1.3         |
| 17       | 1043 | 1044 | .05    | .00   | .00 | .00 | .02  | .0          |
| 18       | 1043 | 1042 | -1.26  | .37   | .00 | .00 | .17  | .5          |
| 19       | 1042 | 1056 | 1.48   | .09   | .00 | .00 | .10  | .1          |
| 20       | 1056 | 1057 | .14    | .01   | .00 | .00 | .03  | .0          |
| 21       | 1042 | 1032 | 4.81   | .63   | .00 | .00 | .31  | 1.1         |
| 22-FG    | 0    | 1042 | 26.35  | . 58  | .00 | .00 | .54  | 1.3         |
| 23-FG    | 0    | 1034 | 19.94  | 1.01  | .00 | .00 | .65  | 2.4         |
| 24       | 1034 | 1035 | 1.26   | 2.34  | .00 | .00 | .53  | 8.7         |
| 25       | 1035 | 1700 | 6.76   | .11   | .00 | .00 | .91  | 10.7        |
| 26       | 2001 | 2002 | 21     | .05   | .00 | .00 | .09  | .3          |
| 27       | 2002 | 2002 | 5.45   | 3.30  | .00 | .00 | .74  | 8.3         |
| 28       | 2002 | 2003 | .85    | 1.32  | .00 | .00 | .36  | 4.2         |
| 29       | 1032 | 1033 | 33     | .00   | .00 | .00 | .02  | .0          |
| 30       | 1032 | 1033 | 36     | .20   | .00 | .00 | .15  | .8          |
| 31       | 1033 | 1034 | 7.57   | 1.17  | .00 | .00 | .13  | . o<br>2. 5 |
| 32       | 1035 | 1030 | 5.78   | 2.75  | .00 | .00 | .78  |             |
| 33       | 1037 | 1057 | 5.13   | 6.98  |     |     |      | 9.2         |
| 34       | 1057 | 1060 | 4.95   |       | .00 | .00 | 1.05 | 17.4        |
| 35       | 1039 | 1038 |        | 2.45  | .00 | .00 | 1.01 | 16.3        |
| 36       | 1038 | 1038 | 4.38   | 1.38  | .00 | .00 | .59  | 5.5         |
| 36<br>37 | 1038 |      | 3.74   | .40   | .00 | .00 | .51  | 4.1         |
| 38       |      | 1040 | .50    | .55   | .00 | .00 | .21  | 1.5         |
|          | 1038 | 1041 | .19    | .01   | .00 | .00 | .04  | .0          |
| 39       | 1063 | 1048 | 3.90   | 11.15 | .00 | .00 | .80  | 10.5        |
| 40       | 1063 | 1500 | 1.84   | .03   | .00 | .00 | .38  | 3.0         |
| 41       | 1034 | 1035 | 6.07   | 2.34  | .00 | .00 | .82  | 8.7         |
| 42       | 1039 | 1040 | .50    | .55   | .00 | .00 | .21  | 1.5         |
| 43       | 1043 | 1042 | -16.06 | .35   | .00 | .00 | .33  | .5          |
| 44       | 2003 | 2004 | 2.40   | 1.32  | .00 | .00 | .49  | 4.2         |
| 45       | 1045 | 1043 | -14.34 | .85   | .00 | .00 | .47  | 1.3         |
| 46       | 1045 | 1063 | 13.22  | 1.24  | .00 | .00 | .86  | 6.2         |
| 47-RV    | 1500 | 1046 | 8.99   | 1.26  | .00 | .00 | .58  | 3.0         |
| 48       | 2058 | 2075 | .92    | .04   | .00 | .00 | .19  | .7          |
| 49       | 2062 | 2061 | -1.30  | .51   | .00 | .00 | .27  | 1.3         |
| 50       | 2063 | 2062 | 80     | .07   | .00 | .00 | .16  | .5          |
| 51       | 1033 | 1034 | -11.43 | .20   | .00 | .00 | .37  | .8          |
| 52       | 1063 | 1500 | 8.99   | .03   | .00 | .00 | .58  | 3.0         |
| 53       | 1064 | 1047 | -2.75  | .70   | .00 | .00 | .56  | 6.3         |
| 54       | 2002 | 2086 | .17    | .00   | .00 | .00 | .02  | . 0         |
| 55-XX    | 2001 | 1041 |        |       |     |     |      |             |
| 56-XX    | 2004 | 2087 |        |       |     |     |      |             |
| 57       | 2087 | 1040 | -3.06  | 2.34  | .00 | .00 | .62  | 6.7         |
| 58       | 1039 | 1040 | 2.39   | .55   | .00 | .00 | .32  | 1.5         |
| 59-RV    | 1700 | 2002 | 6.76   | 2.57  | .00 | .00 | .91  | 10.7        |
| 60       | 2060 | 2061 | 2.40   | 2.82  | .00 | .00 | .49  | 4.2         |
| 61       | 2082 | 2060 | 1.37   | .58   | .00 | .00 | .28  | 1.5         |
| 62       | 1046 | 1064 | 4.17   | 1.43  | .00 | .00 | .85  | 11.9        |
|          |      |      |        |       |     |     |      |             |

63 1033 1036 3.12 1.17 .00 .00 .42 2.5

## JUNCTION NODE RESULTS

| 1032  | JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | GRADE  | JUNCTION<br>ELEVATION<br>(m) | HEAD  | JUNCTIO<br>PRESSUR<br>(kpa) |
|---|--------------------|-------------------|-----------------------------|--------|------------------------------|-------|-----------------------------|
| 1035         .57         565.65         522.00         43.65         428.09           1036         .53         566.62         519.00         47.62         467.03           1037         .65         563.87         537.00         26.87         263.55           1038         .45         565.24         512.00         53.24         522.11           1040         .32         564.30         530.00         34.30         336.34           1041         .19         565.23         502.00         63.23         620.12           1042         2.74         568.42         502.00         66.42         651.34           1043         .90         568.05         553.00         15.05         147.60           1044         .05         568.05         551.00         16.20         158.89           1045         .44         567.20         551.00         16.20         158.89           1046         2.23         532.74         487.00         45.74         448.51           1047         .71         532.01         482.00         50.01         49.43           1047         .71         532.01         482.00         78.60         770.77  | 1032               |                   | 5.14                        | 567.78 | 517.00                       | 50.78 | 498.03                      |
| 1035         .57         565.65         522.00         43.65         428.09           1036         .53         566.62         519.00         47.62         467.03           1037         .65         563.87         537.00         26.87         263.55           1038         .45         565.24         512.00         53.24         522.11           1040         .32         564.30         530.00         34.30         336.34           1041         .19         565.23         502.00         63.23         620.12           1042         2.74         568.42         502.00         66.42         651.34           1043         .90         568.05         553.00         15.05         147.60           1044         .05         568.05         551.00         11.05         108.35           1045         .44         .67.20         551.00         16.20         158.89           1046         2.23         532.74         487.00         45.74         448.51           1047         .71         532.01         482.00         50.01         49.043           1048         .44         554.82         529.00         25.82         253.26 | 1033               |                   | .78                         | 567.79 | 542.00                       | 25.79 | 252.90                      |
| 1035         .57         565.65         522.00         43.65         428.09           1036         .53         566.62         519.00         47.62         467.03           1037         .65         563.87         537.00         26.87         263.55           1038         .45         565.24         512.00         53.24         522.11           1040         .32         564.30         530.00         34.30         336.34           1041         .19         565.23         502.00         63.23         620.12           1042         2.74         568.42         502.00         66.42         651.34           1043         .90         568.05         553.00         15.05         147.60           1044         .05         568.05         551.00         11.05         108.35           1045         .44         .67.20         551.00         16.20         158.89           1046         2.23         532.74         487.00         45.74         448.51           1047         .71         532.01         482.00         50.01         49.043           1048         .44         554.82         529.00         25.82         253.26 | 1034               |                   | .81                         | 567.99 | 530.00                       | 37.99 | 372.59                      |
| 1040  | 1035               |                   | .57                         | 565.65 | 522.00                       | 43.65 | 428.09                      |
| 1040  | 1036               |                   | .53                         | 566.62 | 519.00                       | 47.62 | 467.03                      |
| 1040  | 1037               |                   | .65                         | 563.87 | 537.00                       | 26.87 | 263.55                      |
| 1040  | 1038               |                   | .45                         | 565.24 | 512.00                       | 53.24 | 522,11                      |
| 1041       .19       565.23       502.00       63.23       620.12         1042       2.74       568.42       502.00       66.42       651.34         1043       .90       568.05       553.00       15.05       147.60         1044       .05       568.05       557.00       11.05       108.35         1045       .44       567.20       551.00       16.20       158.89         1046       2.23       532.74       487.00       45.74       448.51         1047       .71       532.01       482.00       50.01       490.43         1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53   | 1039               |                   | . 36                        | 564.84 | 510.00                       | 54.84 | 537.82                      |
| 1042       2.74       568.42       502.00       66.42       651,34         1043       .90       568.05       553.00       15.05       147.60         1044       .05       568.05       557.00       11.05       108.35         1045       .44       567.20       551.00       16.20       158.89         1046       2.23       532.74       487.00       45.74       448.51         1047       .71       532.01       482.00       50.01       490.43         1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53  |                    |                   | .32                         | 564.30 | 530.00                       | 34.30 | 336.34                      |
| 1043       .90       568.05       553.00       15.05       147.60         1044       .05       568.05       557.00       11.05       108.35         1045       .44       567.20       551.00       16.20       158.89         1046       2.23       532.74       487.00       45.74       448.51         1047       .71       532.01       482.00       50.01       490.43         1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1500       .00       565.95       170       482.00       49.31       483.53         1500       .00       565.55       50       20       20  |                    |                   |                             | 565.23 | 502.00                       | 63.23 | 620.12                      |
| 1044       .05       568.05       557.00       11.05       108.35         1045       .44       567.20       551.00       16.20       158.89         1046       2.23       532.74       487.00       45.74       448.51         1047       .71       532.01       482.00       50.01       490.43         1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95       5       572.00       59.73       585.77         2001       .21       522.69       478.00       44.69       438.2  |                    |                   |                             | 568.42 | 502.00                       | 66.42 | 651.34                      |
| 1045       .44       567.20       551.00       16.20       158.89         1046       2.23       532.74       487.00       45.74       448.51         1047       .71       532.01       482.00       50.01       490.43         1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95           1700       .00       565.95           2001       .21       522.69       478.00       44.69       438.22         2002       .93  |                    |                   |                             | 568.05 | 553.00                       | 15.05 | 147.60                      |
| 1046       2.23       532.74       487.00       45.74       448.51         1047       .71       532.01       482.00       50.01       490.43         1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95            2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88 <tr< td=""><td></td><td></td><td></td><td></td><td></td><td>16.05</td><td>100.33</td></tr<>                     |                    |                   |                             |        |                              | 16.05 | 100.33                      |
| 1047       .71       532.01       482.00       50.01       490.43         1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95       57.00       44.69       438.22         2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10   |                    |                   | 2 23                        | 507.20 | 487 00                       | 16.20 |                             |
| 1048       .44       554.82       529.00       25.82       253.26         1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95       555.50       555.50       500       200.1       21       522.69       478.00       44.69       438.22         2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2  |                    |                   |                             |        |                              | 50 01 |                             |
| 1049       .71       531.60       453.00       78.60       770.77         1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95            1700       .00       565.55            2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07  |                    |                   |                             |        |                              |       |                             |
| 1056       1.34       568.33       534.00       34.33       336.62         1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95            1700       .00       565.55   |                    |                   |                             |        |                              |       |                             |
| 1057       .14       568.32       555.00       13.32       130.60         1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95            1700       .00       565.55            2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         <   |                    |                   | 1.34                        |        |                              |       |                             |
| 1059       .18       556.90       494.00       62.90       616.81         1060       4.95       554.45       495.00       59.45       582.99         1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95           1700       .00       565.95           2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41  |                    |                   |                             |        |                              |       |                             |
| 1063       1.19       565.98       534.00       31.98       313.59         1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95            1700       .00       565.55 <td>1059</td> <td></td> <td></td> <td></td> <td></td> <td>62.90</td> <td></td>  | 1059               |                   |                             |        |                              | 62.90 |                             |
| 1064       .85       531.31       482.00       49.31       483.53         1500       .00       565.95   <   | 1060               |                   | 4.95                        | 554.45 | 495.00                       | 59.45 | 582.99                      |
| 1500       .00       565.95         1700       .00       565.55         2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57  | 1063               |                   | 1.19                        | 565.98 | 534.00                       | 31.98 | 313.59                      |
| 1700       .00       565.55         2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52  |                    |                   |                             |        | 482.00                       | 49.31 | 483.53                      |
| 2001       .21       522.69       478.00       44.69       438.22         2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57  |                    |                   |                             |        |                              |       |                             |
| 2002       .93       522.73       463.00       59.73       585.77         2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2003       2.20       519.43       455.00       64.43       631.88         2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2004       3.25       518.12       466.00       52.12       511.10         2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96   |                    |                   |                             |        |                              |       |                             |
| 2058       .42       529.48       500.00       29.48       289.07         2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2059       .31       529.25       505.00       24.25       237.83         2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2060       .87       528.95       489.00       39.95       391.76         2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2061       3.70       526.13       456.00       70.13       687.73         2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2062       1.41       525.62       475.00       50.62       496.43         2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96   |                    |                   |                             |        |                              |       |                             |
| 2063       .65       525.55       490.00       35.55       348.61         2075       .84       529.44       500.00       29.44       288.72         2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2075     .84     529.44     500.00     29.44     288.72       2076     .10     529.44     480.00     49.44     484.83       2077     .44     525.53     500.00     25.53     250.36       2082     1.06     529.52     495.00     34.52     338.57       2086     .17     522.73     490.00     32.73     320.96  |                    |                   |                             |        |                              |       |                             |
| 2076       .10       529.44       480.00       49.44       484.83         2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2077       .44       525.53       500.00       25.53       250.36         2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2082       1.06       529.52       495.00       34.52       338.57         2086       .17       522.73       490.00       32.73       320.96  |                    |                   |                             |        |                              |       |                             |
| 2086 .17 522.73 490.00 32.73 320.96   | 2082               |                   |                             |        |                              |       |                             |
| 2087 3.06 561.95 500.00 61.95 607.54  | 2086               |                   | .17                         | 522.73 | 490.00                       | 32.73 | 320.96                      |
|   | 2087               |                   | 3.06                        | 561.95 | 500.00                       | 61.95 | 607.54                      |

### REGULATING VALVE REPORT

| VALVE<br>TYPE | POSITION<br>NODE | CONTROLLED<br>PIPE | VALVE<br>SETTING<br>(m or 1/s | VALVE<br>STATUS<br>)          | UPSTREAM<br>GRADE<br>(m) | DOWNSTREAM<br>GRADE<br>(m) | THROUGH<br>FLOW<br>(1/s) |
|---------------|------------------|--------------------|-------------------------------|-------------------------------|--------------------------|----------------------------|--------------------------|
| PRV-1         | 1500             | 14                 | 534.00                        | THROTTLED THROTTLED THROTTLED | 565.95                   | 532.74                     | 1.84                     |
| PRV-1         | 1500             | 47                 | 534.00                        |                               | 565.95                   | 532.74                     | 8.99                     |
| PRV-1         | 1700             | 59                 | 525.30                        |                               | 565.55                   | 522.73                     | 6.76                     |

### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE<br>(1/s)     |
|-----|----------------------------|----------------|-------------|-----------------------|
|     |                            | 22<br>23       |             | 26.35<br>19.94        |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 46.29<br>.00<br>46.29 |

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00424

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) |     |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|-----|
| 1              | 2077      | 2063          |          | .00                 | .00                 | .00                  | 02                     |     |
| 2              | 2063      | 2063          | 13       |                     |                     | .00                  | .03<br>.04             | .0  |
| 3              | 2063      | 2062          | 36       |                     |                     | .00                  | .04                    | . 0 |
| 4              | 2062      | 2061          | -1.14    |                     | .00                 | .00                  |                        | .1  |
| 5              | 2061      | 2082          | -1.71    |                     |                     | .00                  | .15<br>.11             | .4  |
| 6              | 2082      | 2052          | .50      | .01                 |                     | .00                  | .03                    | .1  |
| 7              | 2052      | 2075          | .10      |                     | .00                 | .00                  | .03                    | .0  |
| 8              | 1048      | 1047          | 3.54     |                     | .00                 | .00                  | 1.49                   |     |
| 9              | 1048      | 1047          | .06      | .00                 | .00                 |                      | .01                    | .0  |
| 10             | 1064      | 2082          | 2.94     | .19                 | .00                 | .00                  | .19                    | .3  |
| 11             | 2076      | 2075          | 03       |                     |                     |                      | .01                    | .0  |
| 12             | 1046      | 1049          | .21      | .12                 |                     | .00                  | .09                    | .3  |
| 13             | 2075      | 2059          | .09      | .02                 |                     |                      | .04                    | .0  |
| 14-RV          | 1500      | 1046          | .13      | .01                 |                     |                      | .03                    | .0  |
| 15             | 1045      | 1063          | .81      | .13                 |                     |                      | .17                    | .6  |
| 16             | 1045      | 1043          | 61       |                     |                     |                      | .08                    | .1  |
| 17             | 1043      | 1044          | .02      |                     |                     |                      | .01                    | .0  |
| 18             | 1043      | 1042          | 37       |                     |                     |                      | .05                    | .0  |
| 19             | 1042      | 1056          | .44      |                     |                     |                      | .03                    | .0  |
| 20             | 1056      | 1057          | .04      |                     |                     |                      | .01                    | .0  |
| 21             | 1042      | 1032          | 1.44     |                     |                     |                      | .09                    | .1  |
| 22-FG          | 0         | 1042          | 7.91     |                     |                     |                      | .16                    | .1  |
| 23-FG          | Ō         | 1034          | 5.98     |                     |                     |                      | .19                    | . 2 |
| 24             | 1034      | 1035          | .38      | .25                 |                     |                      | .16                    |     |
| 25             | 1035      | 1700          | 2.03     |                     |                     |                      | .27                    | 1.1 |
| 26             | 2001      | 2002          | 06       |                     |                     |                      | .03                    | .0  |
| 27             | 2002      | 2003          | 1.63     |                     |                     | .00                  | .22                    | .9  |
| 28             | 2003      | 2004          | .26      |                     |                     | .00                  | .11                    | . 4 |
| 29             | 1032      | 1033          | 10       |                     |                     | .00                  | .01                    | .0  |
| 30             | 1033      | 1034          | 11       | .02                 |                     | .00                  | .05                    | .0  |
| 31             | 1033      | 1036          | 2.27     |                     |                     | .00                  | .15                    | .2  |
| 32             | 1036      | 1037          | 1.73     | .30                 |                     | .00                  | .23                    | 1.0 |
| 33             | 1037      | 1059          | 1.54     | .75                 | .00                 | .00                  | .31                    | 1.8 |
| 34             | 1059      | 1060          | 1.49     | .26                 | .00                 | .00                  | .30                    | 1.7 |
| 35             | 1036      | 1038          | 1.31     | .15                 | .00                 | .00                  | .18                    | .6  |
| 36             | 1038      | 1039          | 1.12     | .04                 | .00                 | .00                  | .15                    | . 4 |
| 37             | 1039      | 1040          | .15      | .06                 | .00                 | .00                  | .06                    | .1  |
| 38             | 1038      | 1041          | .06      | .00                 | .00                 | .00                  | .01                    | .0  |
| 39             | 1063      | 1048          | 3.67     | 9.95                | .00                 | .00                  | .75                    | 9.3 |
| 40             | 1063      | 1500          | .13      | .00                 | .00                 | .00                  | .03                    | .0  |
| 41             | 1034      | 1035          | 1.82     | .25                 | .00                 | .00                  | .25                    | .9  |
| 42             | 1039      | 1040          | .15      | .06                 | .00                 | .00                  | .06                    | .1  |
| 43             | 1043      | 1042          | -4.83    | .04                 | .00                 | .00                  | .10                    | .0  |
| 44             | 2003      | 2004          | .72      | .14                 | .00                 | .00                  | .15                    | .4  |
| 45             | 1045      | 1043          | -4.30    | .09                 | .00                 | .00                  | .14                    | .1  |
| 46             | 1045      | 1063          | 3.97     | .13                 | .00                 | .00                  | .26                    | .6  |
| 47-RV          | 1500      | 1046          | .62      | .01                 | .00                 | .00                  | .04                    | .0  |
| 48             | 2058      | 2075          | .28      | .00                 | .00                 | .00                  | .06                    | .0  |
| 49             | 2062      | 2061          | 39       | .05                 | .00                 | .00                  | .08                    | .1  |
|                |           |               |          |                     |                     |                      |                        |     |

JOB NAME = GKWSAP - JICA - Kurugoda SR

| 50    | 2063 | 2062 | 24    | .01  | .00 | .00 | . 05 | .0  |
|-------|------|------|-------|------|-----|-----|------|-----|
| 51    | 1033 | 1034 | -3.43 | .02  | .00 | .00 | .11  | .0  |
| 52    | 1063 | 1500 | .62   | .00  | .00 | .00 | .04  | .0  |
| 53    | 1064 | 1047 | -3.33 | 1.00 | .00 | .00 | .68  | 9.0 |
| 54    | 2002 | 2086 | .05   | .00  | .00 | .00 | .01  | .0  |
| 55-XX | 2001 | 1041 |       |      |     |     |      |     |
| 56-XX | 2004 | 2087 |       |      |     |     |      |     |
| 57    | 2087 | 1040 | 92    | .25  | .00 | .00 | .19  | .7  |
| 58    | 1039 | 1040 | .72   | .06  | .00 | .00 | .10  | . 1 |
| 59-RV | 1700 | 2002 | 2.03  | .28  | .00 | .00 | .27  | 1.1 |
| 60    | 2060 | 2061 | .72   | .30  | .00 | .00 | .15  | . 4 |
| 61    | 2082 | 2060 | .41   | .06  | .00 | .00 | .08  | .1  |
| 62    | 1046 | 1064 | 07    | .00  | .00 | .00 | .01  | . 0 |
| 63    | 1033 | 1036 | .94   | .13  | .00 | .00 | .13  | . 2 |
|       |      |      |       |      |     |     |      |     |

## JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | ELEVATION |       | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-----------------------------|---------------------------|-----------|-------|-----------------------------|
| 1032               | 1.54                        |                           | 517.00    |       | 508.67                      |
| 1033               | .23                         |                           | 542.00    | 26.87 | 263.50                      |
| 1034               | .24                         | 568.89                    | 530.00    |       |                             |
| 1035               | .17                         | 568.64                    | 522.00    |       |                             |
| 1036               | .16                         | 568.74                    | 519.00    | 49.74 | 487.83                      |
| 1037               | .20                         | 568.45                    | 537.00    | 31.45 | 308.41                      |
| 1038               | .14                         |                           | 512.00    |       |                             |
| 1039               | .11                         | 568.55                    |           | 58.55 |                             |
| 1040               | .10                         | 568.49                    |           | 38.49 | 377.50                      |
| 1041               | .06                         | 568.59                    | 502.00    | 66.59 | 653.08                      |
| 1042               | .82                         | 568.94                    |           |       |                             |
| 1043               | .27                         | 568.90                    |           | 15.90 |                             |
| 1044               | .02                         | 568.90                    |           |       |                             |
| 1045               | .13                         | 568.81                    |           |       |                             |
| 1046               | .67                         | 533.99                    |           |       |                             |
| 1047               | .21                         | 534.99                    |           | 52.99 | 519.65                      |
| 1048               | .13                         | 558.73                    |           |       |                             |
| 1049               | .21                         | 533.87                    |           |       |                             |
| 1056               | .40                         | 568.93                    |           |       |                             |
| 1057               | .04                         | 568.93                    |           |       |                             |
| 1059               | .05                         | 567.70                    |           |       |                             |
| 1060               | 1.49                        | 567.43                    |           |       |                             |
| 1063               | .36                         | 568.67                    |           |       |                             |
| 1064               | .26                         | 533.99                    | 482.00    | 51.99 | 509.87                      |
| 1500               | .00                         | 568.67                    |           |       |                             |
| 1700               | .00                         | 568.63                    |           |       |                             |
| 2001               | .06                         | 525.02                    |           | 47.02 |                             |
| 2002               | .28                         | 525.02                    | 463.00    |       | 608.25                      |
| 2003               | .66                         | 524.67                    |           |       |                             |
| 2004               | .98                         | 524.53                    | 466.00    | 58.53 | 573.96                      |

JOB NAME = GKWSAP - JICA - Kurugoda SR

| 2058 | .13  | 533.79 | 500.00 | 33.79 | 331.42 |
|------|------|--------|--------|-------|--------|
| 2059 | .09  | 533.77 | 505.00 | 28.77 | 282.15 |
| 2060 | .26  | 533.74 | 489.00 | 44.74 | 438.73 |
| 2061 | 1.11 | 533.43 | 456.00 | 77.43 | 759.38 |
| 2062 | .42  | 533.38 | 475.00 | 58.38 | 572.52 |
| 2063 | .20  | 533.37 | 490.00 | 43.37 | 425.34 |
| 2075 | .25  | 533.79 | 500.00 | 33.79 | 331.38 |
| 2076 | .03  | 533.79 | 480.00 | 53.79 | 527.51 |
| 2077 | .13  | 533.37 | 500.00 | 33.37 | 327.25 |
| 2082 | .32  | 533.80 | 495.00 | 38.80 | 380.50 |
| 2086 | .05  | 525.02 | 490.00 | 35.02 | 343.46 |
| 2087 | .92  | 568.24 | 500.00 | 68.24 | 669.23 |

### REGULATING VALVE REPORT

|                | POSITION |      | VALVE      | VALVE     | UPSTREAM | DOWNSTREAM | THROUGH |
|----------------|----------|------|------------|-----------|----------|------------|---------|
| $	extbf{TYPE}$ | NODE     | PIPE | SETTING    | STATUS    | GRADE    | GRADE      | FLOW    |
|                |          |      | (m or 1/s) | )         | (m)      | (m)        | (1/s)   |
|                | <b></b>  |      |            |           |          |            |         |
| PRV-1          | 1500     | 14   | 534.00     | THROTTLED | 568.67   | 533.99     | .13     |
| PRV-1          | 1500     | 47   | 534.00     | THROTTLED | 568.67   | 533.99     | .62     |
| PRV-1          | 1700     | 59   | 525.30     | THROTTLED | 568.63   | 525.02     | 2.03    |

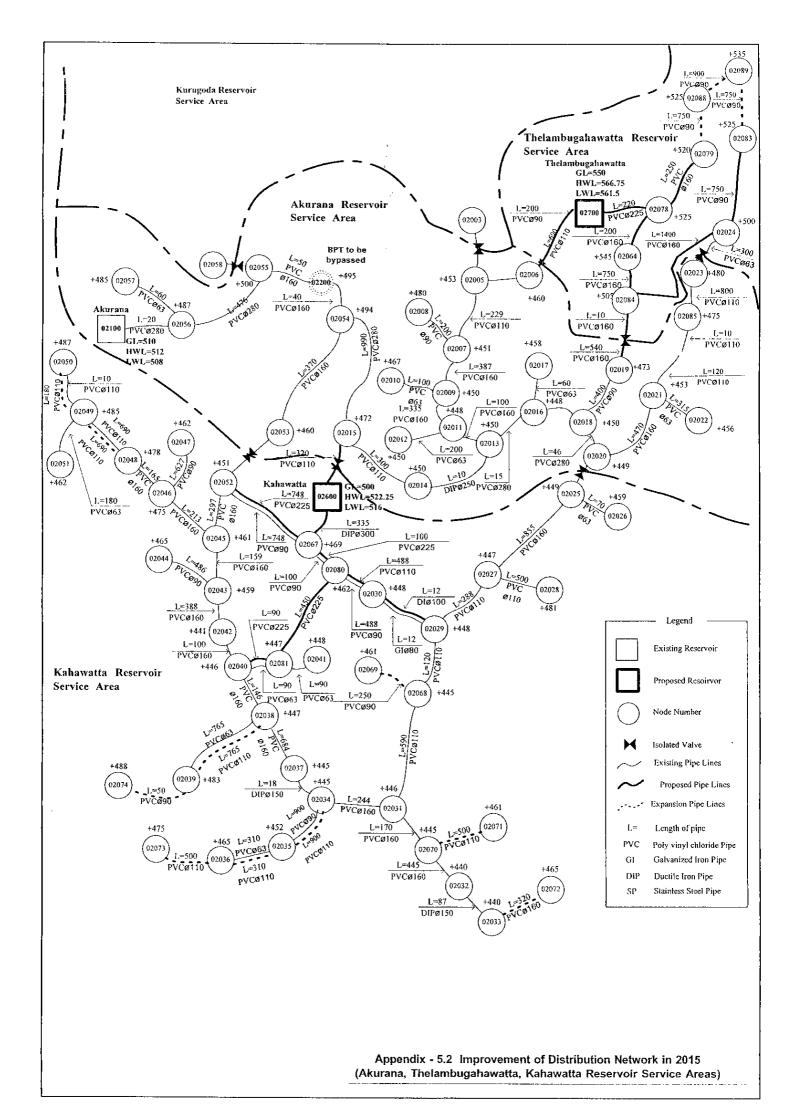
### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE (1/s)        |
|-----|----------------------------|----------------|-------------|-----------------------|
|     |                            | 22<br>23       |             | 7.91<br>5.98          |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 13.89<br>.00<br>13.89 |

### \*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 10:29:32



DATE: 3/ 7/2002 TIME: 10:30:33

INPUT DATA FILENAME ----- c:\D\_nets\2015\THEL2015.DAT TABULATED OUTPUT FILENAME ---- c:\D\_nets\2015\THEL2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\THEL2015.RES

#### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) ..... = meters
PRESSURE .... = kpa

### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER | NOD<br>#1 | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|-----------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-FG           | 0         | 2006         | 690.0         | 9.7              | 130.00              | .00                  | 561.         |
| 2-FG           | 0         | 2078         | 220.0         | 19.8             | 130.00              | .00                  | 561.         |
| 3              | 2078      | 2064         | 200.0         | 19.8             | 130.00              | .00                  |              |
| 4              | 2064      | 2084         | 750.0         | 14.0             | 130.00              | .00                  |              |
| 5              | 2078      | 2079         | 250.0         | 14.0             | 130.00              | .00                  |              |
| 6              | 2084      | 2024         | 1400.0        | 14.0             | 130.00              | .00                  |              |
| 7              | 2024      | 2083         | 750.0         | 7.9              | 130.00              | .00                  |              |
| 8              | 2083      | 2089         | 750.0         | 7.9              | 130.00              | .00                  |              |
| 9              | 2079      | 2088         | 750.0         | 7.9              | 130.00              | .00                  |              |
| 10             | 2088      | 2089         | 900.0         | 7.9              | 130.00              | .00                  |              |

PAGE NO. 2

### JUNCTION NODE DATA

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | JUNCTION ELEVATION (m) | CONNI | ECTING | PIPES |  |
|--------------------|-------------------|-----------------------------|------------------------|-------|--------|-------|--|
| 2006               |                   | 3.50                        | 460.00                 | 1     |        |       |  |
| 2024               |                   | 3.77                        | 500.00                 | 6     | 7      |       |  |
| 2064               |                   | 6.40                        | 545.00                 | 3     | 4      |       |  |
| 2078               |                   | 9.46                        | 525.00                 | 2     | 3      | 5     |  |
| 2079               |                   | 2.50                        | 520.00                 | 5     | 9      |       |  |
| 2083               |                   | 1.19                        | 525.00                 | 7     | 8      |       |  |
| 2084               |                   | 7.53                        | 505.00                 | 4     | 6      |       |  |
| 2088               |                   | 1.12                        | 525.00                 | 9     | 10     |       |  |
| 2089               |                   | 1.29                        | 535.00                 | 8     | 10     |       |  |
|                    |                   |                             |                        |       |        |       |  |

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

SUPPLY ZONE DATA

THIS SYSTEM HAS MULTIPLE SUPPLY ZONES

ZONE NO. 1 IS SUPPLIED THROUGH THESE PIPES:

2

### SYSTEM CONFIGURATION

| NUMBER | OF | PIPES(p)             | = | 10 |
|--------|----|----------------------|---|----|
| NUMBER | OF | JUNCTION NODES(j)    | = | 9  |
| NUMBER | OF | PRIMARY LOOPS(1)     | = | 1  |
| NUMBER | OF | FIXED GRADE NODES(f) | = | 2  |
| NUMBER | OF | SUPPLY ZONES(z)      | = | 2  |

\*\*\*\*\*\*\*\*\*\*\* SIMULATION RESULTS \*\*\*\*\*\*\*\*\*

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00134

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 2006          | 3.50     | 2.18                | .00                 | .00                  | .47                    | 3.1                 |
| 2-FG           | 0         | 2078          | 33.26    | 1.39                | .00                 | .00                  | 1.08                   | 6.3                 |
| 3              | 2078      | 2064          | 18.58    | .43                 | .00                 | .00                  | .60                    | 2.1                 |
| 4              | 2064      | 2084          | 12.18    | 4.00                | .00                 | .00                  | .79                    | 5.3                 |
| 5              | 2078      | 2079          | 5.22     | .28                 | .00                 | .00                  | .34                    | 1.1                 |
| 6              | 2084      | 2024          | 4.65     | 1.26                | .00                 | .00                  | .30                    | .9                  |
| 7              | 2024      | 2083          | .88      | .50                 | .00                 | .00                  | .18                    | .6                  |
| 8              | 2083      | 2089          | 31       | .07                 | .00                 | .00                  | .06                    | .1                  |
| 9              | 2079      | 2088          | 2.72     | 4.03                | .00                 | .00                  | .55                    | 5.3                 |
| 10             | 2088      | 2089          | 1.60     | 1.81                | .00                 | .00                  | .33                    | 2.0                 |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 2006               | <b></b>           | 3.50                        | 559.32                    | 460.00                       | 99.32                   | 973.98                      |
| 2024               |                   | 3.77                        | 554.42                    | 500.00                       | 54.42                   | 533.66                      |
| 2064               |                   | 6.40                        | 559.67                    | 545.00                       | 14.67                   | 143.91                      |
| 2078               |                   | 9.46                        | 560.11                    | 525.00                       | 35.11                   | 344.28                      |
| 2079               |                   | 2.50                        | 559.83                    | 520.00                       | 39.83                   | 390.59                      |
| 2083               |                   | 1.19                        | 553.92                    | 525.00                       | 28.92                   | 283.57                      |
| 2084               |                   | 7.53                        | 555.67                    | 505.00                       | 50.67                   | 496.95                      |
| 2088               |                   | 1.12                        | 555.80                    | 525.00                       | 30.80                   | 302.00                      |
| 2089               |                   | 1.29                        | 553.99                    | 535.00                       | 18.99                   | 186.20                      |

### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                  | PIPE<br>NUMBER |   | FLOWRATE<br>(1/s) |
|-----|------------------|----------------|---|-------------------|
|     |                  | 1 2            |   | 3.50<br>33.26     |
|     | SYSTEM<br>SYSTEM |                | = | 36.76<br>.00      |
| NET | SYSTEM           | DEMAND         | = | 36.76             |

JOB NAME = GKWSAP - JICA - Thelembugahawatta SR

#### DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 2006          | 1.05     | .23                 | .00                 | .00                  | .14                    | .3                  |
| 2-FG           | 0         | 2078          | 9.98     | .15                 | .00                 | .00                  | .32                    | . 6                 |
| 3              | 2078      | 2064          | 5.57     | .05                 | .00                 | .00                  | .18                    | . 2                 |
| 4              | 2064      | 2084          | 3.65     | .43                 | .00                 | .00                  | .24                    | .5                  |
| 5              | 2078      | 2079          | 1.57     | .03                 | .00                 | .00                  | .10                    | .1                  |
| 6              | 2084      | 2024          | 1.40     | .14                 | .00                 | .00                  | .09                    | .1                  |
| 7              | 2024      | 2083          | .26      | .05                 | .00                 | .00                  | .05                    | .0                  |
| 8              | 2083      | 2089          | 09       | .01                 | .00                 | .00                  | .02                    | .0                  |
| 9              | 2079      | 2088          | .82      | .43                 | .00                 | .00                  | .17                    | .5                  |
| 10             | 2088      | 2089          | .48      | .19                 | .00                 | .00                  | .10                    | .2                  |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 2006               |                   | 1.05                        | 561.27                    | 460.00                       | 101.27                  | 993.08                      |
| 2024               |                   | 1.13                        | 560.74                    | 500.00                       | 60.74                   | 595.64                      |
| 2064               |                   | 1.92                        | 561.30                    | 545.00                       | 16.30                   | 159.89                      |
| 2078               |                   | 2.84                        | 561.35                    | 525.00                       | 36.35                   | 356.47                      |
| 2079               |                   | .75                         | 561.32                    | 520.00                       | 41.32                   | 405.22                      |

JOB NAME = GKWSAP - JICA - Thelembugahawatta SR

| 2083 | .36  | 560.68 | 525.00 | 35.68 | 349.95 |
|------|------|--------|--------|-------|--------|
| 2084 | 2.26 | 560.87 | 505.00 | 55.87 | 547.93 |
| 2088 | .34  | 560.89 | 525.00 | 35.89 | 351.93 |
| 2089 | .39  | 560.69 | 535.00 | 25.69 | 251.95 |

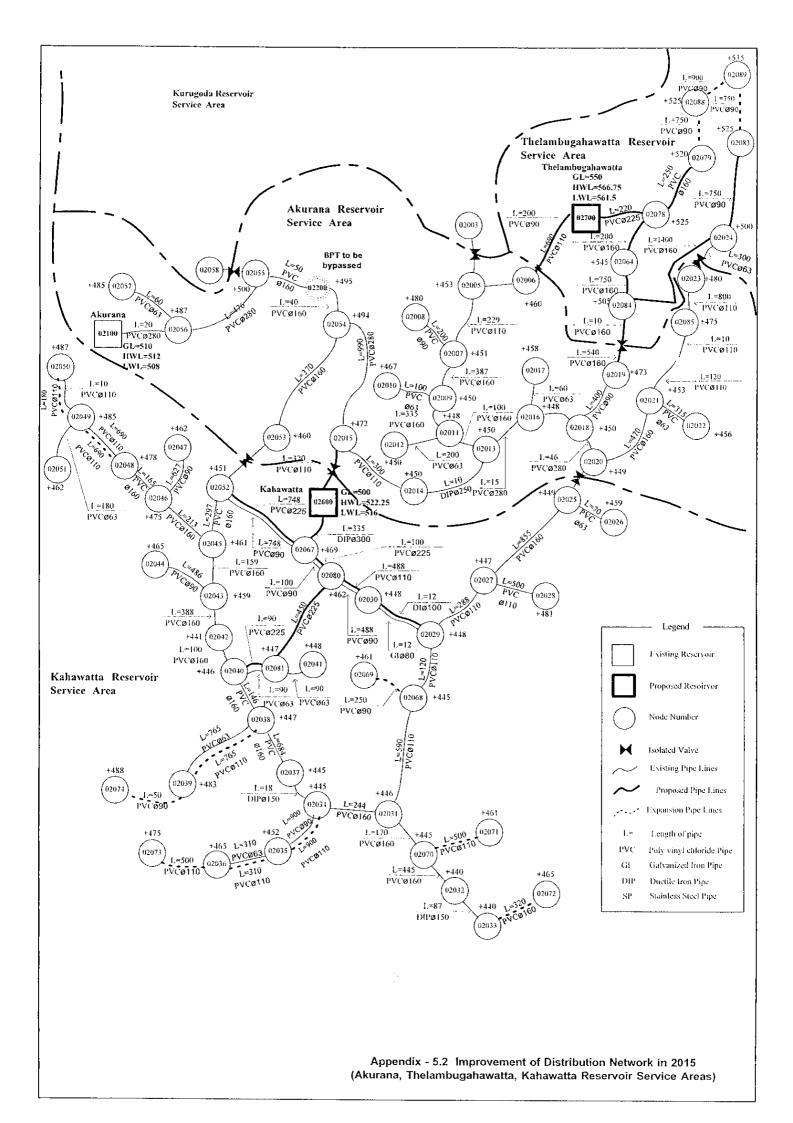
### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATI<br>(1/s)     |
|-----|----------------------------|----------------|-------------|-----------------------|
|     |                            | 1 2            |             | 1.05<br>9.98          |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 11.03<br>.00<br>11.03 |

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 10:30:33



JOB NAME = GKWSAP - JICA - Kahawatta SR

DATE: 3/ 7/2002 TIME: 10:33: 4

INPUT DATA FILENAME ------ c:\D\_nets\2015\KAHW2015.DAT TABULATED OUTPUT FILENAME ----- c:\D\_nets\2015\KAHW2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\KAHW2015.RES

### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) ..... = meters PRESSURE .... = kpa

#### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER           |                                      | E NOS.<br>#2                         | LENGTH (m)                              | DIAMETER (cm)                     | ROUGHNESS<br>COEFF.                            | MINOR LOSS<br>COEFF.     | FGN-H<br>(m) |
|--------------------------|--------------------------------------|--------------------------------------|---|-----------------------------------|--|--------------------------|--------------|
| 1-FG<br>2<br>3<br>4      | 0<br>2067<br>2067<br>2052            | 2067<br>2052<br>2080<br>2045         | 335.0<br>848.0<br>100.0<br>297.0        | 30.0<br>7.9<br>7.9<br>14.0        | 130.00<br>120.00<br>120.00<br>120.00           | .00<br>.00<br>.00        | 516.         |
| 5<br>6<br>7              | 2045<br>2045<br>2043                 | 2043<br>2046<br>2042                 | 159.0<br>213.0<br>388.0                 | 14.0<br>14.0<br>14.0              | 120.00<br>120.00<br>120.00                     | .00<br>.00<br>.00        |              |
| 8<br>9<br>10<br>11<br>12 | 2043<br>2042<br>2040<br>2040<br>2081 | 2044<br>2040<br>2038<br>2081<br>2041 | 486.0<br>100.0<br>146.0<br>90.0<br>90.0 | 7.9<br>14.0<br>14.0<br>5.5<br>5.5 | 120.00<br>120.00<br>120.00<br>120.00<br>120.00 | .00<br>.00<br>.00<br>.00 |              |
| 13                       | 2081                                 | 2080                                 | 450.0                                   | 19.8                              | 130.00   | .00                      |              |

| 14 | 2038 | 2039 | 765.0 | 5.5  | 120.00 | .00 |
|----|------|------|-------|------|--------|-----|
| 15 | 2038 | 2037 | 684.0 | 14.0 | 120.00 | .00 |
| 16 | 2039 | 2074 | 50.0  | 7.9  | 130.00 | .00 |
| 17 | 2037 | 2034 | 18.0  | 15.0 | 120.00 | .00 |
| 18 | 2034 | 2035 | 900.0 | 7.9  | 120.00 | .00 |
| 19 | 2034 | 2031 | 244.0 | 14.0 | 120.00 | .00 |
| 20 | 2035 | 2036 | 310.0 | 5.5  | 120.00 | .00 |
| 21 | 2036 | 2073 | 500.0 | 9.7  | 130.00 | .00 |
| 22 | 2031 | 2070 | 170.0 | 14.0 | 120.00 | .00 |
| 23 | 2031 | 2068 | 590.0 | 9.7  | 120.00 | .00 |
| 24 | 2070 | 2032 | 445.0 | 14.0 | 120.00 | .00 |
| 25 | 2070 | 2071 | 500.0 | 9.7  | 130.00 | .00 |
| 26 | 2032 | 2033 | 87.0  | 15.0 | 120.00 | .00 |
| 27 | 2033 | 2072 | 320.0 | 14.0 | 130.00 | .00 |
| 28 | 2068 | 2029 | 120.0 | 9.7  | 120.00 | .00 |
| 29 | 2068 | 2069 | 250.0 | 7.9  | 130.00 | .00 |
| 30 | 2029 | 2030 | 12.0  | 8.0  | 120.00 | .00 |
| 31 | 2029 | 2027 | 288.0 | 9.7  | 120.00 | .00 |
| 32 | 2030 | 2080 | 488.0 | 7.9  | 120.00 | .00 |
| 33 | 2027 | 2028 | 500.0 | 9.7  | 120.00 | .00 |
| 34 | 2027 | 2025 | 855.0 | 14.0 | 120.00 | .00 |
| 35 | 2025 | 2026 | 70.0  | 5.5  | 120.00 | .00 |
| 36 | 2046 | 2047 | 627.0 | 7.9  | 120.00 | .00 |
| 37 | 2046 | 2048 | 165.0 | 14.0 | 120.00 | .00 |
| 38 | 2048 | 2049 | 690.0 | 9.7  | 120.00 | .00 |
| 39 | 2049 | 2050 | 10.0  | 9.7  | 120.00 | .00 |
| 40 | 2049 | 2051 | 180.0 | 5.5  | 120.00 | .00 |
| 41 | 2067 | 2052 | 848.0 | 19.8 | 130.00 | .00 |
| 42 | 2067 | 2080 | 100.0 | 19.8 | 130.00 | .00 |
| 43 | 2040 | 2081 | 90.0  | 19.8 | 130.00 | .00 |
| 44 | 2038 | 2039 | 765.0 | 9.7  | 130.00 | .00 |
| 45 | 2035 | 2036 | 310.0 | 9.7  | 130.00 | .00 |
| 46 | 2029 | 2030 | 12.0  | 10.0 | 130.00 | .00 |
| 47 | 2030 | 2080 | 188.0 | 9.7  | 130.00 | .00 |
| 48 | 2048 | 2049 | 690.0 | 9.7  | 130.00 | .00 |
| 49 | 2049 | 2050 | 10.0  | 9.7  | 130.00 | .00 |
| 50 | 2034 | 2035 | 900.0 | 9.7  | 130.00 | .00 |

### JUNCTION NODE DATA

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | JUNCTION ELEVATION (m) | CONNI | ECTING | PIPE | :S |  |
|--------------------|-------------------|-----------------------------|------------------------|-------|--------|------|----|--|
| 2025               |                   | .49                         | 449.00                 | 34    | 35     |      |    |  |
| 2026               |                   | .02                         | 459.00                 | 35    |        |      |    |  |
| 2027               |                   | 1.31                        | 447.00                 | 31    | 33     | 34   |    |  |
| 2028               |                   | .14                         | 481.00                 | 33    |        |      |    |  |
| 2029               |                   | .35                         | 448.00                 | 28    | 30     | 31   | 46 |  |
| 2030               |                   | .18                         | 448.00                 | 30    | 32     | 46   | 47 |  |

| 2031 | .74  | 446.00 | 19 | 22 | 23 |    |    |
|------|------|--------|----|----|----|----|----|
| 2032 | 1.89 | 440.00 | 24 | 26 |    |    |    |
| 2033 | 1.90 | 440.00 | 26 | 27 |    |    |    |
| 2034 | 1.48 | 445.00 | 17 | 18 | 19 | 50 |    |
| 2035 | .98  | 452.00 | 18 | 20 | 45 | 50 |    |
| 2036 | 1.10 | 465.00 | 20 | 21 | 45 |    |    |
| 2037 | 1.90 | 445.00 | 15 | 17 |    |    |    |
| 2038 | 4.39 | 447.00 | 10 | 14 | 15 | 44 |    |
| 2039 | 1.36 | 483.00 | 14 | 16 | 44 |    |    |
| 2040 | .48  | 446.00 | 9  | 10 | 11 | 43 |    |
| 2041 | .05  | 448.00 | 12 |    |    | -  |    |
| 2042 | .84  | 441.00 | 7  | 9  |    |    |    |
| 2043 | 1.22 | 459.00 | 5  | 7  | 8  |    |    |
| 2044 | .28  | 465.00 | 8  |    | ~  |    |    |
| 2045 | .65  | 461.00 | 4  | 5  | 6  |    |    |
| 2046 | 1.52 | 475.00 | 6  | 36 | 37 |    |    |
| 2047 | 1.61 | 462.00 | 36 |    |    |    |    |
| 2048 | 3.86 | 478.00 | 37 | 38 | 48 |    |    |
| 2049 | 1.63 | 485.00 | 38 | 39 | 40 | 48 | 49 |
| 2050 | .43  | 487.00 | 39 | 49 |    |    |    |
| 2051 | .39  | 462.00 | 40 |    |    |    |    |
| 2052 | .98  | 451.00 | 2  | 4  | 41 |    |    |
| 2067 | 1.24 | 469.00 | 1  | 2  | 3  | 41 | 42 |
| 2068 | .67  | 445.00 | 23 | 28 | 29 |    |    |
| 2069 | .23  | 461.00 | 29 |    |    |    |    |
| 2070 | 1.97 | 445.00 | 22 | 24 | 25 |    |    |
| 2071 | .40  | 461.00 | 25 |    |    |    |    |
| 2072 | 7.05 | 465.00 | 27 |    |    |    |    |
| 2073 | .41  | 475.00 | 21 |    |    |    |    |
| 2074 | .54  | 488.00 | 16 |    |    |    |    |
| 2080 | 1.18 | 462.00 | 3  | 13 | 32 | 42 | 47 |
| 2081 | .44  | 447.00 | 11 | 12 | 13 | 43 |    |
|      |      |        |    |    |    |    |    |

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

### SYSTEM CONFIGURATION

| NUMBER OF | PIPES(p)                   | = | 50 |
|-----------|----------------------------|---|----|
| NUMBER OF | JUNCTION NODES $(\bar{j})$ | = | 38 |
| NUMBER OF | PRIMARY LOOPS(1)           | = | 12 |
| NUMBER OF | FIXED GRADE NODES(f)       | = | 1  |
| NUMBER OF | SUPPLY ZONES(z)            | = | 1  |

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SIMULATION RESULTS

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THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00213

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 2067          | 46.30    | .52                 | .00                 | .00                  | .66                    | 1.5                 |
| 2              | 2067      | 2052          | .91      | .69                 | .00                 | .00                  | .18                    | .8                  |
| 3              | 2067      | 2080          | 2.52     | .54                 | .00                 | .00                  | .51                    | 5.4                 |
| 4              | 2052      | 2045          | 10.92    | 1.50                | .00                 | .00                  | .71                    | 5.0                 |
| 5              | 2045      | 2043          | .83      | .01                 | .00                 | .00                  | .05                    | .0                  |
| 6              | 2045      | 2046          | 9.44     | .82                 | .00                 | .00                  | .61                    | 3.8                 |
| 7              | 2043      | 2042          | 67       | .01                 |                     |                      | .04                    | . 0                 |
| 8              | 2043      | 2044          | .28      | .05                 | .00                 | .00                  | .06                    | .0                  |
| 9              | 2042      | 2040          | -1.51    | .01                 | .00                 | .00                  | .10                    | .1                  |
| 10             | 2040      | 2038          | 20.03    | 2.27                | .00                 | .00                  | 1.30                   | 15.5                |
| 11             | 2040      | 2081          | 70       | .27                 | .00                 | .00                  | .30                    | 2.9                 |
| 12             | 2081      | 2041          | .05      | .00                 | .00                 | .00                  | .02                    | . 0                 |
| 13             | 2081      | 2080          | -22.50   | 1.38                | .00                 | .00                  | .73                    | 3.0                 |
| 14             | 2038      | 2039          | .33      | .55                 | .00                 | .00                  | .14                    | . 7                 |
| 15             | 2038      | 2037          | 13.74    | 5.29                | .00                 | .00                  | .89                    | 7.7                 |
| 16             | 2039      | 2074          | .54      | .01                 | .00                 | .00                  | .11                    | .2                  |
| 17             | 2037      | 2034          | 11.84    | .08                 | .00                 | .00                  | .67                    | 4.1                 |
| 18             | 2034      | 2035          | .87      | .68                 | .00                 | .00                  | .18                    | . 7                 |
| 19             | 2034      | 2031          | 7.87     | .67                 | .00                 | .00                  | .51                    | 2.7                 |
| 20             | 2035      | 2036          | .26      | .15                 |                     | .00                  | .11                    | . 4                 |
| 21             | 2036      | 2073          | .41      | .03                 |                     | .00                  | .06                    | .0                  |
| 22             | 2031      | 2070          | 13.21    | 1.22                | .00                 | .00                  | .86                    | 7.1                 |
| 23             | 2031      | 2068          | -6.08    | 6.02                |                     | .00                  | .82                    | 10.2                |
| 24             | 2070      | 2032          | 10.84    | 2.22                | .00                 | .00                  | .70                    | 4.9                 |
| 25             | 2070      | 2071          | .40      | .03                 |                     | .00                  | .05                    | . 0                 |
| 26             | 2032      | 2033          | 8.95     | .22                 | .00                 | .00                  | .51                    | 2.5                 |
| 27             | 2033      | 2072          | 7.05     | .62                 | .00                 | .00                  | .46                    | 1.9                 |
| 28             | 2068      | 2029          | -6.98    | 1.58                | .00                 |                      | .94                    | 13.1                |
| 29             | 2068      | 2069          | .23      | .01                 | .00                 | .00                  | .05                    | .0                  |
| 30             | 2029      | 2030          | -3.15    | .09                 |                     | .00                  | .63                    | 7.7                 |
| 31             | 2029      | 2027          | 1.96     | .36                 |                     | .00                  | .27                    | 1.2                 |
| 32             | 2030      | 2080          | -2.30    | 2.24                | .00                 | .00                  | .47                    | 4.6                 |
| 33             | 2027      | 2028          | .14      | .00                 | .00                 | .00                  | .02                    | . 0                 |
| 34             | 2027      | 2025          | .51      | .01                 | .00                 | .00                  | .03                    | . 0                 |
| 35             | 2025      | 2026          | .02      | .00                 |                     | .00                  | .01                    | .0                  |
| 36             | 2046      | 2047          | 1.61     | 1.48                | .00                 | .00                  | .33                    | 2.3                 |
| 37             | 2046      | 2048          | 6.31     | .30                 |                     | .00                  | .41                    | 1.8                 |
| 38             | 2048      | 2049          | 1.18     | .34                 | .00                 | .00                  | .16                    | .4                  |

JOB NAME = GKWSAP - JICA - Kahawatta SR

| 39 | 2049 | 2050 | .21    | .00  | .00 | .00 | .03 | .0   |
|----|------|------|--------|------|-----|-----|-----|------|
| 40 | 2049 | 2051 | .39    | .18  | .00 | .00 | .16 | 1.0  |
| 41 | 2067 | 2052 | 11.00  | .69  | .00 | .00 | .36 | .8   |
| 42 | 2067 | 2080 | 30.63  | .54  | .00 | .00 | .99 | 5.4  |
| 43 | 2040 | 2081 | -21.31 | .25  | .00 | .00 | .69 | 2.7  |
| 44 | 2038 | 2039 | 1.57   | .55  | .00 | .00 | .21 | .7   |
| 45 | 2035 | 2036 | 1.25   | .15  | .00 | .00 | .17 | . 4  |
| 46 | 2029 | 2030 | -6.14  | .09  | .00 | .00 | .78 | 7.7  |
| 47 | 2030 | 2080 | -7.17  | 2.24 | .00 | .00 | .97 | 11.9 |
| 48 | 2048 | 2049 | 1.27   | .34  | .00 | .00 | .17 | . 4  |
| 49 | 2049 | 2050 | .22    | .00  | .00 | .00 | .03 | . 0  |
| 50 | 2034 | 2035 | 1.62   | .68  | .00 | .00 | .22 | . 7  |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 2025               | .49                         | 512.23                    | 449.00                       | 63.23                   | 620.05                      |
| 2026               | .02                         | 512.23                    | 459.00                       | 53.23                   | 521.98                      |
| 2027               | 1.31                        | 512.24                    | 447.00                       | 65.24                   | 639.81                      |
| 2028               | .14                         | 512.24                    | 481.00                       |                         | 306.33                      |
| 2029               | .35                         | 512.60                    | 448.00                       | 64.60                   | 633.54                      |
| 2030               | .18                         |                           | 448.00                       |                         | 634.45                      |
| 2031               | .74                         |                           | 446.00                       |                         |                             |
| 2032               | 1.89                        |                           |                              | 61.56                   |                             |
| 2033               | 1.90                        | 501.34                    |                              | 61.34                   |                             |
| 2034               | 1.48                        |                           |                              | 60.66                   |                             |
| 2035               | .98                         | 504.97                    |                              | 52.97                   | 519.50                      |
| 2036               | 1.10                        | 504.83                    |                              | 39.83                   | 390.58                      |
| 2037               | 1.90                        | 505.73                    |                              | 60.73                   |                             |
| 2038               | 4.39                        | 511.02                    | 447.00                       |                         | 627.81                      |
| 2039               | 1.36                        | 510.47                    |                              | 27.47                   |                             |
| 2040               | .48                         | 513.29                    |                              | 67.29                   | 659.87                      |
| 2041               | .05                         | 513.55                    |                              | 65.55                   |                             |
| 2042               | .84                         | 513.29                    | 441.00                       | 72.29                   |                             |
| 2043               | 1.22                        | 513.28                    | 459.00                       |                         |                             |
| 2044               | .28                         | 513.24                    | 465.00                       | 48.24                   | 473.04                      |
| 2045               | .65                         | 513.29                    | 461.00                       | 52.29                   | 512.78                      |
| 2046               | 1.52                        | 512.47                    | 475.00                       | 37.47                   | 367.43                      |
| 2047               | 1.61                        | 510.98                    | 462.00                       | 48.98                   | 480.37                      |
| 2048               | 3.86                        | 512.16                    | 478.00                       | 34.16                   | 335.04                      |
| 2049               | 1.63                        | 511.83                    | 485.00                       | 26.83                   | 263.11                      |
| 2050               | .43                         | 511.83                    | 487.00                       | 24.83                   | 243.49                      |
| 2051               | .39                         | 511.65                    | 462.00                       | 49.65                   | 486.90                      |
| 2052               | .98                         | 514.79                    | 451.00                       | 63.79                   | 625.57                      |
| 2067               | 1.24                        | 515.48                    | 469.00                       |                         | 455.84                      |
| 2068               | .67                         | 511.02                    | 445.00                       |                         | 647.46                      |
| 2069               | .23                         | 511.01                    |                              | 50.01                   | 490.41                      |
| 2070               | 1.97                        | 503.78                    | 445.00                       | 58.78                   | 576.44                      |

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| 2071 | .40  | 503.75 | 461.00 | 42.75 | 419.25          |
|------|------|--------|--------|-------|-----------------|
| 2072 | 7.05 | 500.72 | 465.00 | 35.72 | 350.34          |
| 2073 | .41  | 504.80 | 475.00 | 29.80 | 292.22          |
| 2074 | .54  | 510.46 | 488.00 | 22.46 | 220.21          |
| 2080 | 1.18 | 514.94 | 462.00 | 52.94 | 519. <b>1</b> 5 |
| 2081 | .44  | 513.56 | 447.00 | 66.56 | 652.69          |

### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |   | FLOWRATE (1/s)        |
|-----|----------------------------|----------------|---|-----------------------|
|     |                            | 1              |   | 46.30                 |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | ======================================= | 46.30<br>.00<br>46.30 |

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00036

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 2067          | 13.89    | .06                 | .00                 | .00                  | .20                    | .1                  |
| 2              | 2067      | 2052          | .27      | .07                 | .00                 | .00                  | .06                    | . 0                 |

| 3  | 2067 | 2080 | .76          | .06 | - 00 | .00 | .15 | . 5 |
|----|------|------|--------------|-----|------|-----|-----|-----|
| 4  | 2052 | 2045 | 3.28         | .16 | .00  | .00 | .21 | .5  |
| 5  | 2045 | 2043 | .25          | .00 | .00  | .00 | .02 | .0  |
| 6  | 2045 | 2046 | 2.83         | .09 | .00  | .00 | .18 | . 4 |
| 7  | 2043 | 2042 | 20           | .00 | .00  | .00 | .01 | .0  |
| 8  | 2043 | 2044 | .08          | .00 | .00  | .00 | .02 | .0  |
| 9  | 2042 | 2040 | 45           | .00 | .00  | .00 | .03 | .0  |
| 10 | 2042 | 2038 | 6.01         | .24 | .00  | .00 | .39 | 1.6 |
| 11 | 2040 | 2030 | 20           | .03 | .00  | .00 | .09 | .3  |
| 12 | 2040 | 2041 |              |     |      |     |     |     |
| 13 |      | 2041 | .02<br>-6.75 | .00 | .00  | .00 | .01 | . 0 |
|    | 2081 |      |              | .15 | .00  | .00 | .22 | .3  |
| 14 | 2038 | 2039 | .10          | .06 | .00  | .00 | .04 | .0  |
| 15 | 2038 | 2037 | 4.12         | .57 | .00  | .00 | .27 | .8  |
| 16 | 2039 | 2074 | .16          | .00 | .00  | .00 | .03 | . 0 |
| 17 | 2037 | 2034 | 3.55         | .01 | .00  | .00 | .20 | . 4 |
| 18 | 2034 | 2035 | .26          | .07 | .00  | .00 | .05 | .0  |
| 19 | 2034 | 2031 | 2.36         | .07 | .00  | .00 | .15 | .3  |
| 20 | 2035 | 2036 | .08          | .02 | .00  | .00 | .03 | .0  |
| 21 | 2036 | 2073 | .12          | .00 | .00  | .00 | .02 | . 0 |
| 22 | 2031 | 2070 | 3.96         | .13 | .00  | .00 | .26 | . 7 |
| 23 | 2031 | 2068 | -1.82        | .65 | .00  | .00 | .25 | 1.1 |
| 24 | 2070 | 2032 | 3.25         | .24 | .00  | .00 | .21 | .5  |
| 25 | 2070 | 2071 | .12          | .00 | .00  | .00 | .02 | . 0 |
| 26 | 2032 | 2033 | 2.69         | .02 | .00  | .00 | .15 | .2  |
| 27 | 2033 | 2072 | 2.12         | .07 | .00  | .00 | .14 | .2  |
| 28 | 2068 | 2029 | -2.09        | .17 | .00  | .00 | .28 | 1.4 |
| 29 | 2068 | 2069 | .07          | .00 | .00  | .00 | .01 | .0  |
| 30 | 2029 | 2030 | 95           | .01 | .00  | .00 | .19 | .8  |
| 31 | 2029 | 2027 | .59          | .04 | .00  | .00 | .08 | .1  |
| 32 | 2030 | 2080 | 69           | .24 | .00  | .00 | .14 | . 4 |
| 33 | 2027 | 2028 | .04          | .00 | .00  | .00 | .01 | .0  |
| 34 | 2027 | 2025 | .15          | .00 | .00  | .00 | .01 | .0  |
| 35 | 2025 | 2026 | .01          | .00 | .00  | .00 | .00 | . 0 |
| 36 | 2046 | 2047 | .48          | .16 | .00  | .00 | .10 | .2  |
| 37 | 2046 | 2048 | 1.89         | .03 | .00  | .00 | .12 | .2  |
| 38 | 2048 | 2049 | .35          | .04 | .00  | .00 | .05 | .0  |
| 39 | 2049 | 2050 | .06          | .00 | .00  | .00 | .01 | .0  |
| 40 | 2049 | 2051 | .12          | .02 | .00  | .00 | .05 | .1  |
| 41 | 2047 | 2052 | 3.30         | .07 | .00  | .00 | .11 | .0  |
| 42 | 2067 | 2080 | 9.19         | .06 | .00  | .00 | .30 | .5  |
| 43 | 2040 | 2081 | -6.40        |     |      |     | .21 | .3  |
| 44 |      |      |              | .03 | .00  | .00 |     |     |
|    | 2038 | 2039 | .47          | .06 | .00  | .00 | .06 | .0  |
| 45 | 2035 | 2036 | .38          | .02 | .00  | .00 | .05 | .0  |
| 46 | 2029 | 2030 | -1.84        | .01 | .00  | .00 | .23 | .8  |
| 47 | 2030 | 2080 | -2.15        | .24 | .00  | .00 | .29 | 1.2 |
| 48 | 2048 | 2049 | .38          | .04 | .00  | .00 | .05 | .0  |
| 49 | 2049 | 2050 | .07          | .00 | .00  | .00 | .01 | . 0 |
| 50 | 2034 | 2035 | .49          | .07 | .00  | .00 | .07 | .0  |
|    |      |      |              |     |      |     |     |     |

| JUNCTION<br>NUMBER | TITLE | EXTERNAL<br>DEMAND<br>(1/s) |                            | ELEVATION                  |                | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------|-----------------------------|----------------------------|----------------------------|----------------|-----------------------------|
| 2025               |       | . 15                        | 515.59                     | 449.00                     | 66.59          | 653.07                      |
| 2026               |       | .01                         | 515.59                     | 459.00                     | 56.59          | 555.00                      |
| 2027               |       | .39                         | 515.60                     | 447.00                     | 68.60<br>34.60 | 672.70                      |
| 2028               |       | .04                         | 515.60                     | 481.00                     | 34.60          | 339.27                      |
| 2029               |       | .10                         | 515.60<br>515.60<br>515.63 | 448.00                     | 67.63          | 663.27                      |
| 2030               |       | .05                         | 515.64                     | 448.00                     | 67.64          | 663.37                      |
| 2031               |       | .22                         | 514.82<br>514.45           | 446.00                     | 68.82<br>74.45 | 674.87                      |
| 2032               |       | .57                         | 514.45                     | 440.00                     | 74.45          | 730.08                      |
| 2033               |       | .57                         | 514.42                     |                            | 74.42          |                             |
| 2034               |       | .44                         | 514.89                     | 445.00                     |                | 685.38                      |
| 2035               |       | .29                         | 514.82                     | 452.00                     | 62.82<br>49.80 | 616.02                      |
| 2036               |       | .33                         | 514.80                     |                            |                |                             |
| 2037               |       | .57                         | 514.90                     | 445.00                     | 69.90          |                             |
| 2038               |       | 1.32                        | 515.47                     | 447.00<br>483.00<br>446.00 | 68.47<br>32.41 | 671.43                      |
| 2039               |       | .41                         | 515.41                     | 483.00                     | 32.41          | 317.80                      |
| 2040               |       | .14                         |                            |                            | 69.71          | 683.63                      |
| 2041               |       | .02                         | 515.74                     | 448.00                     | 67.74          | 664.27                      |
| 2042               |       | .25                         | 515.71<br>515.71           | 441.00<br>459.00           | 74.71<br>56.71 | 732.65                      |
| 2043               |       | .37                         | 515.71                     | 459.00                     | 56.71          |                             |
| 2044               |       | .08                         | 515.70                     |                            |                |                             |
| 2045               |       | .20                         | 515.71                     | 461.00                     | 54.71          | 536.51                      |
| 2046               |       | .46                         | 515.62<br>515.46           | 475.00                     | 40.62<br>53.46 | 398.35                      |
| 2047               |       | .48                         | 515.46                     |                            |                |                             |
| 2048               |       | 1.16                        | 515.59                     |                            |                |                             |
| 2049               |       | .49<br>.13                  | 515.55<br>515.55           | 485.00                     | 30.55<br>28.55 | 299.61<br>279.99            |
| 2050               |       | .13                         | 515.55                     | 487.00                     | 28.55<br>53.53 | 524.97                      |
| 2051<br>2052       |       | .12                         | 515.87                     | 452.00                     | 64.87          |                             |
| 2052               |       | .37                         |                            |                            |                |                             |
| 2067               |       | .20                         | 515.94<br>515.46           | 469.00<br><b>445.</b> 00   | 46.94<br>70.46 | 691.03                      |
| 2069               |       | .07                         | 515.46                     | 461.00                     | 54.46          | 534.10                      |
| 2070               |       | .59                         | 514.69                     |                            | 69.69          | 683.39                      |
| 2070               |       | .12                         | E11 C0                     | 461 00                     | 53 68          | 526 45                      |
| 2072               |       | 2.12                        | 514.36                     | 465 NO                     | 49.36          | 484.03                      |
| 2072               |       | .12                         | 514.80                     | 475.00                     |                |                             |
| 2074               |       | .16                         | 515.41                     |                            |                |                             |
| 2080               |       | .35                         | 515.89                     | 462.00                     | 27.41<br>53.89 | 528.44                      |
| 2081               |       | .13                         | 515.89<br>515.74           | 447.00                     | 68.74          | 674.08                      |
| <del></del>        |       |                             | <del></del>                | <del></del>                |                | - · - · ·                   |

### SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES

(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

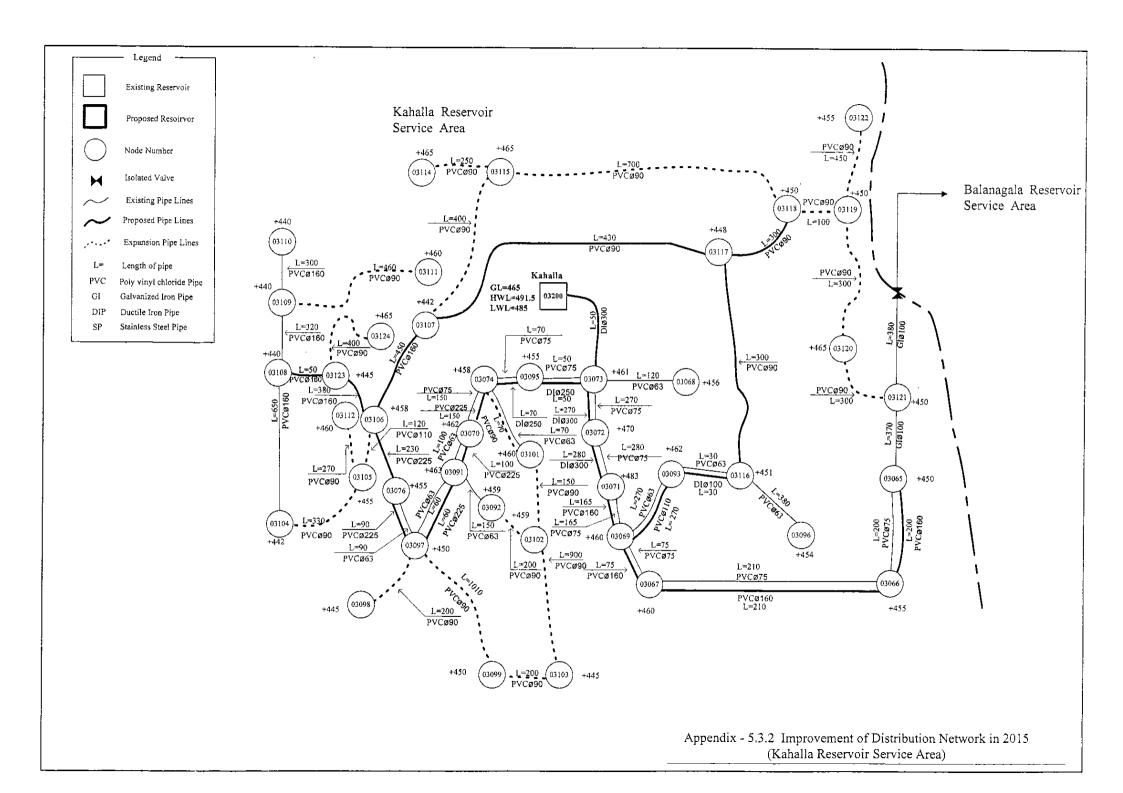
PIPE FLOWRATE
NUMBER (1/s)

1 13.89

NETSYSTEMINFLOW=13.89NETSYSTEMOUTFLOW=.00NETSYSTEMDEMAND=13.89

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 10:33: 4



DATE: 3/ 7/2002 TIME: 10:40:37

INPUT DATA FILENAME ------ c:\D\_nets\2015\KAHL2015.DAT TABULATED OUTPUT FILENAME ----- c:\D\_nets\2015\KAHL2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\KAHL2015.RES

### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) .... = meters PRESSURE .... = kpa

#### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER | NOD<br>#1    | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|--------------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-FG           | 0            | 3073         | 50.0          | 30.0             | 130.00              | .00                  | 485.         |
| 2<br>3         | 3073<br>3095 | 3095<br>3074 | 50.0<br>70.0  | 6.5              | 120.00              | .00                  |              |
| 3<br>4         | 3095         | 3074         | 70.0<br>150.0 | 6.5<br>6.5       | 120.00<br>120.00    | .00                  |              |
| 5              | 3074         | 3101         | 70.0          | 5.5              | 120.00              | .00                  |              |
|                |              |              |               |                  |                     |                      |              |
| 6              | 3070         | 3091         | 100.0         | 5.5              | 120.00              | .00                  |              |
| 7              | 3091         | 3092         | 150.0         | 5.5              | 120.00              | .00                  |              |
| 8              | 3091         | 3097         | 60.0          | 5.5              | 120.00              | .00                  |              |
| 9              | 3097         | 3076         | 90.0          | 5.5              | 120.00              | .00                  |              |
| 10             | 3073         | 3068         | 120.0         | 5.5              | 120.00              | .00                  |              |
| 11             | 3073         | 3072         | 270.0         | 6.5              | 120.00              | .00                  |              |
| 12             | 3072         | 3071         | 280.0         | 6.5              | 120.00              | .00                  |              |
| 13             | 3071         | 3069         | 165.0         | 6.5              | 120.00              | .00                  |              |

| 14         | 3069 | 3067 | 75.0   | 6.5  | 120.00 | .00 |
|------------|------|------|--------|------|--------|-----|
| <b>1</b> 5 | 3069 | 3093 | 270.0  | 5.5  | 120.00 | .00 |
| 16         | 3067 | 3066 | 210.0  | 6.5  | 120.00 | .00 |
|            |      |      |        |      |        |     |
| 17         | 3066 | 3065 | 200.0  | 6.5  | 120.00 | .00 |
| 18         | 3065 | 3121 | 370.0  | 10.0 | 120.00 | .00 |
| 19         | 3093 | 3116 | 30.0   | 5.5  | 120.00 | .00 |
| 20         | 3116 | 3096 | 380.0  | 5.5  | 120.00 | .00 |
| 21         | 3073 | 3095 | 50.0   | 25.0 | 130.00 | .00 |
| 22         | 3095 | 3074 | 70.0   | 25.0 | 130.00 | .00 |
| 23         | 3074 | 3079 |        |      |        |     |
|            |      |      | 150.0  | 19.8 | 130.00 | .00 |
| 24         | 3070 | 3091 | 100.0  | 19.8 | 130.00 | .00 |
| 25         | 3091 | 3097 | 60.0   | 19.8 | 130.00 | .00 |
| 26         | 3097 | 3076 | 90.0   | 19.8 | 130.00 | .00 |
| 27         | 3073 | 3072 | 270.0  | 30.0 | 130.00 | .00 |
| 28         | 3072 | 3071 | 280.0  | 30.0 | 130.00 | .00 |
| 29         | 3069 | 3067 | 75.0   | 14.0 | 130.00 | .00 |
| 30         | 3067 | 3066 | 210.0  | 14.0 | 130.00 |     |
|            |      |      |        |      |        | .00 |
| 31         | 3066 | 3065 | 200.0  | 14.0 | 130.00 | .00 |
| 32         | 3092 | 3102 | 200.0  | 7.9  | 130.00 | .00 |
| 33         | 3101 | 3102 | 150.0  | 7.9  | 130.00 | .00 |
| 34         | 3102 | 3103 | 900.0  | 7.9  | 130.00 | .00 |
| 35         | 3103 | 3099 | 200.0  | 7.9  | 130.00 | .00 |
| 36         | 3099 | 3097 | 1010.0 | 7.9  | 130.00 | .00 |
| 37         | 3097 | 3098 | 200.0  | 7.9  | 130.00 | .00 |
|            |      |      |        |      |        |     |
| 38         | 3076 | 3106 | 230.0  | 19.8 | 130.00 | .00 |
| 39         | 3106 | 3107 | 450.0  | 14.0 | 130.00 | .00 |
| 40         | 3106 | 3105 | 120.0  | 9.7  | 130.00 | .00 |
| 41         | 3106 | 3123 | 380.0  | 14.0 | 130.00 | .00 |
| 42         | 3105 | 3104 | 330.0  | 7.9  | 130.00 | .00 |
| 43         | 3105 | 3112 | 270.0  | 7.9  | 130.00 | .00 |
| 44         | 3104 | 3108 | 650.0  | 14.0 | 130.00 | .00 |
| 45         | 3108 | 3123 | 50.0   | 14.0 | 130.00 |     |
|            |      |      |        |      |        | .00 |
| 46         | 3108 | 3109 | 320.0  | 14.0 | 130.00 | .00 |
| 47         | 3109 | 3110 | 300.0  | 14.0 | 130.00 | .00 |
| 48         | 3109 | 3111 | 460.0  | 7.9  | 130.00 | .00 |
| 49         | 3123 | 3124 | 400.0  | 7.9  | 130.00 | .00 |
| 50         | 3107 | 3115 | 400.0  | 7.9  | 130.00 | .00 |
| 51         | 3107 | 3117 | 430.0  | 7.9  | 130.00 | .00 |
| 52         | 3115 | 3114 | 250.0  | 7.9  | 130.00 | .00 |
| 53         | 3115 | 3118 | 700.0  | 7.9  | 130.00 |     |
|            |      |      |        |      |        | .00 |
| 54         | 3117 | 3116 | 300.0  | 7.9  | 130.00 | .00 |
| 55         | 3117 | 3118 | 300.0  | 7.9  | 130.00 | .00 |
| 56         | 3118 | 3119 | 100.0  | 7.9  | 130.00 | .00 |
| 57         | 3119 | 3120 | 300.0  | 7.9  | 130.00 | .00 |
| 58         | 3119 | 3122 | 450.0  | 7.9  | 130.00 | .00 |
| 59         | 3120 | 3121 | 300.0  | 7.9  | 130.00 | .00 |
| 60         | 3071 | 3069 | 165.0  | 14.0 | 130.00 | .00 |
| 61         | 3069 | 3093 | 270.0  |      |        |     |
|            |      |      |        | 9.7  | 130.00 | .00 |
| 62         | 3093 | 3116 | 30.0   | 10.0 | 130.00 | .00 |
| 63         | 3074 | 3101 | 70.0   | 7.9  | 130.00 | .00 |
|            |      |      |        |      |        |     |

### PAGE NO. 3

## JUNCTION NODE DATA

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | DEMAND | JUNCTION<br>ELEVATION<br>(m) | CONNE | ECTING     | PIPI | ES |    |
|--------------------|-------------------|--------|------------------------------|-------|------------|------|----|----|
| 3065               |                   | 1.07   | 450.00                       | 17    | 18         | 31   |    |    |
| 3066               |                   | 1.47   | 455.00                       | 16    | 17         | 30   | 31 |    |
| 3067               |                   | .43    | 460.00                       | 14    | 16         | 29   | 30 |    |
| 3068               |                   | .15    | 456.00                       | 10    |            |      |    |    |
| 3069               |                   | .69    | 460.00                       | 13    | 14         | 15   | 29 | 60 |
|                    |                   |        | 20000                        |       |            |      |    |    |
| 3070               |                   | .29    | 462.00                       | 4     | 6          | 23   | 24 |    |
| 3071               |                   | 1.00   | 483.00                       | 12    | 13         | 28   | 60 |    |
| 3072               |                   | .45    | 470.00                       | 11    | 12         | 27   | 28 |    |
| 3073               |                   | .49    | 461.00                       | 1     | 2          | 10   | 11 | 21 |
|                    |                   |        |                              |       |            |      |    |    |
| 3074               |                   | .31    | 458.00                       | 3     | 4          | 5    | 22 | 23 |
|                    |                   |        |                              |       |            |      |    |    |
| 3076               |                   | .32    | 455.00                       | 9     | 26         | 38   |    |    |
| 3091               |                   | .32    | 463.00                       | 6     | 7          | 8    | 24 | 25 |
| 3092               |                   | .42    | 459.00                       | 7     | 32         |      |    |    |
| 3093               |                   | .45    | 462.00                       | 15    | 19         | 61   | 62 |    |
| 3095               |                   | .16    | 455.00                       | 2     | 3          | 21   | 22 |    |
| 3096               |                   | .80    | 454.00                       | 20    |            |      |    |    |
| 3097               |                   | 1.33   | 450.00                       | 8     | 9          | 25   | 26 | 36 |
|                    |                   |        |                              |       |            |      |    |    |
| 3098               |                   | .25    | 445.00                       | 37    |            |      |    |    |
| 3099               |                   | 4.03   | 450.00                       | 35    | 36         |      |    |    |
| 3101               |                   | .28    | 460.00                       | 5     | 33         | 63   |    |    |
| 3102               |                   | 1.52   | 459.00                       | 32    | 33         | 34   |    |    |
| 3103               |                   | 2.11   | 445.00                       | 34    | 35         |      |    |    |
| 3104               |                   | 2.44   | 442.00                       | 42    | 44         |      |    |    |
| 3105               |                   | . 55   | 455.00                       | 40    | 42         | 43   |    |    |
| 3106               |                   | .77    | 458.00                       | 38    | 39         | 40   | 41 |    |
| 3107               |                   | 4.16   | 442.00                       | 39    | 50         | 51   |    |    |
| 3108               |                   | 2.07   | 440.00                       | 44    | 45         | 46   |    |    |
| 3109               |                   | 1.66   | 440.00                       | 46    | 47         | 48   |    |    |
| 3110               |                   | 1.46   | 440.00                       | 47    |            |      |    |    |
| 3111               |                   | .30    | 460.00                       | 48    |            |      |    |    |
| 3112               |                   | .27    | 460.00                       | 43    |            |      |    |    |
| 3114               |                   | .38    | 465.00                       | 52    |            |      |    |    |
| 3115               |                   | 1.95   | 465.00                       | 50    | 52         | 53   |    |    |
| 3116               |                   | 1.06   | 451.00                       | 19    | 20         | 54   | 62 |    |
| 3117               |                   | 1.01   | 448.00                       | 51    | 54         | 55   |    |    |
| 3118               |                   | 1.59   | 450.00                       | 53    | 55         | 56   |    |    |
| 3119               |                   | 1.46   | 450.00                       | 56    | 57         | 58   |    |    |
| 3120               |                   | 1.03   | 465.00                       | 57    | 5 <i>9</i> |      |    |    |
| 3121               |                   | 2.64   | 450.00                       | 18    | 59         |      |    |    |
| 3122               |                   | 1.21   | 455.00                       | 58    | J J        |      |    |    |
| 3123               |                   | .30    | 445.00                       | 41    | 45         | 49   |    |    |
| 3124               |                   | .33    | 465.00                       | 49    | 4 J        | 1)   |    |    |
| J + 4 +            |                   |        | ±03.00                       | マシ    |            |      |    |    |

PAGE NO. 4 JOB NAME = GKWSAP - JICA - Kahalla SR

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

### SYSTEM CONFIGURATION

| NUMBER OF | PIPES(p)             | = | 63 |
|-----------|----------------------|---|----|
| NUMBER OF | JUNCTION NODES(j)    | = | 42 |
| NUMBER OF | PRIMARY LOOPS(1)     | = | 21 |
| NUMBER OF | FIXED GRADE NODES(f) | = | 1  |
| NUMBER OF | SUPPLY ZONES(z)      | = | 1  |
|           |                      |   |    |

\*\*\*\*\*\*\*\*\*\* SIMULATION RESULTS \*\*\*\*\*\*\*\*\*

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00090

### PIPELINE RESULTS

| STATUS CODE: | XX -CLOSED PIPE | FG -FIXED GRADE NODE | PU -PUMP LINE    |
|--------------|-----------------|----------------------|------------------|
|              | CV -CHECK VALVE | RV -REGULATING VALVE | TK -STORAGE TANK |

| PIPE<br>NUMBER | NO:<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) |     |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|-----|
| 1-FG           | 0         | 3073          | 44.98    | .07                 | .00                 | .00                  | .64                    | 1.4 |
| 2              | 3073      | 3095          | .77      | .08                 | .00                 | .00                  | .23                    | 1.5 |
| 3              | 3095      | 3074          | .76      | .11                 | .00                 | .00                  | .23                    | 1.5 |
| 4              | 3074      | 3070          | 1.17     | .51                 | .00                 | .00                  | .35                    | 3.4 |
| 5              | 3074      | 3101          | 1.08     | .46                 | .00                 | .00                  | .46                    | 6.6 |
| 6              | 3070      | 3091          | .76      | .34                 | .00                 | .00                  | .32                    | 3.4 |
| 7              | 3091      | 3092          | 1.12     | 1.06                | .00                 | .00                  | .47                    | 7.0 |
| 8              | 3091      | 3097          | .72      | .18                 | .00                 | .00                  | .30                    | 3.0 |
| 9              | 3097      | 3076          | .57      | .18                 | .00                 | .00                  | .24                    | 2.0 |
| 10             | 3073      | 3068          | .15      | .02                 | .00                 | .00                  | .06                    | .1  |
| 11             | 3073      | 3072          | .25      | .05                 | .00                 | .00                  | .07                    | .1  |
| 12             | 3072      | 3071          | .24      | .05                 | .00                 | .00                  | .07                    | .1  |
| 13             | 3071      | 3069          | 1.46     | .84                 | .00                 | .00                  | .44                    | 5.1 |
| 14             | 3069      | 3067          | .86      | .14                 | .00                 | .00                  | .26                    | 1.9 |
| 15             | 3069      | 3093          | .83      | 1.09                | .00                 | .00                  | .35                    | 4.0 |
| 16             | 3067      | 3066          | .81      | .36                 | .00                 | .00                  | . 24                   | 1.7 |
| 17             | 3066      | 3065          | . 65     | .23                 | .00                 | .00                  | .20                    | 1.1 |

| 18         | 3065 | 3121    | 4.87             | 2.16 | .00 | .00 | .62 | 5.8  |
|------------|------|---------|------------------|------|-----|-----|-----|------|
| 19         | 3093 | 3116    | .70              | .09  | .00 | .00 | .30 | 2.9  |
| 20         | 3116 | 3096    | .80              | 1.44 | .00 | .00 | .34 | 3.7  |
| 21         | 3073 | 3095    | 28.76            | .08  | .00 | .00 | .59 | 1.5  |
| 22         | 3095 | 3074    | 28.61            | .11  | .00 | .00 | .58 | 1.5  |
| 23         | 3074 | 3070    | 23.76            | .51  | .00 | .00 | .77 | 3.4  |
| 24         | 3070 | 3091    | 23.89            | .34  | .00 | .00 | .78 | 3.4  |
| 25         | 3091 | 3097    | 22.49            | .18  | .00 | .00 | .73 | 3.0  |
| 26         | 3097 | 3076    | 17.94            | .18  | .00 | .00 | .58 | 2.0  |
| 27         | 3073 | 3072    | 14.56            | .05  | .00 | .00 | .21 | .1   |
| 28         | 3072 | 3071    | 14.12            | .05  | .00 | .00 | .20 | .1   |
| 29         | 3069 | 3067    | 6.99             | .14  | .00 | .00 | .45 | 1.9  |
| 30         | 3067 | 3066    | 6.60             | .36  | .00 | .00 | .43 | 1.7  |
| 31         | 3066 | 3065    | 5.29             | .23  | .00 | .00 | .34 | 1.1  |
| 32         | 3092 | 3102    | .70              | .09  | .00 | .00 | .14 | .4   |
| 33         | 3101 | 3102    | 3.84             | 1.53 | .00 | .00 | .78 | 10.2 |
| 34         | 3102 | 31.03   | 3.02             | 5.90 | .00 | .00 | .62 | 6.5  |
| 35         | 3103 | 3099    | .91              | .14  | .00 | .00 | .19 | .7   |
| 36         | 3099 | 3097    | -3.12            | 7.00 | .00 | .00 | .64 | 6.9  |
| 37         | 3097 | 3098    | .25              | .01  | .00 | .00 | .05 | .0   |
| 38         | 3076 | 3106    | 18.19            | .48  | .00 | .00 | .59 | 2.0  |
| 39         | 3106 | 3107    | 8.04             | 1.11 | .00 | .00 | .52 | 2.4  |
| 40         | 3106 | 3105    | 2.39             | .19  | .00 | .00 | .32 | 1.5  |
| 41         | 3106 | 3123    | 6.99             | .72  | .00 | .00 | .45 | 1.9  |
| 42         | 3105 | 3104    | 1.57             | .64  | .00 | .00 | .32 | 1.9  |
| 43         | 3105 | 3112    | .27              | .02  | .00 | .00 | .06 | .0   |
| 44         | 3104 | 3108    | 87               | .03  | .00 | .00 | .06 | .0   |
| 45         | 3108 | 3123    | -6.36            | .08  | .00 | .00 | .41 | 1.6  |
| 46         | 3108 | 3109    | 3.42             | .16  | .00 | .00 | .22 | .5   |
| 47         | 3109 | 3110    | 1.46             | .03  | .00 | .00 | .09 | .1   |
| 48         | 3109 | 3111    | .30              | .04  | .00 | .00 | .06 | .0   |
| 49         | 3123 | 3124    | .33              | .04  | .00 | .00 | .07 | .1   |
| 50         | 3107 | 3115    | 2.66             | 2.07 | .00 | .00 | .54 | 5.1  |
| 51         | 3107 | 3117    | 1.22             | .52  | .00 | .00 | .25 | 1.2  |
| 52         | 3115 | 3114    | .38              | .04  | .00 | .00 | .08 | .1   |
| 53         | 3115 | 3118    | .33              | .08  | .00 | .00 | .07 | .1   |
| 54         | 3117 | 3116    | -2.52            | 1.40 | .00 | .00 | .51 | 4.6  |
| 55         | 3117 | 3118    | 2.72             | 1.62 | .00 | .00 | .56 | 5.4  |
| 56         | 3118 | 3119    | 1.47             | .17  | .00 | .00 | .30 | 1.7  |
| 57         | 3119 | 3120    | -1.20            | .36  | .00 | .00 | .25 | 1.1  |
| 58         | 3119 | 3122    | 1.21             | .54  | .00 | .00 | .25 | 1.2  |
| 59         | 3120 | 3121    | -2.23            | 1.12 | .00 | .00 | .46 | 3.7  |
| 60         | 3071 | 3069    | 11.90            | .84  | .00 | .00 | .77 | 5.1  |
| 61         | 3069 | 3093    | 4.00             | 1.09 | .00 | .00 | .54 | 4.0  |
| 62         | 3093 | 3116    | 3.67             | .09  | .00 | .00 | .47 | 2.9  |
| 63         | 3074 | 3110    | 3.04             | .46  | .00 | .00 | .62 | 6.6  |
| <b>0</b> 5 | 3074 | J + U + | J.U <del>I</del> | . 40 | .00 | .00 | .02 | 0.0  |
|            |      |         |                  |      |     |     |     |      |

# 

| JUNCTION | JUNCTION         | EXTERNAL | HYDRAULIC | JUNCTION  | PRESSURE | JUNCTIO |
|----------|------------------|----------|-----------|-----------|----------|---------|
| NUMBER   | $\mathtt{TITLE}$ | DEMAND   | GRADE     | ELEVATION | HEAD     | PRESSUR |

|      | (1/s) | (m)    | (m)    | (m)   | (kpa)  |
|------|-------|--------|--------|-------|--------|
| 3065 | 1.07  | 483.25 | 450.00 | 33.25 | 326.07 |
| 3066 | 1.47  | 483.48 | 455.00 | 28.48 | 279.27 |
| 3067 | .43   | 483.84 | 460.00 | 23.84 | 233.77 |
| 3068 | .15   | 484.91 | 456.00 | 28.91 | 283.48 |
| 3069 | .69   | 483.98 | 460.00 | 23.98 | 235.17 |
| 3070 | .29   | 484.23 | 462.00 | 22.23 | 218.02 |
| 3071 | 1.00  | 484.82 | 483.00 | 1.82  | 17.88  |
| 3072 | .45   | 484.87 | 470.00 | 14.87 | 145.87 |
| 3073 | .49   | 484.93 | 461.00 | 23.93 | 234.64 |
| 3074 | .31   | 484.74 | 458.00 | 26.74 | 262.24 |
| 3076 | .32   | 483.52 | 455.00 | 28.52 | 279.71 |
| 3091 | .32   | 483.89 | 463.00 | 20.89 | 204.84 |
| 3092 | .42   | 482.83 | 459.00 | 23.83 | 233.71 |
| 3093 | .45   | 482.89 | 462.00 | 20.89 | 204.86 |
| 3095 | .16   | 484.85 | 455.00 | 29.85 | 292.72 |
| 3096 | .80   | 481.36 | 454.00 | 27.36 | 268.36 |
| 3097 | 1.33  | 483.70 | 450.00 | 33.70 | 330.52 |
| 3098 | .25   | 483.69 | 445.00 | 38.69 | 379.43 |
| 3099 | 4.03  | 476.70 | 450.00 | 26.70 | 261.88 |
| 3101 | .28   | 484.28 | 460.00 | 24.28 | 238.08 |
| 3102 | 1.52  | 482.74 | 459.00 | 23.74 | 232.86 |
| 3103 | 2.11  | 476.85 | 445.00 | 31.85 | 312.31 |
| 3104 | 2.44  | 482.22 | 442.00 | 40.22 | 394.38 |
| 3105 | . 55  | 482.86 | 455.00 | 27.86 | 273.20 |
| 3106 | .77   | 483.05 | 458.00 | 25.05 | 245.61 |
| 3107 | 4.16  | 481.93 | 442.00 | 39.93 | 391.55 |
| 3108 | 2.07  | 482.24 | 440.00 | 42.24 | 414.25 |
| 3109 | 1.66  | 482.08 | 440.00 | 42.08 | 412.65 |
| 3110 | 1.46  | 482.05 | 440.00 | 42.05 | 412.35 |
| 3111 | .30   | 482.04 | 460.00 | 22.04 | 216.11 |
| 3112 | .27   | 482.84 | 460.00 | 22.84 | 223.97 |
| 3114 | .38   | 479.82 | 465.00 | 14.82 | 145.36 |
| 3115 | 1.95  | 479.86 | 465.00 | 14.86 | 145.71 |
| 3116 | 1.06  | 482.80 | 451.00 | 31.80 | 311.86 |
| 3117 | 1.01  | 481.40 | 448.00 | 33.40 | 327.57 |
| 3118 | 1.59  | 479.78 | 450.00 | 29.78 | 292.06 |
| 3119 | 1.46  | 479.61 | 450.00 | 29.61 | 290.38 |
| 3120 | 1.03  | 479.97 | 465.00 | 14.97 | 146.78 |
| 3121 | 2.64  | 481.09 | 450.00 | 31.09 | 304.89 |
| 3122 | 1.21  | 479.07 | 455.00 | 24.07 | 236.04 |
| 3123 | .30   | 482.32 | 445.00 | 37.32 | 366.00 |
| 3124 | .33   | 482.28 | 465.00 | 17.28 | 169.44 |

SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE FLOWRATE

DATE = 03-07-2002JOB NAME = GKWSAP - JICA - Kahalla SR

|                      | NUMBER            |   | (1/s) |
|----------------------|-------------------|---|-------|
|                      | 1                 |   | 44.98 |
| <br>SYSTEM<br>SYSTEM | INFLOW<br>OUTFLOW | = | 44.98 |

NET SYSTEM DEMAND = 44.98

## DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00017

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NO!<br>#1 | DE NOS.<br>#2 | FLOWRATE (1/s) | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) |     |
|----------------|-----------|---------------|----------------|---------------------|---------------------|----------------------|------------------------|-----|
| 1-FG           | 0         | 3073          | 13.49          | .01                 | .00                 | .00                  | .19                    | .1  |
| 2              | 3073      | 3095          | .23            | .01                 | .00                 | .00                  | .07                    | .1  |
| 3              | 3095      | 3074          | .23            | .01                 | .00                 | .00                  | .07                    | .1  |
| 4              | 3074      | 3070          | .35            | .05                 | .00                 | .00                  | .11                    | . 3 |
| 5              | 3074      | 3101          | .32            | .05                 | .00                 | .00                  | .14                    | .7  |
| 6              | 3070      | 3091          | .23            | .04                 | .00                 | .00                  | .10                    | . 3 |
| 7              | 3091      | 3092          | .34            | .11                 | .00                 | .00                  | .14                    | .7  |
| 8              | 3091      | 3097          | .21            | .02                 | .00                 | .00                  | .09                    | .3  |
| 9              | 3097      | 3076          | .17            | .02                 | .00                 | .00                  | .07                    | .2  |
| 10             | 3073      | 3068          | .05            | .00                 | .00                 | .00                  | .02                    | . 0 |
| 11             | 3073      | 3072          | .07            | .01                 | .00                 | .00                  | .02                    | .0  |
| 12             | 3072      | 3071          | .07            | .01                 | .00                 | .00                  | .02                    | .0  |
| 13             | 3071      | 3069          | .44            | .09                 | .00                 | .00                  | .13                    | .5  |
| 14             | 3069      | 3067          | .26            | .02                 | .00                 | .00                  | .08                    | . 2 |
| 15             | 3069      | 3093          | .25            | .12                 | .00                 | .00                  | .10                    | . 4 |
| 16             | 3067      | 3066          | .24            | .04                 | .00                 | .00                  | .07                    | .1  |
| 17             | 3066      | 3065          | .19            | .02                 | .00                 | .00                  | .06                    | .1  |

| 18 | 3065         | 3121 | 1.46          | .23 | .00   | .00 | .19 | .6  |
|----|--------------|------|---------------|-----|-------|-----|-----|-----|
| 19 | 3093         | 3116 | .21           | .01 | .00   | .00 | .09 | .3  |
| 20 | 3116         | 3096 | .24           | .15 | .00   | .00 | .10 | . 4 |
| 21 | 3073         | 3095 | 8.63          | .01 | .00   | .00 | .18 | . 1 |
| 22 | 3095         | 3074 | 8.58          | .01 | .00   | .00 | .17 | .1  |
| 23 | 3074         | 3070 | 7.13          | .05 | .00   | .00 | .23 | .3  |
| 24 | 3070         | 3091 | 7.17          | .04 | .00   | .00 | .23 | . 3 |
| 25 | 3091         | 3097 | 6.75          | .02 | .00   | .00 | .22 | .3  |
| 26 | 3097         | 3076 | 5.38          | .02 | .00   | .00 | .17 | .2  |
| 27 | 3073         | 3072 | 4.37          | .01 | .00   | .00 | .06 | .0  |
| 28 | 3072         | 3071 | 4.24          | .01 | .00   | .00 | .06 | .0  |
| 29 | 3069         | 3067 | 2.10          | .02 | .00   | .00 | .14 | .2  |
| 30 | 3067         | 3066 | 1.98          | .04 | .00   | .00 | .13 | .1  |
| 31 | 3066         | 3065 | 1.59          | .02 | .00   | .00 | .10 | .1  |
| 32 | 3092         | 3102 | .21           | .01 | .00   | .00 | .04 | .0  |
| 33 | 3101         | 3102 | 1.15          | .16 | .00   | .00 | .24 | 1.1 |
| 34 | 3102         | 3103 | .91           | .63 | .00   | .00 | .19 | .7  |
| 35 | 3103         | 3099 | .27           | .02 | .00   | .00 | .06 | . 0 |
| 36 | 3099         | 3097 | 93            | .75 | .00   | .00 | .19 | .7  |
| 37 | 3097         | 3098 | .08           | .00 | .00   | .00 | .02 | . 0 |
| 38 | 3076         | 3106 | 5.46          | .05 | .00   | .00 | .18 | .2  |
| 39 | 3106         | 3107 | 2.41          | .12 | .00   | .00 | .16 | .2  |
| 40 | 3106         | 3105 | .72           | .02 | .00   | .00 | .10 | .1  |
| 41 | 3106         | 3123 | 2.10          | .08 | .00   | .00 | .14 | .2  |
| 42 | 3105         | 3104 | .47           | .07 | .00   | .00 | .10 | .2  |
| 43 | 3105         | 3112 | .08           | .00 | .00   | .00 | .02 | .0  |
| 44 | 3104         | 3108 | 26            | .00 | .00   | .00 | .02 | .0  |
| 45 | 3108         | 3123 | -1.91         | .01 | .00   | .00 | .12 | .1  |
| 46 | 3108         | 3109 | 1.03          | .02 | .00   | .00 | .07 | .0  |
| 47 | 3109         | 3110 | .44           | .00 | .00   | .00 | .03 | .0  |
| 48 | 3109         | 3111 | .09           | .00 | .00   | .00 | .02 | .0  |
| 49 | 3123         | 3124 | .10           | .00 | .00   | .00 | .02 | .0  |
| 50 | 3107         | 3115 | .80           | .22 | .00   | .00 | .16 | .5  |
| 51 | 3107         | 3117 | .37           | .06 | .00   | .00 | .07 | .1  |
| 52 | 3115         | 3114 | .11           | .00 | .00   | .00 | .02 | .0  |
| 53 | 3115         | 3118 | .10           | .01 | .00   | .00 | .02 | .0  |
| 54 | 3117         | 3116 | 75            | .15 | .00   | .00 | .15 | .5  |
| 55 | 3117         | 3118 | .82           | .17 | .00   | .00 | .17 | .5  |
| 56 | 3118         | 3119 | .44           | .02 | .00   | .00 | .09 | .1  |
| 57 | 3119         | 3120 | 36            | .04 | .00   | .00 | .07 | .1  |
| 58 | 3119         | 3122 | .36           | .06 | .00   | .00 | .07 | .1  |
| 59 | 3120         | 3121 | 67            | .12 | .00   | .00 | .14 | . 4 |
| 60 | 3071         | 3069 | 3.57          | .09 | .00   | .00 | .23 | .5  |
| 61 | 3069         | 3093 | 1.20          | .12 | .00   | .00 | .16 | .4  |
| 62 | 3093         | 3116 | 1.10          | .01 | .00   | .00 | .14 | .3  |
| 63 | 3074         | 3101 | .91           | .05 | .00   | .00 | .19 | .7  |
| -  | <del>-</del> |      | - <del></del> |     | . • • |     |     | - • |
|    |              |      |               |     |       |     |     |     |

# JUNCTION NODE RESULTS

| JUNCTION | JUNCTION         | EXTERNAL | HYDRAULIC | JUNCTION  | PRESSURE | JUNCTIO |
|----------|------------------|----------|-----------|-----------|----------|---------|
| NUMBER   | $\mathtt{TITLE}$ | DEMAND   | GRADE     | ELEVATION | HEAD     | PRESSUR |

JOB NAME = GKWSAP - JICA - Kahalla SR

|      | (1/s) | (m)    | (m)    | (m)   | (kpa)          |
|------|-------|--------|--------|-------|----------------|
| 3065 | .32   | 484.81 | 450.00 | 34.81 | 341.39         |
| 3066 | .44   | 484.84 | 455.00 | 29.84 | 292.60         |
| 3067 | .13   | 484.88 | 460.00 | 24.88 | 243.95         |
| 3068 | .05   | 484.99 | 456.00 | 28.99 | 284.30         |
| 3069 | .21   | 484.89 | 460.00 | 24.89 | 244.10         |
| 3070 | .09   | 484.92 | 462.00 | 22.92 | 224.74         |
| 3071 | .30   | 484.98 | 483.00 | 1.98  | 19.43          |
| 3072 | .14   | 484.99 | 470.00 | 14.99 | 146.97         |
| 3073 | .15   | 484.99 | 461.00 | 23.99 | 235.28         |
| 3074 | .09   | 484.97 | 458.00 | 26.97 | 264.51         |
| 3076 | .10   | 484.84 | 455.00 | 29.84 | 292.64         |
| 3091 | .10   | 484.88 | 463.00 | 21.88 | 214.57         |
| 3092 | .13   | 484.77 | 459.00 | 25.77 | 252.69         |
| 3093 | .14   | 484.77 | 462.00 | 22.77 | 223.33         |
| 3095 | .05   | 484.98 | 455.00 | 29.98 | 294.04         |
| 3096 | .24   | 484.61 | 454.00 | 30.61 | 300.18         |
| 3097 | .40   | 484.86 | 450.00 | 34.86 | 341.87         |
| 3098 | .08   | 484.86 | 445.00 | 39.86 | 390.89         |
| 3099 | 1.21  | 484.11 | 450.00 | 34.11 | 334.48         |
| 3101 | .08   | 484.92 | 460.00 | 24.92 | 244.41         |
| 3102 | .46   | 484.76 | 459.00 | 25.76 | 252.60         |
| 3103 | .63   | 484.12 | 445.00 | 39.12 | 383.67         |
| 3104 | .73   | 484.70 | 442.00 | 42.70 | 418.75         |
| 3105 | .17   | 484.77 | 455.00 | 29.77 | 291.94         |
| 3106 | .23   | 484.79 | 458.00 | 26.79 | <b>262.</b> 72 |
| 3107 | 1.25  | 484.67 | 442.00 | 42.67 | 418.45         |
| 3108 | .62   | 484.70 | 440.00 | 44.70 | 438.39         |
| 3109 | .50   | 484.69 | 440.00 | 44.69 | 438.22         |
| 3110 | .44   | 484.68 | 440.00 | 44.68 | 438.19         |
| 3111 | .09   | 484.68 | 460.00 | 24.68 | 242.04         |
| 3112 | .08   | 484.77 | 460.00 | 24.77 | 242.89         |
| 3114 | .11   | 484.44 | 465.00 | 19.44 | 190.68         |
| 3115 | . 59  | 484.45 | 465.00 | 19.45 | 190.72         |
| 3116 | .32   | 484.76 | 451.00 | 33.76 | 331.11         |
| 3117 | .30   | 484.61 | 448.00 | 36.61 | 359.06         |
| 3118 | .48   | 484.44 | 450.00 | 34.44 | 337.74         |
| 3119 | .44   | 484.42 | 450.00 | 34.42 | 337.56         |
| 3120 | .31   | 484.46 | 465.00 | 19.46 | 190.83         |
| 3121 | .79   | 484.58 | 450.00 | 34.58 | 339.12         |
| 3122 | .36   | 484.36 | 455.00 | 29.36 | 287.95         |
| 3123 | .09   | 484.71 | 445.00 | 39.71 | 389.44         |
| 3124 | .10   | 484.71 | 465.00 | 19.71 | 193.26         |

SUMMARY OF INFLOWS AND OUTFLOWS

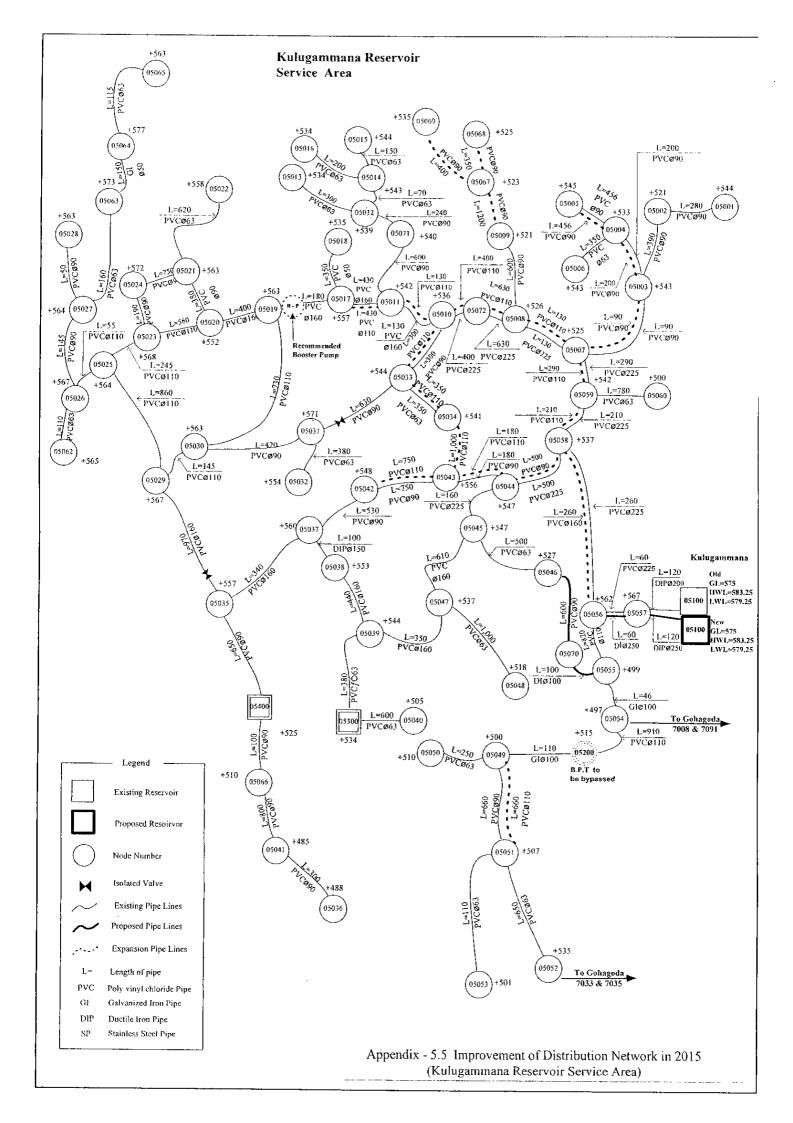
- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE FLOWRATE

|     |        | NUMBER  |             | (1/s) |
|-----|--------|---------|-------------|-------|
|     |        | 1       |             | 13.49 |
| NET | SYSTEM | INFLOW  | =           | 13.49 |
| NET | SYSTEM | OUTFLOW | <del></del> | .00   |
| NET | SYSTEM | DEMAND  | =           | 13.49 |

### \*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 10:40:37



DATE: 3/ 7/2002 TIME: 13:53: 9

INPUT DATA FILENAME ----- C:\D\_nets\2015\KULU2015.DAT TABULATED OUTPUT FILENAME ---- C:\D\_nets\2015\KULU2015.OUT POSTPROCESSOR RESULTS FILENAME --- C:\D\_nets\2015\KULU2015.RES

#### UNITS SPECIFIED

FLOWRATE .... = liters/second HEAD (HGL) ... = meters PRESSURE ... = kpa

REGULATING VALVE DATA

| VALVE<br>TYPE | POSITION<br>JUNCTION | CONTROLLED<br>PIPE | VALVE<br>SETTING<br>(m or 1/s) |
|---------------|----------------------|--------------------|--------------------------------|
| PRV-1         | 5300                 | 77                 | 534.00                         |
| PRV-1         | 5400                 | 73                 | 525.00                         |

### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE      | NODE         | NOS.         | LENGTH        | DIAMETER | ROUGHNESS        | MINOR LOSS | FGN-H |
|-----------|--------------|--------------|---------------|----------|------------------|------------|-------|
| NUMBER    | #1           | #2           | (m)           | (cm)     | COEFF.           | COEFF.     | (m)   |
| 1-FG<br>2 | <del>-</del> | 5057<br>5056 | 120.0<br>60.0 | 20.0     | 120.00<br>120.00 | .00        | 579.  |

| 3          | 5056 | 5055 | 820.0  | 9.7  | 120.00 | .00 |
|------------|------|------|--------|------|--------|-----|
| 4          | 5055 | 5054 | 46.0   | 10.0 | 120.00 | .00 |
| 5          | 5054 | 5200 | 910.0  | 9.7  | 120.00 | .00 |
|            |      |      |        |      |        |     |
| 6          | 5200 | 5049 | 110.0  | 10.0 | 120.00 | .00 |
| 7          | 5049 | 5050 | 250.0  | 5.5  | 120.00 | .00 |
| 8          | 5049 | 5051 | 660.0  | 7.9  | 120.00 | .00 |
| 9          | 5051 | 5053 | 110.0  | 5.5  | 120.00 | .00 |
| 10         | 5051 | 5052 | 650.0  | 5.5  | 120.00 | .00 |
| 11         | 5056 | 5058 | 260.0  | 19.8 | 120.00 | .00 |
| 12         | 5058 | 5059 | 210.0  | 19.8 | 120.00 | .00 |
|            |      |      |        | 5.5  |        |     |
| 13         | 5059 | 5060 | 780.0  |      | 120.00 | .00 |
| 14         | 5059 | 5007 | 290.0  | 19.8 | 120.00 | .00 |
| 15         | 5007 | 5003 | 90.0   | 7.9  | 120.00 | .00 |
| 16         | 5003 | 5004 | 200.0  | 7.9  | 120.00 | .00 |
| 17         | 5004 | 5005 | 456.0  | 7.9  | 120.00 | .00 |
| 18         | 5004 | 5006 | 350.0  | 5.5  | 120.00 | .00 |
| 19         | 5003 | 5002 | 390.0  | 7.9  | 120.00 | .00 |
| 20         | 5001 | 5002 | 280.0  | 7.9  | 120.00 | .00 |
| 21         | 5007 | 5008 | 130.0  | 19.8 | 120.00 | .00 |
| 22         | 5007 | 5009 | 600.0  | 7.9  | 120.00 | .00 |
|            |      |      |        |      |        |     |
| 23         | 5009 | 5067 | 1200.0 | 7.9  | 130.00 | .00 |
| 24         | 5067 | 5069 | 400.0  | 7.9  | 130.00 | .00 |
| 25         | 5058 | 5044 | 500.0  | 19.8 | 120.00 | .00 |
| 26         | 5044 | 5045 | 160.0  | 19.8 | 120.00 | .00 |
| 27         | 5045 | 5046 | 500.0  | 5.5  | 120.00 | .00 |
| 28         | 5046 | 5055 | 600.0  | 7.9  | 130.00 | .00 |
| 29         | 5008 | 5072 | 630.0  | 19.8 | 120.00 | .00 |
| 30         | 5072 | 5010 | 400.0  | 19.8 | 120.00 | .00 |
| 31         | 5010 | 5011 | 130.0  | 14.0 | 120.00 | .00 |
| 32         | 5011 | 5071 | 600.0  | 7.9  | 120.00 | .00 |
| 33         | 5071 | 5012 | 240.0  | 7.9  | 120.00 | .00 |
| 34         | 5012 | 5013 | 300.0  | 5.5  | 120.00 | .00 |
| 35         | 5012 | 5013 | 70.0   | 5.5  | 120.00 | .00 |
|            |      |      |        |      |        |     |
| 36         | 5014 | 5015 | 150.0  | 5.5  | 120.00 | .00 |
| 37         | 5014 | 5016 | 200.0  | 5.5  | 120.00 | .00 |
| 38         | 5011 | 5017 | 430.0  | 14.0 | 120.00 | .00 |
| 39         | 5017 | 5018 | 350.0  | 4.4  | 120.00 | .00 |
| 40-XX      | 5017 | 5019 | 180.0  | 14.0 | 120.00 | .00 |
| 41         | 5019 | 5020 | 400.0  | 14.0 | 120.00 | .00 |
| 42         | 5020 | 5021 | 380.0  | 7.9  | 120.00 | .00 |
| 43         | 5021 | 5022 | 620.0  | 5.5  | 120.00 | .00 |
| 44         | 5020 | 5023 | 560.0  | 9.7  | 120.00 | .00 |
| <b>4</b> 5 | 5023 | 5024 | 190.0  | 7.9  | 120.00 | .00 |
| 46         | 5024 | 5021 | 750.0  | 7.9  | 120.00 | .00 |
| 47         | 5023 | 5025 | 245.0  | 9.7  | 120.00 | .00 |
| 48         | 5025 | 5026 | 55.0   | 9.7  | 120.00 | .00 |
| 49         | 5025 | 5020 | 110.0  |      |        |     |
|            |      |      |        | 5.5  | 120.00 | .00 |
| 50         | 5026 | 5027 | 145.0  | 7.9  | 120.00 | .00 |
| 51         | 5027 | 5028 | 50.0   | 7.9  | 120.00 | .00 |
| 52         | 5027 | 5063 | 160.0  | 5.5  | 120.00 | .00 |
| 53         | 5063 | 5064 | 150.0  | 5.5  | 120.00 | .00 |
| 54         | 5064 | 5065 | 115.0  | 5.5  | 120.00 | .00 |
| 55         | 5025 | 5029 | 860.0  | 9.7  | 120.00 | .00 |
|            |      |      |        |      |        |     |

| DATE = | 03-07-2002 | PAGE | NO. | 3 |
|--------|------------|------|-----|---|
|        |            |      |     | _ |

| 56    | 5029 | 5030 | 145.0  | 9.7  | 120.00 | .00 |      |
|-------|------|------|--------|------|--------|-----|------|
| 57    | 5030 | 5019 | 730.0  | 9.7  | 120.00 | .00 |      |
| 58    | 5030 | 5031 | 420.0  | 7.9  | 120.00 | .00 |      |
| 59    | 5031 | 5032 | 380.0  | 5.5  | 120.00 | .00 |      |
| 60-XX | 5031 | 5033 | 630.0  | 7.9  | 120.00 | .00 |      |
| 61    | 5033 | 5034 | 350.0  | 5.5  | 120.00 | .00 |      |
| 62    | 5042 | 5043 | 750.0  | 7.9  | 120.00 | .00 |      |
| 63    | 5043 | 5044 | 180.0  | 7.9  | 120.00 | .00 |      |
| 64    | 5042 | 5037 | 530.0  | 7.9  | 120.00 | .00 |      |
| 65    | 5037 | 5038 | 100.0  | 15.0 | 120.00 | .00 |      |
| 66    | 5038 | 5039 | 440.0  | 14.0 | 120.00 | .00 |      |
| 67    | 5039 | 5047 | 350.0  | 14.0 | 120.00 | .00 |      |
| 68    | 5047 | 5045 | 610.0  | 14.0 | 120.00 | .00 |      |
| 69    | 5047 | 5048 | 1000.0 | 5.5  | 120.00 | .00 |      |
| 70-XX | 5029 | 5035 | 970.0  | 14.0 | 120.00 | .00 |      |
| 71    | 5035 | 5037 | 340.0  | 14.0 | 120.00 | .00 |      |
| 72    | 5035 | 5400 | 650.0  | 7.9  | 120.00 | .00 |      |
| 73-RV | 5400 | 5066 | 100.0  | 7.9  | 120.00 | .00 |      |
| 74    | 5066 | 5041 | 800.0  | 7.9  | 120.00 | .00 |      |
| 75    | 5041 | 5036 | 300.0  | 7.9  | 120.00 | .00 |      |
| 76    | 5039 | 5300 | 380.0  | 5.5  | 120.00 | .00 |      |
| 77-RV | 5300 | 5040 | 600.0  | 5.5  | 120.00 | .00 |      |
| 78    | 5010 | 5033 | 300.0  | 7.9  | 120.00 | .00 |      |
| 79    | 5034 | 5043 | 1000.0 | 9.7  | 130.00 | .00 |      |
| 80    | 5067 | 5068 | 350.0  | 7.9  | 130.00 | .00 |      |
| 81-FG | 0    | 5057 | 120.0  | 25.0 | 130.00 | .00 | 579. |
| 82    | 5057 | 5056 | 60.0   | 25.0 | 130.00 | .00 |      |
| 83    | 5033 | 5034 | 350.0  | 9.7  | 130.00 | .00 |      |
| 84    | 5042 | 5043 | 750.0  | 9.7  | 130.00 | .00 |      |
| 85    | 5043 | 5044 | 180.0  | 9.7  | 130.00 | .00 |      |
| 86    | 5058 | 5044 | 500.0  | 7.9  | 130.00 | .00 |      |
| 87    | 5010 | 5033 | 300.0  | 9.7  | 130.00 | .00 |      |
| 88    | 5007 | 5003 | 90.0   | 7.9  | 130.00 | .00 |      |
| 89    | 5003 | 5004 | 200.0  | 7.9  | 130.00 | .00 |      |
| 90    | 5004 | 5005 | 456.0  | 7.9  | 130.00 | .00 |      |
| 91    | 5056 | 5058 | 260.0  | 14.0 | 130.00 | .00 |      |
| 92    | 5058 | 5059 | 210.0  | 9.7  | 130.00 | .00 |      |
| 93    | 5059 | 5007 | 290.0  | 9.7  | 130.00 | .00 |      |
| 94    | 5007 | 5008 | 130.0  | 9.7  | 130.00 | .00 |      |
| 95    | 5008 | 5072 | 630.0  | 9.7  | 130.00 | .00 |      |
| 96    | 5010 | 5011 | 130.0  | 9.7  | 130.00 | .00 |      |
| 97    | 5011 | 5017 | 430.0  | 9.7  | 130.00 | .00 |      |
| 98-FG | 0    | 5019 | 90.0   | 14.0 | 130.00 | .00 | 590  |
| 99    | 5049 | 5051 | 660.0  | 9.7  | 130.00 | .00 |      |
|       |      |      |        |      |        |     |      |

# JUNCTION NODE DATA

| JUNCTION | JUNCTION | EXTERNAL | JUNCTION  |            |       |
|----------|----------|----------|-----------|------------|-------|
| NUMBER   | TITLE    | DEMAND   | ELEVATION | CONNECTING | PIPES |
|          |          | (1/s)    | (m)       |            |       |

| <br> |      |        |          |            |            |            |          |
|------|------|--------|----------|------------|------------|------------|----------|
| 5001 | .08  | 544.00 | 20       | ~ <b></b>  |            |            |          |
| 5002 | .19  | 521.00 | 19       | 20         |            |            |          |
| 5003 | .28  | 543.00 | 15       | 16         | 19         | 88         | 89       |
| 5004 | .51  | 533.00 | 16       | 17         | 18         | 89         | 90       |
| 5005 | 3.40 | 545.00 | 17       | 90         |            |            | <b>.</b> |
| 5006 | .21  | 543.00 | 18       |            |            |            |          |
| 5007 | .23  | 525.00 | 14       | 15         | 21         | 88         | 93       |
|      |      |        |          |            |            | •          | , ,      |
| 5008 | .54  | 526.00 | 21       | 22         | 29         | 94         | 95       |
| 5009 | .75  | 521.00 | 22       | 23         | -+         |            |          |
| 5010 | .50  | 536.00 | 30       | 31         | 78         | 87         | 96       |
| 5011 | .70  | 542.00 | 31       | 32         | 38         | 96         | 97       |
| 5012 | .48  | 539.00 | 33       | 34         | 35         | 50         | ,        |
| 5013 | .09  | 534.00 | 34       | J          | 33         |            |          |
| 5014 | .12  | 543.00 | 35       | 36         | 37         |            |          |
| 5015 | .05  | 544.00 | 36       | 50         | <i>J</i> , |            |          |
| 5016 | .07  | 534.00 | 37       |            |            |            |          |
| 5017 | .66  | 557.00 | 38       | 39         | 40         | 97         |          |
| 5018 | .09  | 535.00 | 39       | 7,5        | 10         | <i>J</i> , |          |
| 5019 | .70  | 563.00 | 40       | 41         | 57         | 98         |          |
| 5020 | .42  | 552.00 | 41       | 42         | 44         | 20         |          |
| 5021 | .39  | 563.00 | 42       | 43         | 46         |            |          |
| 5022 | .40  | 558.00 | 43       | ± 5        |            |            |          |
| 5023 | .07  | 568.00 | 44       | 45         | 47         |            |          |
| 5024 | .03  | 572.00 | 45       | 46         | <b>4</b> / |            |          |
| 5025 | .53  | 564.00 | 47       | 48         | 55         |            |          |
| 5026 | .15  | 567.00 | 48       | 49         | 50         |            |          |
| 5027 | .19  | 564.00 | 50       | 51         | 52         |            |          |
| 5028 | .05  | 563.00 | 51       | J.         | 24         |            |          |
| 5029 | .26  | 567.00 | 55       | 56         | 70         |            |          |
| 5030 | .16  | 563.00 | 56       | 57         | 58         |            |          |
| 5031 | .25  | 571.00 | 58       | 5 <i>7</i> | 60         |            |          |
| 5032 | .33  | 554.00 | 59       | 33         | 00         |            |          |
| 5033 | .18  | 544.00 | 60       | 61         | 78         | 83         | 87       |
| 5034 | 1.18 | 541.00 | 61       | 79         | 83         | 03         | 0 /      |
| 5035 | 1.44 | 557.00 | 70       | 71         | 72         |            |          |
| 5036 | .29  | 488.00 | 75       | , _        | 7 2        |            |          |
| 5037 | .48  | 560.00 | 64       | 65         | 71         |            |          |
| 5038 | .14  | 553.00 | 65       | 66         | /          |            |          |
| 5039 | .58  | 544.00 | 66       | 67         | 76         |            |          |
| 5040 | .32  | 505.00 | 77       | 07         | 70         |            |          |
| 5041 | .82  | 485.00 | 74       | 75         |            |            |          |
| 5042 | .45  | 548.00 | 62       | 64         | 84         |            |          |
| 5043 | .44  | 556.00 | 62       | 63         | 79         | 84         | 85       |
| 5044 | .28  | 547.00 | 25       | 26         | 63         | 85         | 86       |
| 5045 | .34  | 547.00 | 25<br>26 | 26<br>27   | 68         | ŲΞ         | 00       |
| 5046 | .37  | 527.00 | 26<br>27 | 28         | UO         |            |          |
| 5047 | .37  | 527.00 | 27<br>67 | ∠8<br>68   | 69         |            |          |
| 5048 |      |        |          | 80         | פס         |            |          |
| 5049 | .19  | 518.00 | 69       | -7         | 0          | 00         |          |
| 5050 | .73  | 500.00 | 6        | 7          | 8          | 99         |          |
| 5051 | .12  | 510.00 | 7        | <u></u>    | 10         | 0.0        |          |
| 3031 | .52  | 507.00 | 8        | 9          | 10         | 99         |          |
|      |      |        |          |            |            |            |          |

DATE = 03-07-2002 JOB NAME = GKWSAP - JICA - Kulugammana SR

| 5052         | .49  | 535.00 | 10 |    |    |    |    |
|--------------|------|--------|----|----|----|----|----|
| 5053         | 1.27 | 501.00 | 9  |    |    |    |    |
| 5054         | .92  | 497.00 | 4  | 5  |    |    |    |
| 5055         | .47  | 499.00 | 3  | 4  | 28 |    |    |
| <b>5</b> 056 | .43  | 562.00 | 2  | 3  | 11 | 82 | 91 |
| 5057         | .07  | 567.00 | 1  | 2  | 81 | 82 |    |
| 5058         | .45  | 537.00 | 11 | 12 | 25 | 86 | 91 |
|              |      |        |    |    |    |    |    |
| 5059         | .37  | 542.00 | 12 | 13 | 14 | 92 | 93 |
| 5060         | .22  | 500.00 | 13 |    |    |    |    |
| 5062         | .04  | 565.00 | 49 |    |    |    |    |
| 5063         | .06  | 573.00 | 52 | 53 |    |    |    |
| 5064         | .06  | 577.00 | 53 | 54 |    |    |    |
| 5065         | .03  | 563.00 | 54 |    |    |    |    |
| 5066         | 1.04 | 510.00 | 73 | 74 |    |    |    |
| 5067         | 1.04 | 523.00 | 23 | 24 | 80 |    |    |
| 5068         | .57  | 525.00 | 80 |    |    |    |    |
| 5069         | .19  | 535.00 | 24 |    |    |    |    |
| 5071         | .41  | 540.00 | 32 | 33 |    |    |    |
| 5072         | .60  | 532.00 | 29 | 30 | 95 |    |    |
| 5200         | .00  | 515.00 | 5  | 6  |    |    |    |
| 5300         | .00  | 534.00 | 76 | 77 |    |    |    |
| 5400         | .00  | 525.00 | 72 | 73 |    |    |    |
|              |      |        |    |    |    |    |    |

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

### SYSTEM CONFIGURATION

THE RESULTS ARE OBTAINED AFTER 8 TRIALS WITH AN ACCURACY = .00016

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE

|            | CV           | -CHECK       | VALVE | RV           | -REGULATING | VALVE      | TK    | -STORAGE | TANK   |
|------------|--------------|--------------|-------|--------------|-------------|------------|-------|----------|--------|
| PIPE       |              |              | FLOW  | RATE         |             |            | MINOR |          | HL/    |
| NUMBER     | #1           | #2           |       | , .          | LOSS        |            | LOSS  |          | . 1000 |
|            |              |              | (1,   | /s)          | (m)         | (m)        | (m)   | (m/s)    | ) (m/m |
| 1-FG       | 0            | 5057         |       | 9.07         | .08         | .00        | .00   | .29      | .6     |
| 2          | 5057         | 5056         |       | 3.89         |             | .00        | .00   | .29      |        |
| 3          | 5056         | 5055         | 5     | 3.92         | 3.70        | .00        |       | .53      | 4.5    |
| 4          | 5055         | 5054         | 4     | 4.05         | .19         | .00        |       | .52      | 4.1    |
| 5          | 5054         | 5200         |       | 3.13         | 2.71        | .00        |       |          |        |
| 6          | 5200         | 5049         |       | 3.13         |             | .00        |       |          |        |
| 7          | 5049         | 5050         |       | .12          |             | .00        |       |          |        |
| 8          | 5049         | 5051         |       | .80          |             | .00        |       |          |        |
| 9          | 5051         | 5053         |       | 1.27         |             | .00        |       |          |        |
| 10         | 5051         | 5052         |       | .49          |             | .00        |       |          |        |
| 11         | 5056         | 5058         |       | 5.55         |             | .00        |       |          |        |
| 12         | 5058         | 5059         |       | 1.07         |             | .00        |       |          |        |
| 13         | 5059         | 5060         |       | .22          |             | .00        |       |          |        |
| 14<br>15   | 5059         | 5007         |       |              | .25         | .00        |       |          |        |
| 15<br>16   | 5007<br>5003 | 5003<br>5004 |       | 2.24         |             | .00        |       |          | 4.3    |
| 17         | 5003         | 5004         |       | 1.98<br>1.63 |             | .00        |       |          |        |
| 18         | 5004         | 5005         |       |              | 1.11<br>.11 | .00<br>.00 |       |          |        |
| 19         | 5004         | 5002         |       |              | .03         |            |       |          |        |
| 20         | 5001         | 5002         |       | 08           |             |            |       |          |        |
| 21         | 5007         | 5002         |       |              | .04         |            |       |          |        |
| 22         | 5008         | 5009         |       | 2.55         |             |            |       |          |        |
| 23         | 5009         | 5067         |       | 1.80         |             |            |       |          |        |
| 24         | 5067         | 5069         |       | .19          |             | .00        |       |          |        |
| 25         | 5058         | 5044         |       | 3.18         |             | .00        |       |          |        |
| 26         | 5044         | 5045         |       | 5.81         |             | .00        |       | .19      |        |
| 27         | 5045         | 5046         |       | .97          |             |            |       |          | 5.4    |
| 28         | 5046         | 5055         |       |              | .20         |            |       | .12      |        |
| 29         | 5008         | 5072         |       |              | .08         |            |       | .12      |        |
| 30         | 5072         | 5010         | 3     | 3.73         | .05         |            |       | .12      |        |
| 31         | 5010         | 5011         | -     | 1.89         | .03         | .00        | .00   | .12      |        |
| 32         | 5011         | 5071         | -     | 1.22         | .85         | .00        | .00   | .25      | 1.4    |
| 33         | 5071         | 5012         |       | .81          |             | .00        | .00   | .17      | .6     |
| 34         | 5012         | 5013         |       | .09          | .02         | .00        | .00   | .04      | .0     |
| 35         | 5012         | 5014         |       | .24          | .03         | .00        | .00   | .10      | . 4    |
| 36         | 5014         | 5015         |       | .05          | .00         | .00        | .00   | .02      | .0     |
| 37         | 5014         | 5016         |       | .07          |             | .00        | .00   | .03      | .0     |
| 38         | 5011         | 5017         |       | .53          | .01         | .00        | .00   | .03      | . 0    |
| 39         | 5017         | 5018         |       | .09          | .07         | .00        | .00   | .06      | . 2    |
| 40-XX      | 5017         | 5019         | _     |              |             |            |       |          | _      |
| 41         | 5019         | 5020         | 2     | 2.22         | .11         | .00        | .00   | .14      | . 2    |
| 42         | 5020         | 5021         |       | .75          | . 22        | .00        | .00   | .15      | .5     |
| 43<br>44   | 5021         | 5022         | _     | .40          | .65         | .00        | .00   | .17      | 1.0    |
| 44<br>45   | 5020<br>5023 | 5023<br>5024 | ل     | L.04         | .22         | .00        | .00   | .14      | .3     |
| 45<br>46   | 5023         | 5024<br>5021 |       | .07          | .00         | .00        | .00   | .01      | .0     |
| 47         | 5024         | 5021         |       | .04          | .00<br>.07  | .00        | .00   | .01      | . 0    |
| <b>4</b> / | 3023         | J02J         |       | . <i>9</i> 1 | .07         | .00        | .00   | .12      | .3     |

| 48       | 5025 | 5026         | .58          | .01  | .00 | .00 | .08  | .1  |
|----------|------|--------------|--------------|------|-----|-----|------|-----|
| 49       | 5026 | 5062         | .04          | .00  | .00 | .00 | .02  | . 0 |
| 50       | 5026 | 5027         | .39          | .02  | .00 | .00 | .08  | .1  |
| 51       | 5027 | 5028         | .05          | .00  | .00 | .00 | .01  | . 0 |
| 52       | 5027 | 5063         | .15          | .03  | .00 | .00 | .06  | .1  |
| 53       | 5063 | 5064         | .09          | .01  | .00 | .00 | .04  | .0  |
| 54       | 5064 | 5065         | .03          | .00  | .00 | .00 | .01  | .0  |
| 55       | 5025 | 5029         | 20           | .02  | .00 | .00 | .03  | .0  |
| 56       | 5029 | 5030         | 46           | .01  | .00 | .00 | .06  | .0  |
| 57       | 5030 | 5019         | -1.20        | .37  | .00 | .00 | .16  | .5  |
| 57<br>58 | 5030 | 5019         | .58          | .15  | .00 | .00 |      | .3  |
| 56<br>59 | 5030 | 5031         |              |      |     |     | .12  |     |
|          |      |              | .33          | .28  | .00 | .00 | . 14 | .7  |
| 60-XX    | 5031 | 5033         | 0.5          | 0.1  |     |     |      | •   |
| 61       | 5033 | 5034         | .06          | .01  | .00 | .00 | .03  | .0  |
| 62       | 5042 | 5043         | 57           | .26  | .00 | .00 | .12  | .3  |
| 63       | 5043 | 5044         | -1.01        | .18  | .00 | .00 | .21  | . 9 |
| 64       | 5042 | 5037         | 1.18         | .71  | .00 | .00 | .24  | 1.3 |
| 65       | 5037 | 5038         | -2.89        | .03  | .00 | .00 | .16  | .3  |
| 66       | 5038 | 5039         | -3.03        | .21  | .00 | .00 | .20  | .4  |
| 67       | 5039 | 5047         | -3.93        | .27  | .00 | .00 | .26  | . 7 |
| 68       | 5047 | 5045         | -4.50        | .60  | .00 | .00 | .29  | .9  |
| 69       | 5047 | 5048         | .19          | .26  | .00 | .00 | .08  | .2  |
| 70-XX    | 5029 | 5035         |              |      |     |     |      |     |
| 71       | 5035 | 5037         | -3.59        | .22  | .00 | .00 | .23  | .6  |
| 72       | 5035 | 5400         | 2.15         | 2.63 | .00 | .00 | .44  | 4.0 |
| 73-RV    | 5400 | 5066         | 2.15         | .40  | .00 | .00 | .44  | 4.0 |
| 74       | 5066 | 5041         | 1.11         | .95  | .00 | .00 | .23  | 1.1 |
| 75       | 5041 | 5036         | .29          | .03  | .00 | .00 | .06  | .1  |
| 76       | 5039 | 5300         | .32          | .26  | .00 | .00 | .13  | .6  |
| 77-RV    | 5300 | 5040         | .32          | .42  | .00 | .00 | .13  | .6  |
| 78       | 5010 | 5033         | .20          | .01  | .00 | .00 | .04  | .0  |
| 79       | 5034 | 5043         | 80           | .21  | .00 | .00 | .11  | .2  |
| 80       | 5067 | 5043         | .57          | .10  | .00 | .00 | .12  | .3  |
| 81-FG    | 0    | 5057         | 17.67        |      |     |     |      |     |
| 82       | 5057 | 5057<br>5056 |              | .08  | .00 | .00 | .36  | .6  |
| 83       | 5037 | 5034         | 17.78        | .04  | .00 | .00 | .36  | .6  |
| 84       | 5042 |              | .31          | .01  | .00 | .00 | .04  | . 0 |
|          |      | 5043         | -1.06        | .26  | .00 | .00 | .14  | .3  |
| 85       | 5043 | 5044         | -1.87        | .18  | .00 | .00 | . 25 | . 9 |
| 86       | 5058 | 5044         | .79          | .27  | .00 | .00 | .16  | .5  |
| 87       | 5010 | 5033         | .36          | .01  | .00 | .00 | .05  | .0  |
| 88       | 5007 | 5003         | 2.43         | .39  | .00 | .00 | .50  | 4.3 |
| 89       | 5003 | 5004         | 2.14         | .69  | .00 | .00 | .44  | 3.4 |
| 90       | 5004 | 5005         | 1.77         | 1.11 | .00 | .00 | .36  | 2.4 |
| 91       | 5056 | 5058         | 6.77         | .47  | .00 | .00 | .44  | 1.8 |
| 92       | 5058 | 5059         | 1.84         | .20  | .00 | .00 | .25  | .9  |
| 93       | 5059 | 5007         | <b>1.</b> 75 | .25  | .00 | .00 | .24  | .8  |
| 94       | 5007 | 5008         | 1.06         | .04  | .00 | .00 | .14  | .3  |
| 95       | 5008 | 5072         | .62          | .08  | .00 | .00 | .08  | .1  |
| 96       | 5010 | 5011         | .78          | .03  | .00 | .00 | .11  | .2  |
| 97       | 5011 | 5017         | .22          | .01  | .00 | .00 | .03  | .0  |
| 98-FG    | 0    | 5019         | 4.12         | .06  | .00 | .00 | .27  | .7  |
| 99       | 5049 | 5051         | 1.48         | .43  | .00 | .00 | .20  | .6  |
|          |      |              | 2.10         |      | .00 | .00 | . 20 | . 9 |

| JUNCTION<br>NUMBER | TITLE | EXTERNAL<br>DEMAND<br>(1/s) |                  | ELEVATION | HEAD           | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------|-----------------------------|------------------|-----------|----------------|-----------------------------|
| 5001               |       | .08                         | 577.78           | 544.00    | 33.78          | 331.30                      |
| 5002               |       | .19                         | 577.79           | 521.00    | 56.79          | 556.88                      |
| 5003               |       | .28                         | 577.82           | 543.00    | 34.82          | 341.47                      |
| 5004               |       | .51                         | 577.13           | 533.00    | 44.13          | 432.74                      |
| 5005               |       | 3.40                        | 576.02           | 545.00    | 31.02          | 304.21                      |
| 5006               |       | .21                         | 577.02           | 543.00    | 34.02          | 333.59                      |
| 5007               |       | .23                         | 578.21           | 525.00    | 53.21          | 521.84                      |
| 5008               |       | .54                         | 578.17           | 526.00    | 52.17          | 511.60                      |
| 5009               |       | .75                         | 574.84           | 521.00    | 53.84          | 528.01                      |
| 5010               |       | .50                         | 578.04           | 536.00    | 42.04          | 412.25                      |
| 5011               |       | .70                         | 578.01           | 542.00    | 36.01          | 353.16                      |
| 5012               |       | .48                         | 577.00           | 539.00    | 38.00          | 372.69                      |
| 5013               |       | .09                         | 576.98           | 534.00    | 42.98          | 421.53                      |
| 5014               |       | .12                         | 576.98           | 543.00    | 33.98          | 333.18                      |
| 5015               |       | .05                         | 576.97           | 544.00    | 32.97          | 323.34                      |
| 5016               |       | .07                         | 576.97           | 534.00    | 42.97          | 421.36                      |
| 5017               |       | .66                         | 578.00           | 557.00    | 21.00          | 205.98                      |
| 5018               |       | .09                         | 577.94           | 535.00    | 42.94          | 421.05                      |
| 5019               |       | .70                         | 589.94           | 563.00    | 26.94          | 264.15                      |
| 5020               |       | .42                         | 589.83           | 552.00    | 37.83          | 370.99                      |
| 5021               |       | .39                         | 589.61           | 563.00    | 26.61          | 260.95                      |
| 5022<br>5023       |       | .40                         | 588.96           | 558.00    | 30.96          | 303.62                      |
| 5023               |       | .07                         | 589.61           | 568.00    | 21.61<br>17.61 | 211.94                      |
| 5024               |       | .03                         | 589.61           | 5/2.00    | 17.61          | 172.70                      |
| 5025               |       | .55                         | 202.24<br>E00 E2 | 564.00    | ⊿5.54<br>22.54 | 250.44<br>220.95            |
| 5027               |       | 10                          | 509.55<br>500 51 | 567.00    | 22.53<br>25 51 | 250.13                      |
| 5028               |       | 05                          | 509.51<br>589.51 | 563.00    | 25.51          | 259.93                      |
| 5029               |       | 26                          | 589 55           | 567.00    | 20.51          | 221.18                      |
| 5030               |       | .16                         | 589 57           | 563 00    | 26.57          | 260.52                      |
| 5031               |       | . 25                        | 589.42           | 571.00    | 18.42          | 180.60                      |
| 5032               |       | .33                         | 589.14           | 554.00    | 35.14          | 344.58                      |
| 5033               |       | .18                         | 578.02           | 544.00    | 34.02          | 333.65                      |
| 5034               |       | 1.18                        | 578.01           | 541.00    | 37.01          | 362.95                      |
| 5035               |       | 1.44                        | 577.03           | 557.00    | 20.03          | 196.43                      |
| 5036               |       | .29                         | 523.62           | 488.00    | 35.62          | 349.27                      |
| 5037               |       | .48                         | 577.25           | 560.00    | 17.25          | 169.16                      |
| 5038               |       | .14                         | 577.28           | 553.00    | 24.28          | 238.11                      |
| 5039               |       | .58                         | 577.49           | 544.00    | 33.49          | 328.39                      |
| 5040               |       | .32                         | 533.58           | 505.00    | 28.58          | 280.32                      |
| 5041               |       | .82                         | 523.65           | 485.00    | 38.65          | 378.98                      |
| 5042               |       | .45                         | 577.96           | 548.00    | 29.96          | 293.78                      |
| 5043               |       | .44                         | 578.22           | 556.00    | 22.22          | 217.88                      |
| 5044               |       | .28                         | 578.40           | 547.00    | 31.40          | 307.88                      |
| 5045               |       | .34                         | 578.35           | 547.00    | 31.35          | 307.43                      |

| 5046 | .37  | 575.63 | 527.00 | 48.63 | 476.91 |
|------|------|--------|--------|-------|--------|
| 5047 | .38  | 577.75 | 537.00 | 40.75 | 399.65 |
| 5048 | .19  | 577.49 | 518.00 | 59.49 | 583.39 |
| 5049 | .73  | 572.25 | 500.00 | 72.25 | 708.49 |
| 5050 | .12  | 572.22 | 510.00 | 62.22 | 610.15 |
| 5051 | .52  | 571.82 | 507.00 | 64.82 | 635.67 |
| 5052 | .49  | 570.83 | 535.00 | 35.83 | 351.37 |
| 5053 | 1.27 | 570.84 | 501.00 | 69.84 | 684.92 |
| 5054 | .92  | 575.24 | 497.00 | 78.24 | 767.30 |
| 5055 | .47  | 575.43 | 499.00 | 76.43 | 749.55 |
| 5056 | .43  | 579.14 | 562.00 | 17.14 | 168.05 |
| 5057 | .07  | 579.17 | 567.00 | 12.17 | 119.39 |
| 5058 | .45  | 578.67 | 537.00 | 41.67 | 408.63 |
| 5059 | .37  | 578.47 | 542.00 | 36.47 | 357.62 |
| 5060 | .22  | 578.20 | 500.00 | 78.20 | 766.86 |
| 5062 | .04  | 589.53 | 565.00 | 24.53 | 240.55 |
| 5063 | .06  | 589.48 | 573.00 | 16.48 | 161.60 |
| 5064 | .06  | 589.47 | 577.00 | 12.47 | 122.27 |
| 5065 | .03  | 589.47 | 563.00 | 26.47 | 259.56 |
| 5066 | 1.04 | 524.60 | 510.00 | 14.60 | 143.14 |
| 5067 | 1.04 | 571.83 | 523.00 | 48.83 | 478.89 |
| 5068 | .57  | 571.73 | 525.00 | 46.73 | 458.25 |
| 5069 | .19  | 571.82 | 535.00 | 36.82 | 361.05 |
| 5071 | .41  | 577.16 | 540.00 | 37.16 | 364.44 |
| 5072 | .60  | 578.09 | 532.00 | 46.09 | 451.97 |
| 5200 | .00  | 572.53 | 515.00 | 57.53 | 564.16 |
| 5300 | .00  | 577.22 | 534.00 | 43.22 | 423.88 |
| 5400 | .00  | 574.40 | 525.00 | 49.40 | 484.48 |
|      |      |        |        |       |        |

### REGULATING VALVE REPORT

| VALVE        | POSITION | CONTROLLED | VALVE      | VALVE     | UPSTREAM | DOWNSTREAM | THROUGH |  |
|--------------|----------|------------|------------|-----------|----------|------------|---------|--|
| $	ext{TYPE}$ | NODE     | PIPE       | SETTING    | STATUS    | GRADE    | GRADE      | FLOW    |  |
|              |          |            | (m or 1/s) | 1)        | (m)      | (m)        | (1/s)   |  |
|              |          |            | <b></b>    |           |          |            |         |  |
| PRV-1        | 5300     | 77         | 534.00     | THROTTLED | 577.22   | 533.58     | .32     |  |
| PRV-1        | 5400     | 73         | 525.00     | THROTTLED | 574.40   | 524.60     | 2.15    |  |

### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

| PIPE   | FLOWRATE  |
|--------|-----------|
| NUMBER | (1/s)     |
|        | _ <b></b> |
| 1      | 9.07      |
| 81     | 17.67     |
| 98     | 4.12      |

JOB NAME = GKWSAP - JICA - Kulugammana SR

NET SYSTEM INFLOW = 30.86 NET SYSTEM OUTFLOW = .00 NET SYSTEM DEMAND = 30.86

### DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

### 

PAGE NO. 10

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NO:<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 5057          | 2.72     | .01                 | .00                 | .00                  | .09                    | .0                  |
| 2              | 5057      | 5056          | 2.67     | .00                 | .00                 | .00                  | .09                    | .0                  |
| 3              | 5056      | 5055          | 1.17     | .40                 | .00                 | .00                  | .16                    | .4                  |
| 4              | 5055      | 5054          | 1.22     | .02                 | .00                 | .00                  | .15                    | . 4                 |
| 5              | 5054      | 5200          | .94      | .29                 | .00                 | .00                  | .13                    | .3                  |
| 6              | 5200      | 5049          | .94      | .03                 | .00                 | .00                  | .12                    | .2                  |
| 7              | 5049      | 5050          | .04      | .00                 | .00                 | .00                  | .02                    | .0                  |
| 8              | 5049      | 5051          | .24      | .05                 | .00                 | .00                  | .05                    | .0                  |
| 9              | 5051      | 5053          | .38      | .11                 | .00                 | .00                  | .16                    | .9                  |
| 10             | 5051      | 5052          | .15      | .11                 | .00                 | .00                  | .06                    | .1                  |
| 11             | 5056      | 5058          | 4.67     | .05                 | .00                 | .00                  | .15                    | .1                  |
| 12             | 5058      | 5059          | 3.32     | .02                 | .00                 | .00                  | .11                    | .1                  |
| 13             | 5059      | 5060          | .07      | .03                 | .00                 | .00                  | .03                    | .0                  |
| 14             | 5059      | 5007          | 3.17     | .03                 | .00                 | .00                  | .10                    | . 0                 |
| 15             | 5007      | 5003          | .67      | .04                 | .00                 | .00                  | .14                    | . 4                 |
| 16             | 5003      | 5004          | .59      | .07                 | .00                 | .00                  | .12                    | .3                  |
| 17             | 5004      | 5005          | .49      | .12                 | .00                 | .00                  | .10                    | . 2                 |
| 18             | 5004      | 5006          | .06      | .01                 | .00                 | .00                  | .03                    | .0                  |
| 19             | 5003      | 5002          | .08      | .00                 | .00                 | .00                  | .02                    | .0                  |
| 20             | 5001      | 5002          | 02       | .00                 | .00                 | .00                  | .00                    | .0                  |

| 21                   | 5007 | 5008 | 1.91  | .00 | .00 | .00 | .06 | . 0 |
|----------------------|------|------|-------|-----|-----|-----|-----|-----|
| 22                   | 5008 | 5009 | .77   | .36 | .00 | .00 | .16 | . 6 |
| 23                   | 5009 | 5067 | .54   | .32 | .00 | .00 | .11 | . 2 |
| 24                   | 5067 | 5069 | .06   | .00 | .00 | .00 | .01 | .0  |
| 25                   | 5058 | 5044 | 2.45  | .03 | .00 | .00 | .08 | .0  |
| 26                   | 5044 | 5045 |       |     |     |     |     |     |
|                      |      |      | 1.74  | .00 | .00 | .00 | .06 | .0  |
| 27                   | 5045 | 5046 | .29   | .29 | .00 | .00 | .12 | .5  |
| 28                   | 5046 | 5055 | .18   | .02 | .00 | .00 | .04 | . 0 |
| 29                   | 5008 | 5072 | 1.11  | .01 | .00 | .00 | .04 | .0  |
| 30                   | 5072 | 5010 | 1.12  | .01 | .00 | .00 | .04 | .0  |
| 31                   | 5010 | 5011 | .57   | .00 | .00 | .00 | .04 | .0  |
| 32                   | 5011 | 5071 | .37   | .09 | .00 | .00 | .07 | .1  |
| 33                   | 5071 | 5012 | .24   | .02 | .00 | .00 | .05 | . 0 |
| 34                   | 5012 | 5013 | .03   | .00 | .00 | .00 | .01 | .0  |
| 35                   | 5012 | 5014 | .07   | .00 | .00 | .00 | .03 | .0  |
| 36                   | 5014 | 5015 | .02   | .00 | .00 | .00 | .01 | .0  |
| 37                   | 5014 | 5016 | .02   | .00 | .00 | .00 | .01 | .0  |
| 38                   | 5011 | 5017 | .16   | .00 | .00 | .00 | .01 | .0  |
| 39                   | 5017 | 5018 | .03   | .01 | .00 | .00 | .02 | .0  |
| 40-XX                | 5017 | 5019 |       |     |     |     |     |     |
| 41                   | 5019 | 5020 | .67   | .01 | .00 | .00 | .04 | .0  |
| 42                   | 5020 | 5021 | .23   | .02 | .00 | .00 | .05 | .0  |
| 43                   | 5021 | 5022 | .12   | .07 | .00 | .00 | .05 | .1  |
| 44                   | 5020 | 5023 | .31   | .02 | .00 | .00 | .04 | .0  |
| 45                   | 5023 | 5024 | .02   | .00 | .00 | .00 | .00 | .0  |
| 46                   | 5024 | 5021 | .01   | .00 | .00 | .00 | .00 | .0  |
| 47                   | 5023 | 5025 | .27   | .01 | .00 | .00 | .04 | .0  |
| 48                   | 5025 | 5026 | .17   | .00 | .00 | .00 | .02 | .0  |
| 49                   | 5026 | 5062 | .01   | .00 | .00 | .00 | .01 | .0  |
| 50                   | 5026 | 5027 | .12   | .00 | .00 | .00 | .02 | .0  |
| 51                   | 5020 | 5027 | .02   | .00 | .00 | .00 | .00 | . 0 |
| 52                   | 5027 | 5063 | .05   | .00 |     | .00 | .02 |     |
| 53                   | 5063 | 5064 | .03   |     | .00 |     |     | .0  |
| 54                   | 5064 | 5065 |       | .00 | .00 | .00 | .01 | . 0 |
| 5 <del>4</del><br>55 |      | 5029 | .01   | .00 | .00 | .00 | .00 | . 0 |
|                      | 5025 | 5029 | 06    | .00 | .00 | .00 | .01 | . 0 |
| 56<br>57             | 5029 |      | 14    | .00 | .00 | .00 | .02 | .0  |
| 5 <b>7</b>           | 5030 | 5019 | 36    | .04 | .00 | .00 | .05 | .0  |
| 58                   | 5030 | 5031 | .17   |     | .00 | .00 |     | . 0 |
| 59                   | 5031 | 5032 | .10   | .03 | .00 | .00 | .04 | . 0 |
| 60-XX                |      | 5033 | 20    | 0.0 | 0.0 | 2.2 | 0.4 |     |
| 61                   | 5033 | 5034 | .02   | .00 | .00 | .00 |     | . 0 |
| 62                   | 5042 | 5043 | 17    | .03 | .00 | .00 |     | . 0 |
| 63                   | 5043 | 5044 | 30    | .02 | .00 | .00 |     | .1  |
| 64                   | 5042 | 5037 | .35   | .08 | .00 | .00 |     | .1  |
| 65                   | 5037 | 5038 | 87    | .00 | .00 | .00 | .05 | .0  |
| 66                   | 5038 | 5039 | 91    | .02 | .00 | .00 | .06 | .0  |
| 67                   | 5039 | 5047 | -1.18 | .03 | .00 | .00 | .08 | .0  |
| 68                   | 5047 | 5045 | -1.35 | .06 | .00 | .00 | .09 | .1  |
| 69                   | 5047 | 5048 | .06   | .03 | .00 | .00 | .02 | .0  |
| 70-XX                | 5029 | 5035 |       |     |     |     |     |     |
| 71                   | 5035 | 5037 | -1.08 | .02 | .00 | .00 | .07 | .0  |
| 72                   | 5035 | 5400 | .65   | .28 | .00 | .00 |     | . 4 |
| 73-RV                | 5400 | 5066 | .65   | .04 | .00 | .00 |     | .4  |
|                      |      |      |       |     |     |     |     |     |

JOB NAME = GKWSAP - JICA - Kulugammana SR

| 74    | 5066 | 5041 | .33  | .10 | .00 | .00 | .07 | .1  |
|-------|------|------|------|-----|-----|-----|-----|-----|
| 75    | 5041 | 5036 | .09  | .00 | .00 | .00 | .02 | .0  |
| 76    | 5039 | 5300 | .10  | .03 | .00 | .00 | .04 | . 0 |
| 77-RV | 5300 | 5040 | .10  | .04 | .00 | .00 | .04 | .0  |
| 78    | 5010 | 5033 | .06  | .00 | .00 | .00 | .01 | .0  |
| 79    | 5034 | 5043 | 24   | .02 | .00 | .00 | .03 | . 0 |
| 80    | 5067 | 5068 | .17  | .01 | .00 | .00 | .03 | .0  |
| 81-FG | 0    | 5057 | 5.30 | .01 | .00 | .00 | .11 | . 0 |
| 82    | 5057 | 5056 | 5.33 | .00 | .00 | .00 | .11 | .0  |
| 83    | 5033 | 5034 | .09  | .00 | .00 | .00 | .01 | .0  |
| 84    | 5042 | 5043 | 32   | .03 | .00 | .00 | .04 | . 0 |
| 85    | 5043 | 5044 | 56   | .02 | .00 | .00 | .08 | .1  |
| 86    | 5058 | 5044 | .24  | .03 | .00 | .00 | .05 | .0  |
| 87    | 5010 | 5033 | .11  | .00 | .00 | .00 | .01 | .0  |
| 88    | 5007 | 5003 | .73  | .04 | .00 | .00 | .15 | . 4 |
| 89    | 5003 | 5004 | .64  | .07 | .00 | .00 | .13 | .3  |
| 90    | 5004 | 5005 | .53  | .12 | .00 | .00 | .11 | .2  |
| 91    | 5056 | 5058 | 2.03 | .05 | .00 | .00 | .13 | .1  |
| 92    | 5058 | 5059 | .55  | .02 | .00 | .00 | .07 | .1  |
| 93    | 5059 | 5007 | .53  | .03 | .00 | .00 | .07 | .0  |
| 94    | 5007 | 5008 | .32  | .00 | .00 | .00 | .04 | .0  |
| 95    | 5008 | 5072 | .18  | .01 | .00 | .00 | .02 | .0  |
| 96    | 5010 | 5011 | .23  | .00 | .00 | .00 | .03 | . 0 |
| 97    | 5011 | 5017 | .07  | .00 | .00 | .00 | .01 | .0  |
| 98-FG | 0    | 5019 | 1.24 | .01 | .00 | .00 | .08 | .0  |
| 99    | 5049 | 5051 | .44  | .05 | .00 | .00 | .06 | .0  |
|       |      |      |      |     |     |     |     |     |

## JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 5001               | <b> </b>          | .02                         | 579.09                    | 544.00                       | 35.09                   | 344.14                      |
| 5002               |                   | .06                         | 579.09                    | 521.00                       | 58.09                   | 569.70                      |
| 5003               |                   | .08                         | 579.10                    | 543.00                       | 36.10                   | 353.98                      |
| 5004               |                   | .15                         | 579.02                    | 533.00                       | 46.02                   | 451.32                      |
| 5005               |                   | 1.02                        | 578.90                    | 545.00                       | 33.90                   | 332.47                      |
| 5006               |                   | .06                         | 579.01                    | 543.00                       | 36.01                   | 353.14                      |
| 5007               |                   | .07                         | 579.14                    | 525.00                       | 54.14                   | 530.92                      |
| 5008               |                   | .16                         | 579.13                    | 526.00                       | 53.13                   | 521.07                      |
| 5009               |                   | .23                         | 578.78                    | 521.00                       | 57.78                   | 566.59                      |
| 5010               |                   | .15                         | 579.12                    | 536.00                       | 43.12                   | 422.86                      |
| 5011               |                   | .21                         | 579.12                    | 542.00                       | 37.12                   | 363.99                      |
| 5012               |                   | .14                         | 579.01                    | 539.00                       | 40.01                   | 392.35                      |
| 5013               |                   | .03                         | 579.01                    | 534.00                       | 45.01                   | 441.36                      |
| 5014               |                   | .04                         | 579.01                    | 543.00                       | 36.01                   | 353.09                      |
| 5015               |                   | .02                         | 579.00                    | 544.00                       | 35.00                   | 343.28                      |
| 5016               |                   | .02                         | 579.00                    | 534.00                       | 45.00                   | 441.34                      |
| 5017               |                   | .20                         | 579.12                    | 557.00                       | 22.12                   | 216.88                      |
| 5018               |                   | .03                         | 579.11                    | 535.00                       | 44.11                   | 432.56                      |

| 5019 | .21  | 589.99 | 563.00 | 26.99 | 264.71 |
|------|------|--------|--------|-------|--------|
| 5020 | .13  | 589.98 | 552.00 | 37.98 | 372.48 |
| 5021 | .12  | 589.96 | 563.00 | 26.96 | 264.37 |
| 5022 | .12  | 589.89 | 558.00 | 31.89 | 312.72 |
|      |      |        |        |       |        |
| 5023 | .02  | 589.96 | 568.00 | 21.96 | 215.34 |
| 5024 | .01  | 589.96 | 572.00 | 17.96 | 176.11 |
| 5025 | .16  | 589.95 | 564.00 | 25.95 | 254.49 |
| 5026 | . 05 | 589.95 | 567.00 | 22.95 | 225.06 |
| 5027 | .06  | 589.95 | 564.00 | 25.95 | 254.45 |
| 5028 | .02  | 589.95 | 563.00 | 26.95 | 264.26 |
| 5029 | .08  | 589.95 | 567.00 | 22.95 | 225.08 |
| 5030 | .05  | 589.95 | 563.00 | 26.95 | 264.32 |
| 5031 | .08  | 589.94 | 571.00 | 18.94 | 185.71 |
| 5032 | .10  | 589.91 | 554.00 | 35.91 | 352.13 |
| 5033 | .05  | 579.12 | 544.00 | 35.12 | 344.39 |
| 5034 | .35  | 579.12 |        |       |        |
|      |      |        | 541.00 | 38.12 | 373.80 |
| 5035 | .43  | 579.01 | 557.00 | 22.01 | 215.86 |
| 5036 | .09  | 524.85 | 488.00 | 36.85 | 361.39 |
| 5037 | . 14 | 579.03 | 560.00 | 19.03 | 186.67 |
| 5038 | .04  | 579.04 | 553.00 | 26.04 | 255.35 |
| 5039 | .17  | 579.06 | 544.00 | 35.06 | 343.83 |
| 5040 | .10  | 533.96 | 505.00 | 28.96 | 283.96 |
| 5041 | .25  | 524.85 | 485.00 | 39.85 | 390.84 |
| 5042 | .14  | 579.11 | 548.00 | 31.11 | 305.10 |
| 5043 | .13  | 579.14 | 556.00 | 23.14 | 226.92 |
| 5044 | .08  | 579.16 | 547.00 | 32.16 | 315.37 |
| 5045 | .10  | 579.15 | 547.00 | 32.15 | 315.32 |
| 5046 | .11  | 578.86 | 527.00 | 51.86 | 508.58 |
| 5047 | .11  | 579.09 | 537.00 | 42.09 | 412.75 |
| 5048 |      |        |        |       |        |
|      | .06  | 579.06 | 518.00 | 61.06 | 598.80 |
| 5049 | .22  | 578.50 | 500.00 | 78.50 | 769.79 |
| 5050 | .04  | 578.49 | 510.00 | 68.49 | 671.70 |
| 5051 | .16  | 578.45 | 507.00 | 71.45 | 700.70 |
| 5052 | .15  | 578.34 | 535.00 | 43.34 | 425.07 |
| 5053 | .38  | 578.35 | 501.00 | 77.35 | 758.51 |
| 5054 | .28  | 578.82 | 497.00 | 81.82 | 802.37 |
| 5055 | .14  | 578.84 | 499.00 | 79.84 | 782.96 |
| 5056 | .13  | 579.24 | 562.00 | 17.24 | 169.05 |
| 5057 | .02  | 579.24 | 567.00 | 12.24 | 120.05 |
| 5058 | .14  | 579.19 | 537.00 | 42.19 | 413.72 |
| 5059 | .11  | 579.17 | 542.00 | 37.17 | 364.47 |
| 5060 | .07  | 579.14 | 500.00 | 79.14 | 776.07 |
| 5062 | .01  | 589.95 | 565.00 | 24.95 | 244.67 |
| 5063 | .02  | 589.94 | 573.00 | 16.94 | 166.16 |
| 5064 |      |        |        |       |        |
|      | .02  | 589.94 | 577.00 | 12.94 | 126.93 |
| 5065 | .01  | 589.94 | 563.00 | 26.94 | 264.22 |
| 5066 | .31  | 524.96 | 510.00 | 14.96 | 146.67 |
| 5067 | .31  | 578.45 | 523.00 | 55.45 | 543.80 |
| 5068 | .17  | 578.44 | 525.00 | 53.44 | 524.08 |
| 5069 | .06  | 578.45 | 535.00 | 43.45 | 426.11 |
| 5071 | .12  | 579.03 | 540.00 | 39.03 | 382.71 |
| 5072 | .18  | 579.13 | 532.00 | 47.13 | 462.14 |
| 5200 | .00  | 578.53 | 515.00 | 63.53 | 622.99 |
|      |      |        |        |       |        |

| 5300 | .00 | 579.03 | 534.00 | 45.03 | 441.62 |
|------|-----|--------|--------|-------|--------|
| 5400 | .00 | 578.73 | 525.00 | 53.73 | 526.90 |

### REGULATING VALVE REPORT

| VALVE<br>TYPE | POSITION<br>NODE | CONTROLLED<br>PIPE | VALVE<br>SETTING<br>(m or 1/s) | VALVE<br>STATUS | UPSTREAM<br>GRADE<br>(m) | DOWNSTREAM<br>GRADE<br>(m) | THROUGH<br>FLOW<br>(1/s) |
|---------------|------------------|--------------------|--------------------------------|-----------------|--------------------------|----------------------------|--------------------------|
| PRV-1         | 5300             | 77                 | 534.00                         | THROTTLED       | 579.03                   | 533.96                     | .10                      |
| PRV-1         | 5400             | 73                 | 525.00                         | THROTTLED       | 578.73                   | 524.96                     |                          |

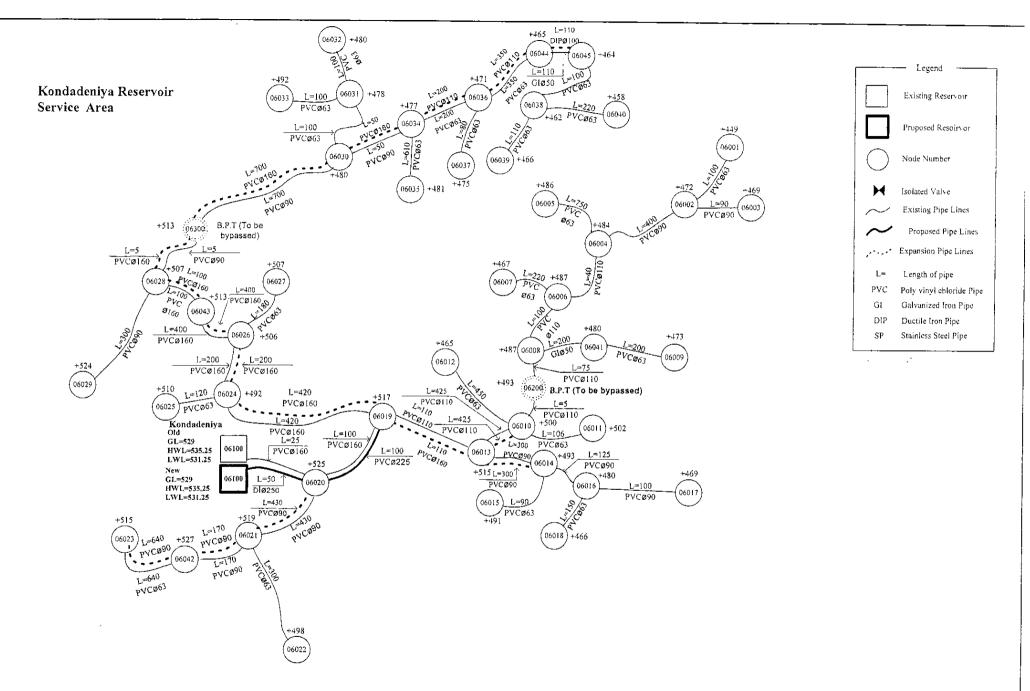
# SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE<br>(1/s)    |
|-----|----------------------------|----------------|-------------|----------------------|
|     |                            | 1<br>81<br>98  |             | 2.72<br>5.30<br>1.24 |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 9.26<br>.00<br>9.26  |

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 13:53: 9



DATE: 3/ 7/2002 TIME: 13:57:39

INPUT DATA FILENAME ----- c:\D\_nets\2015\KOND2015.DAT TABULATED OUTPUT FILENAME ----- c:\D\_nets\2015\KOND2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\KOND2015.RES

### UNITS SPECIFIED

FLOWRATE .... = liters/second

HEAD (HGL) ..... = meters
PRESSURE .... = kpa

### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER | NOD<br>#1 | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|-----------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-FG<br>2      | 0<br>6020 | 6020<br>6021 | 25.0<br>430.0 | 14.0             | 120.00              | .00                  | 531.         |
| 3              | 6020      | 6019         | 100.0         | $7.9 \\ 14.0$    | 120.00<br>120.00    | .00<br>.00           |              |
| 4              | 6021      | 6042         | 170.0         | 7.9              | 120.00              | .00                  |              |
| 5              | 6021      | 6022         | 300.0         | 5.5              | 120.00              | .00                  |              |
| 6              | 6042      | 6023         | 640.0         | 5.5              | 120.00              | .00                  |              |
| 7              | 6019      | 6024         | 420.0         | 14.0             | 120.00              | .00                  |              |
| 8              | 6019      | 6013         | 110.0         | 9.7              | 120.00              | .00                  |              |
| 9              | 6024      | 6026         | 200.0         | 14.0             | 120.00              | .00                  |              |
| 10             | 6024      | 6025         | 120.0         | 5.5              | 120.00              | .00                  |              |
| 11             | 6026      | 6043         | 400.0         | 14.0             | 120.00              | .00                  |              |
| 12             | 6026      | 6027         | 180.0         | 5.5              | 120.00              | .00                  |              |
| 13             | 6043      | 6028         | 100.0         | 14.0             | 120.00              | .00                  |              |

531.

| 14    | 6028         | 6029 | 300.0 | 7.9  | 120.00 | .00 |
|-------|--------------|------|-------|------|--------|-----|
| 15    | 6028         | 6300 | 5.0   | 7.9  | 120.00 | .00 |
| 16    | 6300         | 6030 | 700.0 | 7.9  | 120.00 | .00 |
| 17    | 6030         | 6034 | 50.0  | 7.9  | 120.00 | .00 |
| 18    | 6030         | 6031 | 100.0 | 5.5  | 120.00 | .00 |
| 19    | 6031         | 6032 | 100.0 | 5.5  | 120.00 | .00 |
| 20    | 6031         | 6033 | 100.0 | 5.5  | 120.00 | .00 |
| 21    | 6034         | 6036 | 200.0 | 5.5  | 120.00 | .00 |
| 22    | 6034         | 6035 | 610.0 | 5.5  | 120.00 | .00 |
| 23    | 6034         | 6044 | 350.0 | 5.5  | 120.00 | .00 |
| 24    | 6036         | 6037 | 80.0  | 5.5  | 120.00 | .00 |
| 25    | 6044         | 6045 | 110.0 | 5.0  | 120.00 |     |
| 26    | 6045         | 6038 | 100.0 | 5.5  | 120.00 | .00 |
| 27    | 6038         | 6039 | 110.0 | 5.5  | 120.00 | .00 |
| 28    | 6038         | 6040 | 220.0 | 5.5  |        | .00 |
| 29    | 6013         | 6010 | 425.0 |      | 120.00 | .00 |
| 30    | 6013         | 6014 |       | 9.7  | 120.00 | .00 |
| 31    | 6013         |      | 300.0 | 7.9  | 120.00 | .00 |
| 32    |              | 6016 | 125.0 | 7.9  | 120.00 | .00 |
| 33    | 6014<br>6016 | 6015 | 90.0  | 5.5  | 120.00 | .00 |
|       |              | 6017 | 100.0 | 7.9  | 120.00 | .00 |
| 34    | 6016         | 6018 | 150.0 | 5.5  | 120.00 | .00 |
| 35    | 6010         | 6200 | 5.0   | 9.7  | 120.00 | .00 |
| 36    | 6010         | 6011 | 106.0 | 5.5  | 120.00 | .00 |
| 37    | 6200         | 6008 | 75.0  | 9.7  | 120.00 | .00 |
| 38    | 6008         | 6006 | 100.0 | 9.7  | 120.00 | .00 |
| 39    | 6008         | 6041 | 200.0 | 5.0  | 120.00 | .00 |
| 40    | 6041         | 6009 | 200.0 | 5.5  | 120.00 | .00 |
| 41    | 6006         | 6004 | 40.0  | 9.7  | 120.00 | .00 |
| 42    | 6006         | 6007 | 220.0 | 5.5  | 120.00 | .00 |
| 43    | 6004         | 6002 | 400.0 | 7.9  | 120.00 | .00 |
| 44    | 6004         | 6005 | 750.0 | 5.5  | 120.00 | .00 |
| 45    | 6002         | 6003 | 90.0  | 7.9  | 120.00 | .00 |
| 46    | 6002         | 6001 | 100.0 | 5.5  | 120.00 | .00 |
| 47    | 6010         | 6012 | 450.0 | 5.5  | 120.00 | .00 |
| 48-FG | 0            | 6020 | 25.0  | 25.0 | 130.00 | .00 |
| 49    | 6020         | 6021 | 430.0 | 14.0 | 130.00 | .00 |
| 50    | 6020         | 6019 | 100.0 | 19.8 | 130.00 | .00 |
| 51    | 6021         | 6042 | 170.0 | 7.9  | 130.00 | .00 |
| 52    | 6042         | 6023 | 640.0 | 7.9  | 130.00 | .00 |
| 53    | 6019         | 6024 | 420.0 | 14.0 | 130.00 | .00 |
| 54    | 6019         | 6013 | 110.0 | 14.0 | 130.00 | .00 |
| 55    | 6024         | 6026 | 200.0 | 14.0 | 130.00 | .00 |
| 56    | 6026         | 6043 | 400.0 | 14.0 | 130.00 | .00 |
| 57    | 6043         | 6028 | 100.0 | 14.0 | 130.00 | .00 |
| 58    | 6028         | 6300 | 5.0   | 14.0 | 130.00 | .00 |
| 59    | 6300         | 6030 | 700.0 | 14.0 | 130.00 | .00 |
| 60    | 6030         | 6034 | 50.0  | 14.0 | 130.00 | .00 |
| 61    | 6034         | 6036 | 200.0 | 9.7  | 130.00 | .00 |
| 62    | 6036         | 6044 | 350.0 | 9.7  | 130.00 | .00 |
| 63    | 6044         | 6045 | 110.0 | 10.0 | 130.00 | .00 |
| 64-XX | 6045         | 6038 | 100.0 | 9.7  | 130.00 | .00 |
| 65    | 6013         | 6010 | 425.0 | 9.7  | 130.00 | .00 |
| 66    | 6013         | 6014 | 300.0 | 7.9  | 130.00 | .00 |
|       |              |      |       |      |        |     |

# JUNCTION NODE DATA

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | JUNCTION<br>ELEVATION<br>(m) | CONNECTING |     | PIPE     | 3S         |     |
|--------------------|-------------------|-----------------------------|------------------------------|------------|-----|----------|------------|-----|
| 6001               |                   | .28                         | 449.00                       | 46         |     |          |            |     |
| 6002               |                   | 1.41                        | 472.00                       | 43         | 45  | 46       |            |     |
| 6003               |                   | .21                         | 469.00                       | 45         |     | 10       |            |     |
| 6004               |                   | 2.80                        | 484.00                       | 41         | 43  | 44       |            |     |
| 6005               |                   | 1.04                        | 486.00                       | 44         | 1-7 |          |            |     |
| 6006               |                   | .86                         | 487.00                       | 38         | 41  | 42       |            |     |
| 6007               |                   | .30                         | 467.00                       | 42         |     |          |            |     |
| 6008               |                   | .86                         | 487.00                       | 37         | 38  | 39       |            |     |
| 6009               |                   | .38                         | 473.00                       | 40         |     | <b></b>  |            |     |
| 6010               |                   | 2.40                        | 500.00                       | 29         | 35  | 36       | 47         | 65  |
| 6011               |                   | .22                         | 502.00                       | 36         |     |          | - /        | 0.5 |
| 6012               |                   | .68                         | 465.00                       | 47         |     |          |            |     |
| 6013               |                   | 1.70                        | 515.00                       | 8          | 29  | 30       | 5 <b>4</b> | 65  |
|                    |                   |                             | 323.00                       | Ū          |     |          |            | V.D |
| 6014               |                   | 1.22                        | 493.00                       | 30         | 31  | 32       | 66         |     |
| 6015               |                   | .19                         | 491.00                       | 32         | -   |          | •          |     |
| 6016               |                   | 1.04                        | 480.00                       | 31         | 33  | 34       |            |     |
| 6017               |                   | .32                         | 469.00                       | 33         |     | <b>-</b> |            |     |
| 6018               |                   | .32                         | 466.00                       | 34         |     |          |            |     |
| 6019               |                   | 1.28                        | 517.00                       | 3          | 7   | 8        | 50         | 53  |
| 0023               |                   | 1.20                        | 517.00                       | J          | ,   | Ü        | 50         | 55  |
| 6020               |                   | 1.14                        | 525.00                       | 1          | 2   | 3        | 48         | 49  |
| 6021               |                   | 1.76                        | 519.00                       | 2          | 4   | 5        | 49         | 51  |
| 6022               |                   | .40                         | 498.00                       | 5          |     |          |            |     |
| 6023               |                   | 1.09                        | 515.00                       | 6          | 52  |          |            |     |
| 6024               |                   | 1.22                        | 492.00                       | 7          | 9   | 10       | 53         | 55  |
| 6025               |                   | .16                         | 510.00                       | 10         |     |          |            |     |
| 6026               |                   | .14                         | 506.00                       | 9          | 11  | 12       | 55         | 56  |
| 6027               |                   | .02                         | 507.00                       | 12         |     |          |            |     |
| 6028               |                   | .10                         | 507.00                       | 13         | 14  | 15       | 57         | 58  |
| 6029               |                   | .09                         | 524.00                       | 14         |     |          |            |     |
| 6030               |                   | .92                         | 480.00                       | 16         | 17  | 18       | 59         | 60  |
| 6031               |                   | .07                         | 478.00                       | 18         | 19  | 20       |            |     |
| 6032               |                   | .02                         | 480.00                       | 19         |     |          |            |     |
| 6033               |                   | .03                         | 492.00                       | 20         |     |          |            |     |
| 6034               |                   | .39                         | 477.00                       | 17         | 21  | 22       | 60         | 61  |
| 6035               |                   | .24                         | 481.00                       | 22         |     |          |            |     |
| 6036               |                   | .36                         | 471.00                       | 21         | 23  | 24       | 61         | 62  |
| 6037               |                   | .02                         | 475.00                       | 24         |     |          | _          | _   |
| 6038               |                   | 3.45                        | 462.00                       | 26         | 27  | 28       | 64         |     |
| 6039               |                   | .63                         | 466.00                       | 27         |     |          |            |     |
| 6040               |                   | 1.24                        | 458.00                       | 28         |     |          |            |     |
|                    |                   |                             |                              | _          |     |          |            |     |

| 1.02 | 480.00                            | 39   | 40   |  |  |
|------|-----------------------------------|--|--|--|--|
| 1.83 | 527.00                            | 4  | 6  | 51   | 52   |
| .10  | 513.00                            | 11   | 13   | 56   | 57   |
| .29  | 465.00                            | 23   | 25   | 62   | 63   |
| 2.40 | 464.00                            | 25   | 26   | 63   | 64   |
| .00  | 493.00                            | 35   | 37   |  |  |
| .00  | 513.00                            | 15   | 16   | 58   | 59   |
|      | 1.83<br>.10<br>.29<br>2.40<br>.00 | 1.83 527.00<br>.10 513.00<br>.29 465.00<br>2.40 464.00<br>.00 493.00 | 1.83 527.00 4<br>.10 513.00 11<br>.29 465.00 23<br>2.40 464.00 25<br>.00 493.00 35 | 1.83 527.00 4 6<br>.10 513.00 11 13<br>.29 465.00 23 25<br>2.40 464.00 25 26<br>.00 493.00 35 37 | 1.83     527.00     4     6     51       .10     513.00     11     13     56       .29     465.00     23     25     62       2.40     464.00     25     26     63       .00     493.00     35     37 |

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

### SYSTEM CONFIGURATION

| NUMBER OF | PIPES             | (p)         | = | 66 |
|-----------|-------------------|-------------|---|----|
| NUMBER OF | JUNCTION NODES    | (j)         | = | 47 |
| NUMBER OF | PRIMARY LOOPS     | $(\bar{1})$ | = | 18 |
| NUMBER OF | FIXED GRADE NODES | (f)         | = | 2  |
| NUMBER OF | SUPPLY ZONES      | (7)         | _ | 1  |

### 

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00061

### PIPELINE RESULTS

| STATUS CODE: | XX -CLOSED PIPE | FG -FIXED GRADE NODE | PU -PUMP LINE    |
|--------------|-----------------|----------------------|------------------|
|              | CV -CHECK VALVE | RV -REGULATING VALVE | TK -STORAGE TANK |

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 6020          | 6.13     | .04                 | .00                 | .00                  | .40                    | 1.7                 |
| 2              | 6020      | 6021          | .86      | .32                 | .00                 | .00                  | .18                    | . 7                 |
| 3              | 6020      | 6019          | 8.23     | .30                 | .00                 | .00                  | .53                    | 2.9                 |
| 4              | 6021      | 6042          | 1.40     | .31                 | .00                 | .00                  | .29                    | 1.8                 |
| 5              | 6021      | 6022          | .40      | .31                 | .00                 | .00                  | .17                    | 1.0                 |
| 6              | 6042      | 6023          | .29      | .36                 | .00                 | .00                  | .12                    | .5                  |
| 7              | 6019      | 6024          | 5.71     | .64                 | .00                 | .00                  | .37                    | 1.5                 |
| 8              | 6019      | 6013          | 4.49     | .64                 | .00                 | .00                  | .61                    | 5.8                 |
| 9              | 6024      | 6026          | 5.04     | .24                 | .00                 | .00                  | .33                    | 1.2                 |
| 10             | 6024      | 6025          | .16      | .02                 | .00                 | .00                  | .07                    | .1                  |

| 11    | 6026 | 6043        | 4.97  | .47   | .00 | .00 | .32  | 1.1         |
|-------|------|-------------|-------|-------|-----|-----|------|-------------|
| 12    | 6026 | 6027        | .02   | .00   | .00 | .00 | .01  | .0          |
| 13    | 6043 | 6028        | 4.92  | .12   | .00 | .00 | .32  | 1.1         |
| 14    | 6028 | 6029        |       |       |     |     |      |             |
|       |      |             | .09   | .00   | .00 | .00 | .02  | . 0         |
| 15    | 6028 | 6300        | 1.71  | .01   | .00 | .00 | .35  | 2.6         |
| 16    | 6300 | 6030        | 1.71  | 1.85  | .00 | .00 | .35  | 2.6         |
| 17    | 6030 | 6034        | 1.53  | .11   | .00 | .00 | .31  | 2.1         |
| 18    | 6030 | 6031        | .12   | .01   | .00 | .00 | .05  | .1          |
| 19    | 6031 | 6032        | .02   | .00   | .00 | .00 | .01  | . 0         |
| 20    | 6031 | 6033        | .03   | .00   | .00 | .00 | .01  |             |
| 21    | 6034 | 6036        |       |       |     |     |      | .0          |
|       |      |             | 1.44  | 2.25  | .00 | .00 | .61  | 11.2        |
| 22    | 6034 | 6035        | .24   | .25   | .00 | .00 | .10  | . 4         |
| 23    | 6036 | 6044        | 1.38  | 3.62  | .00 | .00 | .58  | 10.3        |
| 24    | 6036 | 6037        | .02   | .00   | .00 | .00 | .01  | .0          |
| 25    | 6044 | 6045        | 1.00  | 1.00  | .00 | .00 | .51  | 9.1         |
| 26    | 6045 | 6038        | 5.32  | 12.62 | .00 | .00 | 2.24 | 126.2       |
| 27    | 6038 | 6039        | .63   | .27   | .00 | .00 | .27  | 2.4         |
| 28    | 6038 | 6040        | 1.24  | 1.87  | .00 | .00 | .52  | 8.5         |
| 29    | 6013 | 6010        | 5.98  |       |     |     |      |             |
|       |      |             |       | 4.20  | .00 | .00 | .81  | 9.8         |
| 30    | 6013 | 6014        | 1.48  | .61   | .00 | .00 | .30  | 2.0         |
| 31    | 6014 | 6016        | 1.68  | .32   | .00 | .00 | .34  | 2.5         |
| 32    | 6014 | 6015        | .19   | .02   | .00 | .00 | .08  | . 2         |
| 33    | 6016 | 6017        | .32   | .01   | .00 | .00 | .07  | .1          |
| 34    | 6016 | 6018        | .32   | .10   | .00 | .00 | .13  | .6          |
| 35    | 6010 | 6200        | 9.16  | .11   | .00 | .00 | 1.24 | 21.7        |
| 36    | 6010 | 6011        | .22   | .04   | .00 | .00 | .09  | .3          |
| 37    | 6200 | 6008        | 9.16  | 1.63  | .00 |     |      |             |
| 38    | 6008 |             |       |       |     | .00 | 1.24 | 21.7        |
|       |      | 6006        | 6.90  | 1.29  | .00 | .00 | .93  | 12.8        |
| 39    | 6008 | 6041        | 1.40  | 3.39  | .00 | .00 | .71  | 16.9        |
| 40    | 6041 | 6009        | .38   | .19   | .00 | .00 | .16  | .9          |
| 41    | 6006 | 6004        | 5.74  | .37   | .00 | .00 | .78  | 9.1         |
| 42    | 6006 | 6007        | .30   | .14   | .00 | .00 | .13  | . 6         |
| 43    | 6004 | 6002        | 1.90  | 1.29  | .00 | .00 | .39  | 3.2         |
| 44    | 6004 | 6005        | 1.04  | 4.61  | .00 | .00 | .44  | 6.1         |
| 45    | 6002 | 6003        | .21   | .00   | .00 | .00 | .04  | .0          |
| 46    | 6002 | 6001        | .28   | .05   | .00 | .00 | .12  | .5          |
| 47    | 6010 | 6012        |       | 1.26  |     |     |      |             |
| 48-FG | 0    |             | .68   |       | .00 | .00 | .29  | 2.8         |
|       |      | 6020        | 30.51 | .04   | .00 | .00 | .62  | 1.7         |
| 49    | 6020 | 6021        | 4.22  | .32   | .00 |     | .27  |             |
| 50    | 6020 | 6019        | 22.19 | .30   | .00 | .00 | .72  |             |
| 51    | 6021 | 6042        | 1.52  | .31   | .00 | .00 | .31  | 1.8         |
| 52    | 6042 | 6023        | .80   | .36   | .00 | .00 | .16  | .5          |
| 53    | 6019 | 6024        | 6.18  | .64   | .00 | .00 | .40  |             |
| 54    | 6019 | 6013        | 12.76 | .64   | .00 | .00 | .83  |             |
| 55    | 6024 | 6026        | 5.47  | .24   | .00 | .00 | .36  |             |
| 56    | 6026 | 6043        | 5.38  | .47   | .00 |     |      |             |
| 57    | 6043 | 6028        |       |       |     | .00 | .35  |             |
|       |      |             | 5.33  | .12   | .00 | .00 | .35  | 1.1         |
| 58    | 6028 | 6300        | 8.35  | .01   | .00 | .00 | .54  | 2.6         |
| 59    | 6300 | 6030        | 8.35  | 1.85  | .00 | .00 | .54  | 2.6         |
| 60    | 6030 | 6034        | 7.49  | .11   | .00 | .00 | .49  |             |
| 61    | 6034 | 6036        | 6.95  | 2.25  | .00 | .00 | .94  | 11.2        |
| 62    | 6036 | 6044        | 6.63  | 3.62  | .00 | .00 | .90  | 10.3        |
| 63    | 6044 | 6045        | 6.72  | 1.00  | .00 | .00 | .86  | 9.1         |
|       |      | <del></del> | 3.72  |       |     |     |      | <b>√.</b> ± |

| 64-XX | 6045 | 6038 |      |      |     |     |     |     |
|-------|------|------|------|------|-----|-----|-----|-----|
| 65    | 6013 | 6010 | 6.48 | 4.20 | .00 | .00 | .88 | 9.8 |
| 66    | 6013 | 6014 | 1.61 | .61  | .00 | .00 | .33 | 2.0 |

# JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 6001               |                   | .28                         | 521.32                    | 449.00                       | 72.32                   | 709.27                      |
| 6002               |                   | 1.41                        | 521.38                    | 472.00                       | 49.38                   | 484.24                      |
| 6003               |                   | .21                         | 521.37                    | 469.00                       | 52.37                   | 513.62                      |
| 6004               |                   | 2.80                        | 522.66                    | 484.00                       | 38.66                   | 379.17                      |
| 6005               |                   | 1.04                        | 518.06                    | 486.00                       | 32.06                   | 314.38                      |
| 6006               |                   | .86                         | 523.03                    | 487.00                       | 36.03                   | 353.35                      |
| 6007               |                   | .30                         | 522.90                    | 467.00                       | 55.90                   | 548.16                      |
| 6008               |                   | .86                         | 524.32                    | 487.00                       | 37.32                   | 365.99                      |
| 6009               |                   | .38                         | 520.74                    | 473.00                       | 47.74                   | 468.19                      |
| 6010               |                   | 2.40                        | 526.06                    | 500.00                       | 26.06                   | 255.60                      |
| 6011               |                   | .22                         | 526.03                    | 502.00                       | 24.03                   | 235.62                      |
| 6012               |                   | .68                         | 524.81                    | 465.00                       | 59.81                   | 586.49                      |
| 6013               |                   | 1.70                        | 530.27                    | 515.00                       | 15.27                   | 149.73                      |
| 6014               |                   | 1.22                        | 529.66                    | 493.00                       | 36.66                   | 359.50                      |
| 6015               |                   | .19                         | 529.63                    | 491.00                       | 38.63                   | 378.88                      |
| 6016               |                   | 1.04                        | 529.34                    | 480.00                       | 49.34                   | 483.85                      |
| 6017               |                   | .32                         | 529.33                    | 469.00                       | 60.33                   | 591.60                      |
| 6018               |                   | .32                         | 529.23                    | 466.00                       | 63.23                   | 620.12                      |
| 6019               |                   | 1.28                        | 530.91                    | 517.00                       | 13.91                   | 136.38                      |
| 6020               |                   | 1.14                        | 531.21                    | 525.00                       | 6.21                    | 60.87                       |
| 6021               |                   | 1.76                        | 530.88                    | 519.00                       | 11.88                   | 116.55                      |
| 6022               |                   | .40                         | 530.57                    | 498.00                       | 32.57                   | 319.41                      |
| 6023               |                   | 1.09                        | 530.21                    | 515.00                       | 15.21                   | 149.19                      |
| 6024               |                   | 1.22                        | 530.27                    | 492.00                       | 38.27                   | 375.30                      |
| 6025<br>6026       |                   | .16                         | 530.25                    | 510.00                       | 20.25                   | 198.55                      |
| 6027               |                   | .14<br>.02                  | 530.03<br>530.03          | 506.00                       | 24.03                   | 235.63<br>225.82            |
| 6028               |                   | .10                         | 529.44                    | 507.00<br>507.00             | 23.03<br>22.44          | 220.08                      |
| 6029               |                   | .09                         | 529.44                    | 524.00                       | 5.44                    | 53.34                       |
| 6030               |                   | .92                         | 527.57                    | 480.00                       |                         |                             |
| 6031               |                   | .07                         | 527.56                    | 478.00                       |                         |                             |
| 6032               |                   | .02                         | 527.56                    | 480.00                       | 47.56                   |                             |
| 6033               |                   | .03                         | 527.56                    | 492.00                       | 35.56                   | 348.75                      |
| 6034               |                   | .39                         | 527.47                    | 477.00                       | 50.47                   | 494.91                      |
| 6035               |                   | .24                         | 527.22                    | 481.00                       | 46.22                   | 453.25                      |
| 6036               |                   | .36                         | 525.21                    | 471.00                       | 54.21                   | 531.67                      |
| 6037               |                   | .02                         | 525.21                    | 475.00                       | 50.21                   | 492.44                      |
| 6038               |                   | 3.45                        | 507.97                    | 462.00                       | 45.97                   | 450.84                      |
| 6039               |                   | .63                         | 507.71                    | 466.00                       | 41.71                   | 408.99                      |
| 6040               |                   | 1.24                        | 506.10                    | 458.00                       | 48.10                   | 471.71                      |
| 6041               |                   | 1.02                        | 520.93                    | 480.00                       | 40.93                   | 401.41                      |
|                    |                   |                             |                           | -                            | •                       |                             |

JOB NAME = GKWSAP - JICA - Kondadeniya SR

| 6042 | 1.83 | 530.57 | 527.00 | 3.57  | 35.05  |
|------|------|--------|--------|-------|--------|
| 6043 | .10  | 529.56 | 513.00 | 16.56 | 162.37 |
| 6044 | .29  | 521.60 | 465.00 | 56.60 | 555.05 |
| 6045 | 2.40 | 520.60 | 464.00 | 56.60 | 555.01 |
| 6200 | .00  | 525.95 | 493.00 | 32.95 | 323.17 |
| 6300 | .00  | 529.43 | 513.00 | 16.43 | 161.11 |

### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE (1/s)        |
|-----|----------------------------|----------------|-------------|-----------------------|
|     |                            | 1<br>48        |             | 6.13<br>30.51         |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 36.64<br>.00<br>36.64 |

### DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00001

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NODE<br>#1 | NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|------------|------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0 6        | 5020       | 1.84     | .00                 | .00                 | .00                  | .12                    | .1                  |

| 2        | 6020 | 6021 | .26  | .03  | ٥٥ ـ | .00 | .05 | . 0      |
|----------|------|------|------|------|------|-----|-----|----------|
| 3        | 6020 | 6019 | 2.47 | .03  | .00  | .00 | .16 | .3       |
| 4        | 6021 | 6042 | .42  | . 03 | .00  | .00 | .09 | . 2      |
| 5        | 6021 | 6022 | .12  | .03  | .00  | .00 | .05 | .1       |
| 6        | 6042 | 6023 | .09  | .04  | .00  | .00 | .04 | .0       |
| 7        | 6019 | 6024 | 1.71 | .07  | .00  | .00 | .11 | .1       |
| 8        | 6019 | 6013 | 1.35 | .07  | .00  | .00 | .18 | .6       |
| 9        | 6024 | 6026 | 1.51 | .03  | .00  | .00 | .10 | .1       |
| 10       | 6024 | 6025 | .05  | .00  | .00  | .00 | .02 | .0       |
| 11       | 6026 | 6043 | 1.49 | .05  | .00  | .00 | .10 | .1       |
| 12       | 6026 | 6027 | .01  | .00  | .00  | .00 | .00 |          |
| 13       | 6043 | 6028 | 1.48 | .01  | .00  | .00 | .10 | .0<br>.1 |
| 14       | 6028 | 6029 | .03  | .00  | .00  |     | .01 |          |
| 15       | 6028 | 6300 | .51  |      |      | .00 |     | .0       |
| 16       | 6300 |      |      | .00  | .00  | .00 | .10 | .2       |
|          |      | 6030 | .51  | .20  | .00  | .00 | .10 | .2       |
| 17       | 6030 | 6034 | .46  | .01  | .00  | .00 | .09 | .2       |
| 18       | 6030 | 6031 | .04  | .00  | .00  | .00 | .02 | . 0      |
| 19       | 6031 | 6032 | .01  | .00  | .00  | .00 | .00 | . 0      |
| 20       | 6031 | 6033 | .01  | .00  | .00  | .00 | .00 | . 0      |
| 21       | 6034 | 6036 | .43  | .24  | .00  | .00 | .18 | 1.2      |
| 22       | 6034 | 6035 | .07  | .03  | .00  | .00 | .03 | . 0      |
| 23       | 6036 | 6044 | .41  | .39  | .00  | .00 | .17 | 1.1      |
| 24       | 6036 | 6037 | .01  | .00  | .00  | .00 | .00 | . 0      |
| 25       | 6044 | 6045 | .30  | .11  | .00  | .00 | .15 | .9       |
| 26       | 6045 | 6038 | 1.60 | 1.36 | .00  | .00 | .67 | 13.5     |
| 27       | 6038 | 6039 | .19  | .03  | .00  | .00 | .08 | . 2      |
| 28       | 6038 | 6040 | .37  | .20  | .00  | .00 | .16 | . 9      |
| 29       | 6013 | 6010 | 1.79 | .45  | .00  | .00 | .24 | 1.0      |
| 30       | 6013 | 6014 | .44  | .07  | .00  | .00 | .09 | .2       |
| 31       | 6014 | 6016 | .50  | .03  | .00  | .00 | .10 | . 2      |
| 32       | 6014 | 6015 | .06  | .00  | .00  | .00 | .02 | . 0      |
| 33       | 6016 | 6017 | .10  | .00  | .00  | .00 | .02 | .0       |
| 34       | 6016 | 6018 | .10  | .01  | .00  | .00 | .04 | . 0      |
| 35       | 6010 | 6200 | 2.75 | .01  | .00  | .00 | .37 | 2.3      |
| 36       | 6010 | 6011 | .07  | .00  | .00  | .00 | .03 | .0       |
| 37       | 6200 | 6008 | 2.75 | .18  | .00  | .00 | .37 | 2.3      |
| 38       | 6008 | 6006 | 2.07 | .14  | .00  | .00 | .28 | 1.3      |
| 39       | 6008 | 6041 | .42  | .36  | .00  | .00 | .21 | 1.8      |
| 40       | 6041 | 6009 | .11  | .02  | .00  | .00 | .05 | .1       |
| 41       | 6006 | 6004 | 1.72 | .04  | .00  | .00 | .23 | .9       |
| 42       | 6006 | 6007 | .09  | .01  | .00  | .00 | .04 | .0       |
| 43       | 6004 | 6002 | .57  | .14  | .00  | .00 | .12 |          |
| 44       | 6004 | 6002 | .31  |      |      |     |     | .3       |
| 45       |      |      |      | .50  | .00  | .00 | .13 | .6       |
| 45<br>46 | 6002 | 6003 | .06  | .00  | .00  | .00 | .01 | .0       |
|          | 6002 | 6001 | .08  | .01  | .00  | .00 | .04 | . 0      |
| 47       | 6010 | 6012 | .20  | .14  | .00  | .00 | .09 | .3       |
| 48-FG    | 0    | 6020 | 9.15 | .00  | .00  | .00 | .19 | .1       |
| 49       | 6020 | 6021 | 1.26 | .03  | .00  | .00 | .08 | .0       |
| 50       | 6020 | 6019 | 6.66 | .03  | .00  | .00 | .22 | .3       |
| 51       | 6021 | 6042 | .46  | .03  | .00  | .00 | .09 | . 2      |
| 52       | 6042 | 6023 | .24  | .04  | .00  | .00 | .05 | . 0      |
| 53       | 6019 | 6024 | 1.85 | .07  | .00  | .00 | .12 | .1       |
| 54       | 6019 | 6013 | 3.83 | .07  | .00  | .00 | .25 | .6       |
|          |      |      |      |      |      |     |     |          |

| 55    | 6024 | 6026 | 1.64 | .03 | .00 | .00 | .11 | .1  |
|-------|------|------|------|-----|-----|-----|-----|-----|
| 56    | 6026 | 6043 | 1.61 | .05 | .00 | .00 | .10 | .1  |
| 57    | 6043 | 6028 | 1.60 | .01 | .00 | .00 | .10 | . 1 |
| 58    | 6028 | 6300 | 2.50 | .00 | .00 | .00 | .16 | .2  |
| 59    | 6300 | 6030 | 2.50 | .20 | .00 | .00 | .16 | .2  |
| 60    | 6030 | 6034 | 2.25 | .01 | .00 | .00 | .15 | .2  |
| 61    | 6034 | 6036 | 2.08 | .24 | .00 | .00 | .28 | 1.2 |
| 62    | 6036 | 6044 | 1.99 | .39 | .00 | .00 | .27 | 1.1 |
| 63    | 6044 | 6045 | 2.02 | .11 | .00 | .00 | .26 | . 9 |
| 64-XX | 6045 | 6038 |      |     |     |     |     |     |
| 65    | 6013 | 6010 | 1.94 | .45 | .00 | .00 | .26 | 1.0 |
| 66    | 6013 | 6014 | .48  | .07 | .00 | .00 | .10 | . 2 |
|       |      |      |      |     |     |     |     |     |

| 6001         .08         530.18         449.00         81.18         796.13           6002         .42         530.19         472.00         58.19         570.64           6003         .06         530.19         469.00         61.19         600.05           6004         .84         530.33         484.00         46.33         454.31           6005         .31         529.83         486.00         43.83         429.84           6006         .26         530.37         487.00         43.37         425.28           6007         .09         530.35         467.00         63.35         621.27           6008         .26         530.50         487.00         43.50         426.64           6009         .11         530.12         473.00         57.12         560.16           6010         .72         530.69         500.00         30.69         300.99           6011         .07         530.69         502.00         28.69         281.34           6012         .20         530.56         465.00         65.56         642.90           6013         .51         531.14         515.00         16.14         158.32                   | JUNCTION<br>NUMBER | DEMAND | HYDRAULIC<br>GRADE<br>(m) | ELEVATION | HEAD  | JUNCTIO<br>PRESSUR<br>(kpa) |
|---|--------------------|--------|---------------------------|-----------|-------|-----------------------------|
| 6003         .06         530.19         469.00         61.19         600.05           6004         .84         530.33         484.00         46.33         454.31           6005         .31         529.83         486.00         43.83         429.84           6006         .26         530.37         487.00         43.37         425.28           6007         .09         530.35         467.00         63.35         621.27           6008         .26         530.50         487.00         43.50         426.64           6009         .11         530.12         473.00         57.12         560.16           6010         .72         530.69         500.00         30.69         300.99           6011         .07         530.69         500.00         30.69         300.99           6011         .07         530.69         500.00         30.69         300.99           6011         .07         530.69         500.00         30.69         300.99           6011         .07         531.69         465.00         65.56         642.90           6012         .20         530.56         465.00         65.56         642.90                   | 6001               | .08    | 530.18                    | 449.00    | 81.18 | 796.13                      |
| 6004       .84       530.33       484.00       46.33       454.31         6005       .31       529.83       486.00       43.83       429.84         6006       .26       530.37       487.00       43.37       425.28         6007       .09       530.35       467.00       63.35       621.27         6008       .26       530.50       487.00       43.50       426.64         6009       .11       530.12       473.00       57.12       560.16         6010       .72       530.69       500.00       30.69       300.99         6011       .07       530.69       502.00       28.69       281.34         6012       .20       530.56       465.00       65.56       642.90         6013       .51       531.14       515.00       16.14       158.32         6014       .37       531.08       491.00       40.08       393.02         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.03       466.00       65.03       637.76   | 6002               | .42    | 530.19                    | 472.00    | 58.19 | 570.64                      |
| 6005         .31         529.83         486.00         43.83         429.84           6006         .26         530.37         487.00         43.37         425.28           6007         .09         530.35         467.00         63.35         621.27           6008         .26         530.50         487.00         43.50         426.64           6009         .11         530.12         473.00         57.12         560.16           6010         .72         530.69         500.00         30.69         300.99           6011         .07         530.69         502.00         28.69         281.34           6012         .20         530.56         465.00         65.56         642.90           6013         .51         531.14         515.00         16.14         158.32           6014         .37         531.08         493.00         38.08         373.43           6015         .06         531.08         491.00         40.08         393.02           6016         .31         531.04         480.00         51.04         500.58           6017         .10         531.04         469.00         62.04         608.44                   | 6003               | .06    | 530.19                    | 469.00    | 61.19 | 600.05                      |
| 6006         .26         530.37         487.00         43.37         425.28           6007         .09         530.35         467.00         63.35         621.27           6008         .26         530.50         487.00         43.50         426.64           6009         .11         530.12         473.00         57.12         560.16           6010         .72         530.69         500.00         30.69         300.99           6011         .07         530.69         502.00         28.69         281.34           6012         .20         530.56         465.00         65.56         642.90           6013         .51         531.14         515.00         16.14         158.32           6014         .37         531.08         493.00         38.08         373.43           6015         .06         531.08         491.00         40.08         393.02           6016         .31         531.04         480.00         51.04         500.58           6017         .10         531.04         469.00         62.04         608.44           6018         .10         531.03         466.00         65.03         637.76                   | 6004               | .84    | 530.33                    | 484.00    | 46.33 | 454.31                      |
| 6007         .09         530.35         467.00         63.35         621.27           6008         .26         530.50         487.00         43.50         426.64           6009         .11         530.12         473.00         57.12         560.16           6010         .72         530.69         500.00         30.69         300.99           6011         .07         530.69         502.00         28.69         281.34           6012         .20         530.56         465.00         65.56         642.90           6013         .51         531.14         515.00         16.14         158.32           6014         .37         531.08         491.00         38.08         373.43           6015         .06         531.08         491.00         40.08         393.02           6016         .31         531.04         480.00         51.04         500.58           6017         .10         531.03         466.00         65.03         637.76           6018         .10         531.03         466.00         65.03         637.76           6019         .38         531.21         517.00         14.21         139.38                   |                    |        | 529.83                    | 486.00    | 43.83 | 429.84                      |
| 6008       .26       530.50       487.00       43.50       426.64         6009       .11       530.12       473.00       57.12       560.16         6010       .72       530.69       500.00       30.69       300.99         6011       .07       530.69       502.00       28.69       281.34         6012       .20       530.56       465.00       65.56       642.90         6013       .51       531.14       515.00       16.14       158.32         6014       .37       531.08       493.00       38.08       373.43         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.14       519.00       12.21       119.75 <t< td=""><td>6006</td><td>.26</td><td>530.37</td><td>487.00</td><td>43.37</td><td>425.28</td></t<> | 6006               | .26    | 530.37                    | 487.00    | 43.37 | 425.28                      |
| 6009       .11       530.12       473.00       57.12       560.16         6010       .72       530.69       500.00       30.69       300.99         6011       .07       530.69       502.00       28.69       281.34         6012       .20       530.56       465.00       65.56       642.90         6013       .51       531.14       515.00       16.14       158.32         6014       .37       531.08       493.00       38.08       373.43         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>                               |                    |        |                           |           |       |                             |
| 6010       .72       530.69       500.00       30.69       300.99         6011       .07       530.69       502.00       28.69       281.34         6012       .20       530.56       465.00       65.56       642.90         6013       .51       531.14       515.00       16.14       158.32         6014       .37       531.08       493.00       38.08       373.43         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .37       531.14       492.00       39.14       383.88 <t< td=""><td></td><td>.26</td><td>530.50</td><td></td><td></td><td></td></t<>                      |                    | .26    | 530.50                    |           |       |                             |
| 6011       .07       530.69       502.00       28.69       281.34         6012       .20       530.56       465.00       65.56       642.90         6013       .51       531.14       515.00       16.14       158.32         6014       .37       531.08       493.00       38.08       373.43         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       510.00       21.14       207.33 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>                               |                    |        |                           |           |       |                             |
| 6012       .20       530.56       465.00       65.56       642.90         6013       .51       531.14       515.00       16.14       158.32         6014       .37       531.08       493.00       38.08       373.43         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       515.00       21.14       207.33         6025       .05       531.14       510.00       21.14       207.33 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>                               |                    |        |                           |           |       |                             |
| 6013       .51       531.14       515.00       16.14       158.32         6014       .37       531.08       493.00       38.08       373.43         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       510.00       21.14       207.33         6025       .05       531.14       510.00       25.12       246.33         6026       .04       531.12       506.00       25.12       246.33 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>                               |                    |        |                           |           |       |                             |
| 6014       .37       531.08       493.00       38.08       373.43         6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       515.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>                               |                    |        |                           |           |       |                             |
| 6015       .06       531.08       491.00       40.08       393.02         6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       515.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91 <t< td=""><td></td><td></td><td></td><td>515.00</td><td>16.14</td><td>158.32</td></t<>              |                    |        |                           | 515.00    | 16.14 | 158.32                      |
| 6016       .31       531.04       480.00       51.04       500.58         6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       515.00       16.14       158.27         6024       .37       531.14       510.00       21.14       207.33         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>                               |                    |        |                           |           |       |                             |
| 6017       .10       531.04       469.00       62.04       608.44         6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       515.00       16.14       158.27         6024       .37       531.14       510.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19   |                    |        |                           |           |       |                             |
| 6018       .10       531.03       466.00       65.03       637.76         6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       515.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32 <td></td> <td></td> <td></td> <td>480.00</td> <td>51.04</td> <td></td>                                |                    |        |                           | 480.00    | 51.04 |                             |
| 6019       .38       531.21       517.00       14.21       139.38         6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       492.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 469.00    | 62.04 | 608.44                      |
| 6020       .34       531.25       525.00       6.25       61.25         6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       492.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           |           | 65.03 | 637.76                      |
| 6021       .53       531.21       519.00       12.21       119.75         6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       492.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 517.00    | 14.21 | 139.38                      |
| 6022       .12       531.18       498.00       33.18       325.36         6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       492.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 525.00    | 6.25  | 61.25                       |
| 6023       .33       531.14       515.00       16.14       158.27         6024       .37       531.14       492.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 519.00    | 12.21 | 119.75                      |
| 6024       .37       531.14       492.00       39.14       383.88         6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        | 531.18                    | 498.00    |       | 325.36                      |
| 6025       .05       531.14       510.00       21.14       207.33         6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 515.00    |       | 158.27                      |
| 6026       .04       531.12       506.00       25.12       246.33         6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 492.00    |       | 383.88                      |
| 6027       .01       531.12       507.00       24.12       236.52         6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 510.00    |       | 207.33                      |
| 6028       .03       531.06       507.00       24.06       235.91         6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    | .04    | 531.12                    | 506.00    |       | 246.33                      |
| 6029       .03       531.06       524.00       7.06       69.19         6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 507.00    | 24.12 |                             |
| 6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    | .03    | 531.06                    |           | 24.06 | 235.91                      |
| 6030       .28       530.85       480.00       50.85       498.72         6031       .02       530.85       478.00       52.85       518.32   |                    |        |                           | 524.00    | 7.06  | 69.19                       |
| 6031 .02 530.85 478.00 52.85 518.32   |                    |        |                           | 480.00    | 50.85 | 498.72                      |
|   |                    |        |                           |           |       | 518.32                      |
|   | 6032               | .01    | 530.85                    | 480.00    | 50.85 | 498.70                      |

| 6033 | .01  | 530.85 | 492.00 | 38.85 | 381.02 |
|------|------|--------|--------|-------|--------|
| 6034 | .12  | 530.84 | 477.00 | 53.84 | 528.02 |
| 6035 | .07  | 530.82 | 481.00 | 49.82 | 488.53 |
| 6036 | .11  | 530.60 | 471.00 | 59.60 | 584.49 |
| 6037 | .01  | 530.60 | 475.00 | 55.60 | 545.26 |
| 6038 | 1.04 | 528.75 | 462.00 | 66.75 | 654.56 |
| 6039 | .19  | 528.72 | 466.00 | 62.72 | 615.05 |
| 6040 | .37  | 528.55 | 458.00 | 70.55 | 691.81 |
| 6041 | .31  | 530.14 | 480.00 | 50.14 | 491.71 |
| 6042 | .55  | 531.18 | 527.00 | 4.18  | 40.97  |
| 6043 | .03  | 531.07 | 513.00 | 18.07 | 177.19 |
| 6044 | .09  | 530.21 | 465.00 | 65.21 | 639.51 |
| 6045 | .72  | 530.10 | 464.00 | 66.10 | 648.26 |
| 6200 | .00  | 530.68 | 493.00 | 37.68 | 369.52 |
| 6300 | .00  | 531.05 | 513.00 | 18.05 | 177.05 |

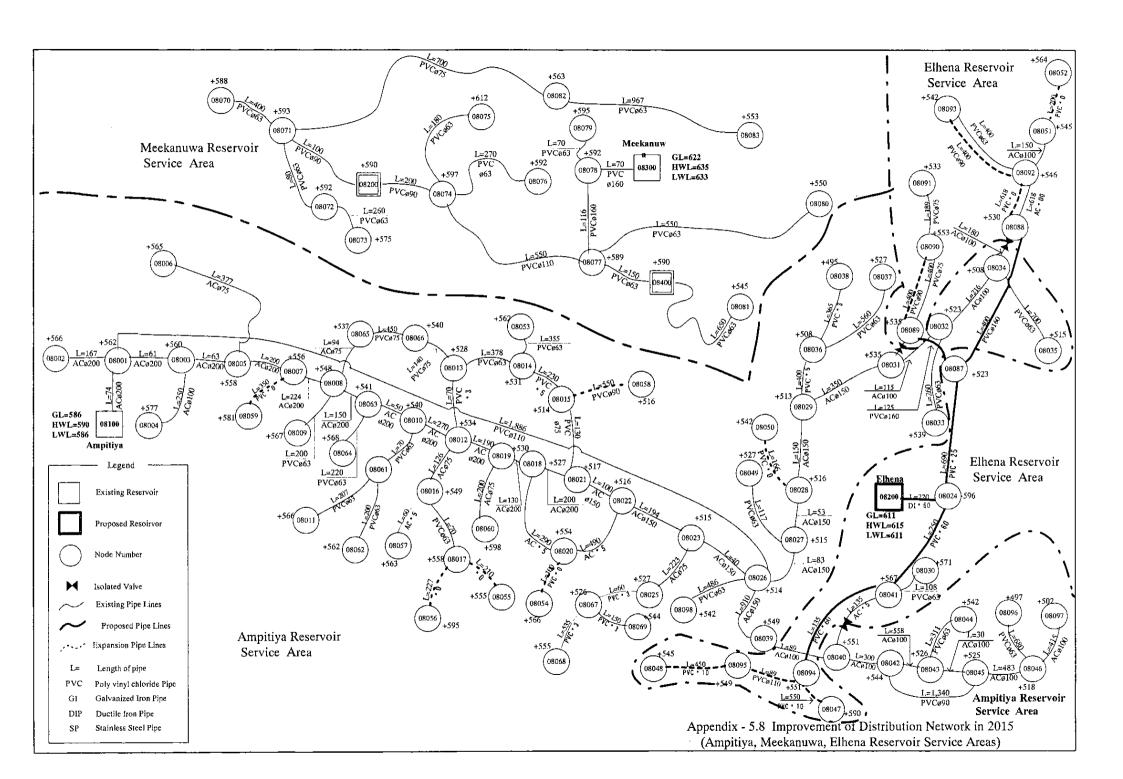
# SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER | - <b></b> | FLOWRATE (1/s)        |
|-----|----------------------------|----------------|-----------|-----------------------|
|     |                            | 1<br>48        |           | 1.84<br>9.15          |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | = =       | 10.99<br>.00<br>10.99 |

### \*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 13:57:39



DATE: 3/ 7/2002 TIME: 13:58:47

INPUT DATA FILENAME ------ C:\D\_nets\2015\ELHE2015.DAT TABULATED OUTPUT FILENAME ----- C:\D\_nets\2015\ELHE2015.OUT POSTPROCESSOR RESULTS FILENAME --- C:\D\_nets\2015\ELHE2015.RES

### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) ..... = meters PRESSURE .... = kpa

### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER | NOD<br>#1 | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|-----------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-FG           | 0         | 8024         | 220.0         | 20.0             | 130.00              | .00                  | 611.         |
| 2              | 8024      | 8041         | 250.0         | 14.0             | 130.00              | .00                  |              |
| 3              | 8041      | 8094         | 135.0         | 14.0             | 130.00              | .00                  |              |
| 4              | 8094      | 8047         | 550.0         | 9.7              | 130.00              | .00                  |              |
| 5              | 8094      | 8095         | 89.0          | 9.7              | 130.00              | .00                  |              |
| 6              | 8095      | 8048         | 450.0         | 9.7              | 130.00              | .00                  |              |
| 7              | 8024      | 8087         | 690.0         | 19.8             | 130.00              | .00                  |              |
| 8              | 8087      | 8089         | 125.0         | 14.0             | 130.00              | .00                  |              |
| 9              | 8087      | 8088         | 400.0         | 14.0             | 130.00              | .00                  |              |
| 10             | 8089      | 8090         | 390.0         | 6.5              | 120.00              | .00                  |              |
| 11             | 8090      | 8091         | 189.0         | 6.5              | 120.00              | .00                  |              |
| 12             | 8088      | 8092         | 618.0         | 10.0             | 120.00              | .00                  |              |
| 13             | 8092      | 8093         | 400.0         | 5.5              | 120.00              | .00                  |              |

| 14 | 8092 | 8051 | 150.0 | 10.0 | 120.00 | .00  |
|----|------|------|-------|------|--------|------|
| 15 | 8051 | 8052 | 200.0 | 9.7  | 130.00 | .00  |
| 16 | 8041 | 8030 | 108.0 | 5.5  | 130.00 | . 00 |

### JUNCTION NODE DATA

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | JUNCTION<br>ELEVATION<br>(m) | CONN | ECTING | PIPES |
|--------------------|-------------------|-----------------------------|------------------------------|------|--------|-------|
| 8024               |                   | .75                         | 596.00                       | 1    | 2      | 7     |
| 8030               |                   | .75                         | 571.00                       | 16   |        |       |
| 8041               |                   | .75                         | 567.00                       | 2    | 3      | 16    |
| 8047               |                   | .89                         | 590.00                       | 4    |        |       |
| 8048               |                   | .89                         | 545.00                       | 6    |        |       |
| 8051               |                   | .21                         | 545.00                       | 14   | 15     |       |
| 8052               |                   | 1.21                        | 564.00                       | 15   |        |       |
| 8087               |                   | .00                         | 523.00                       | 7    | 8      | 9     |
| 8088               |                   | .00                         | 520.00                       | 9    | 12     |       |
| 8089               |                   | .75                         | 535.00                       | 8    | 10     |       |
| 8090               |                   | .75                         | 553.00                       | 10   | 11     |       |
| 8091               |                   | 2.89                        | 533.00                       | 11   |        |       |
| 8092               |                   | 1.21                        | 546.00                       | 12   | 13     | 14    |
| 8093               |                   | 1.21                        | 542.00                       | 13   |        |       |
| 8094               |                   | .00                         | 551.00                       | 3    | 4      | 5     |
| 8095               |                   | .89                         | 549.00                       | 5    | 6      |       |

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

### SYSTEM CONFIGURATION

|           | PIPES(p)             |   | 16 |
|-----------|----------------------|---|----|
| NUMBER OF | JUNCTION NODES(j)    | = | 16 |
| NUMBER OF | PRIMARY LOOPS(1)     | = | 0  |
| NUMBER OF | FIXED GRADE NODES(f) | = | 1  |
| NUMBER OF | SUPPLY ZONES(z)      | = | 1  |

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

DATE = 03-07-2002 JOB NAME = GKWSAP - JICA - Elhena SR

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | <b>N</b> OI<br>#1 | DE NOS.<br>#2 | FLOWRATE      | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-------------------|---------------|---------------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG<br>2      | 0<br>8024         | 8024<br>8041  | 13.15<br>4.17 | .24                 | .00                 | .00                  | .42<br>.27             | 1.0                 |
| 3              | 8041              | 8041          | 2.67          | .04                 | .00                 | .00                  | .17                    | .7                  |
| 4              | 8094              | 8047          | .89           | .14                 | .00                 | .00                  | .12                    | .2                  |
| 5              | 8094              | 8095          | 1.78          | .08                 | .00                 | .00                  | .24                    | .9                  |
| 6              | 8095              | 8048          | .89           | .11                 | .00                 | .00                  | .12                    | .2                  |
| 7              | 8024              | 8087          | 8.23          | .33                 | .00                 | .00                  | .27                    | .4                  |
| 8              | 8087              | 8089          | 4.39          | .10                 | .00                 | .00                  | .29                    | . 8                 |
| 9              | 8087              | 8088          | 3.84          | .25                 | .00                 | .00                  | .25                    | .6                  |
| 10             | 8089              | 8090          | 3.64          | 10.81               | .00                 | .00                  | 1.10                   | 27.7                |
| 11             | 8090              | 8091          | 2.89          | 3.42                | .00                 | .00                  | .87                    | 18.0                |
| 12             | 8088              | 8092          | 3.84          | 2.32                | .00                 | .00                  | .49                    | 3.7                 |
| 13             | 8092              | 8093          | 1.21          | 3.25                | .00                 | .00                  | .51                    | 8.1                 |
| 14             | 8092              | 8051          | 1.42          | .09                 | .00                 | .00                  | .18                    | .5                  |
| 15             | 8051              | 8052          | 1.21          | .09                 | .00                 | .00                  | .16                    | . 4                 |
| 16             | 8041              | 8030          | .75           | .31                 | .00                 | .00                  | .32                    | 2.8                 |
|                |                   |               |               |                     |                     |                      |                        |                     |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER   | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s)  | HYDRAULIC<br>GRADE<br>(m)  | JUNCTION<br>ELEVATION<br>(m)   | PRESSURE<br>HEAD<br>(m)  | JUNCTIO<br>PRESSUR<br>(kpa)  |
|--|-------------------|--|--|--|--|--|
| 8024<br>8030<br>8041<br>8047<br>8048<br>8051<br>8052<br>8087<br>8088<br>8089<br>8090<br>8091<br>8092<br>8093 |                   | .75<br>.75<br>.75<br>.89<br>.89<br>.21<br>1.21<br>.00<br>.00<br>.75<br>.75<br>2.89<br>1.21 | 610.76<br>610.27<br>610.58<br>610.40<br>610.34<br>607.77<br>607.68<br>610.43<br>610.18<br>610.33<br>599.53<br>596.11<br>607.86<br>604.61 | 596.00<br>571.00<br>567.00<br>590.00<br>545.00<br>545.00<br>545.00<br>523.00<br>523.00<br>520.00<br>535.00<br>535.00<br>533.00<br>546.00<br>542.00 | 14.76<br>39.27<br>43.58<br>20.40<br>65.34<br>62.77<br>43.68<br>87.43<br>90.18<br>75.33<br>46.53<br>63.11<br>61.86<br>62.61 | 144.77<br>385.08<br>427.36<br>200.04<br>640.79<br>615.59<br>428.39<br>857.43<br>884.38<br>738.76<br>456.27<br>618.90<br>606.65<br>613.99 |
| 8094<br>8095   |                   | .00  | 610.54<br>610.46   | 551.00<br>549.00   | 59.54<br>61.46   | 583.85<br>602.67   |

JOB NAME = GKWSAP - JICA - Elhena SR

### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE (1/s)        |
|-----|----------------------------|----------------|-------------|-----------------------|
|     |                            | 1              |             | 13.15                 |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 13.15<br>.00<br>13.15 |

### DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 8024          | 3.95     | .03                 | .00                 | .00                  | .13                    | .1                  |
| 2              | 8024      | 8041          | 1.25     | .02                 | .00                 | .00                  | .08                    | .0                  |
| 3              | 8041      | 8094          | .80      | .00                 | .00                 | .00                  | . 05                   | .0                  |
| 4              | 8094      | 8047          | .27      | .01                 | .00                 | .00                  | .04                    | .0                  |
| 5              | 8094      | 8095          | .53      | .01                 | .00                 | .00                  | .07                    | .1                  |
| 6              | 8095      | 8048          | .27      | .01                 | .00                 | .00                  | .04                    | . 0                 |
| 7              | 8024      | 8087          | 2.47     | .04                 | .00                 | .00                  | .08                    | .0                  |
| 8              | 8087      | 8089          | 1.32     | .01                 | .00                 | .00                  | .09                    | .0                  |

| 9  | 8087 | 8088 | 1.15 | .03  | .00 | .00 | .07  | . 0 |
|----|------|------|------|------|-----|-----|------|-----|
| 10 | 8089 | 8090 | 1.09 | 1.16 | .00 | .00 | .33  | 2.9 |
| 11 | 8090 | 8091 | .87  | .37  | .00 | .00 | .26  | 1.9 |
| 12 | 8088 | 8092 | 1.15 | .25  | .00 | .00 | . 15 | . 4 |
| 13 | 8092 | 8093 | .36  | .35  | .00 | .00 | .15  | .8  |
| 14 | 8092 | 8051 | .43  | .01  | .00 | .00 | .05  | . 0 |
| 15 | 8051 | 8052 | .36  | .01  | .00 | .00 | . 05 | .0  |
| 16 | 8041 | 8030 | .23  | .03  | .00 | .00 | .09  | .3  |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 8024               |                   | .23                         | 610.97                    | 596.00                       | 14.97                   | 146.85                      |
| 8030               |                   | .23                         | 610.92                    | 571.00                       | 39.92                   | 391.49                      |
| 8041               |                   | .23                         | 610.95                    | 567.00                       | 43.95                   | 431.05                      |
| 8047               |                   | .27                         | 610.94                    | 590.00                       | 20.94                   | 205.31                      |
| 8048               |                   | .27                         | 610.93                    | 545.00                       | 65.93                   | 646.55                      |
| 8051               |                   | .06                         | 610.65                    | 545.00                       | 65.65                   | 643.84                      |
| 8052               |                   | .36                         | 610.64                    | 564.00                       | 46.64                   | 457.42                      |
| 8087               |                   | .00                         | 610.94                    | 523.00                       | 87.94                   | 862.39                      |
| 8088               |                   | .00                         | 610.91                    | 520.00                       | 90.91                   | 891.55                      |
| 8089               |                   | .23                         | 610.93                    | 535.00                       | 75.93                   | 744.61                      |
| 8090               |                   | .23                         | 609.77                    | 553.00                       | 56.77                   | 556.69                      |
| 8091               |                   | .87                         | 609.40                    | 533.00                       | 76.40                   | 749.22                      |
| 8092               |                   | .36                         | 610.66                    | 546.00                       | 64.66                   | 634.13                      |
| 8093               |                   | .36                         | 610.31                    | 542.00                       | 68.31                   | 669.92                      |
| 8094               |                   | .00                         | 610.95                    | 551.00                       | 59.95                   | 587.91                      |
| 8095               |                   | .27                         | 610.94                    | 549.00                       | 61.94                   | 607.44                      |

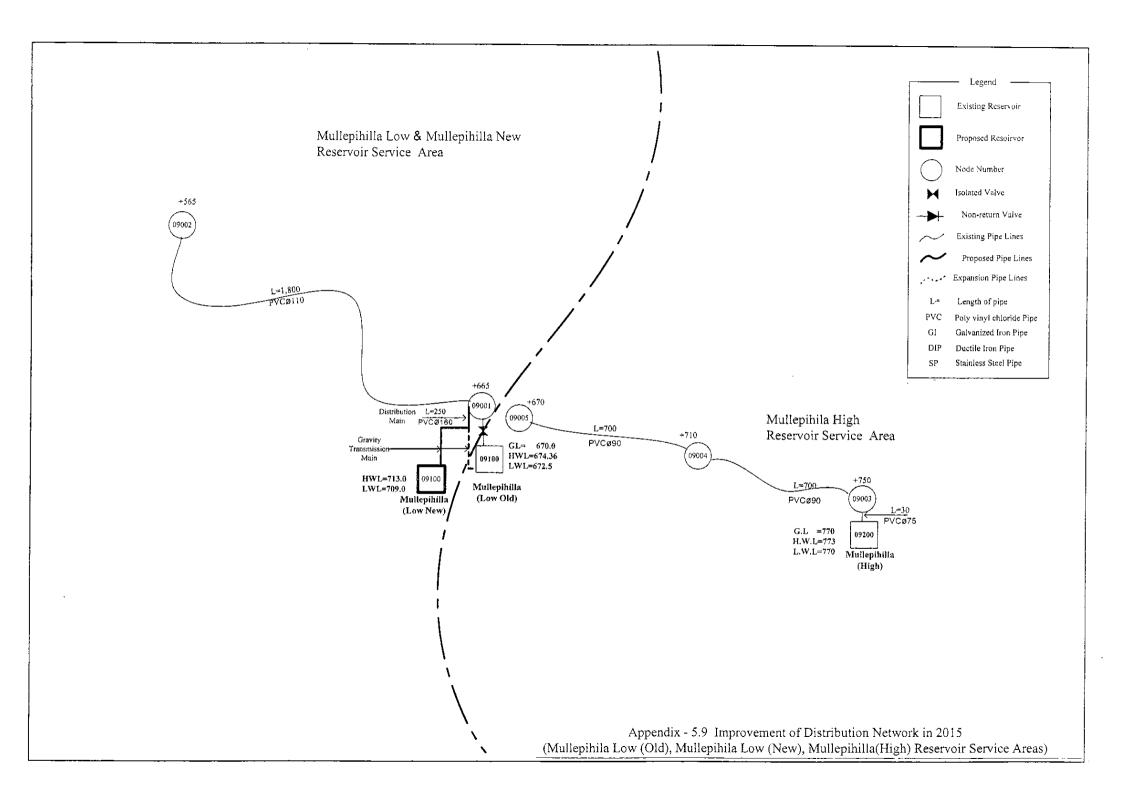
### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |        | PIPE<br>NUMBER |   | FLOWRATE (1/s) |
|-----|--------|----------------|---|----------------|
|     |        | 1              |   | 3.95           |
| NET | SYSTEM | INFLOW         | = | 3.95           |
| NET | SYSTEM | OUTFLOW        | = | .00            |
| NET | SYSTEM | DEMAND         | = | 3.94           |

### \*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 13:58:47



DATE: 3/ 7/2002 TIME: 14: 0: 6

INPUT DATA FILENAME ----- c:\D\_nets\2015\MULL2015.DAT TABULATED OUTPUT FILENAME ---- c:\D\_nets\2015\MULL2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\MULL2015.RES

#### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) .... = meters
PRESSURE .... = kpa

### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER | NOD<br>#1 | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|-----------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-XXFG         | 0         | 9001         | 25.0          | 9.7              | 120.00              | .00                  | 672.         |
| 2-FG           | 0         | 9001         | 250.0         | 14.0             | 130.00              | .00                  | 709.         |
| 3              | 9001      | 9002         | 1800.0        | 9.7              | 120.00              | .00                  |              |

### JUNCTION NODE DATA

| JUNCTION | JUNCTION | EXTERNAL | JUNCTION  |            |       |
|----------|----------|----------|-----------|------------|-------|
| NUMBER   | TITLE    | DEMAND   | ELEVATION | CONNECTING | PIPES |
|          |          | (1/s)    | (m)       |            |       |
| <br>     |          |          | <b></b>   |            |       |

2.43 665.00 1 2 3 14.65 565.00 3 9001 9002

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

#### SYSTEM CONFIGURATION

| NUMBER OF | PIPES(p)             | = | 3 |
|-----------|----------------------|---|---|
| NUMBER OF | JUNCTION NODES(j)    | = | 2 |
| NUMBER OF | PRIMARY LOOPS(1)     | = | 0 |
| NUMBER OF | FIXED GRADE NODES(f) | = | 2 |
| NUMBER OF | SUPPLY ZONES(z)      | = | 1 |

\*\*\*\*\*\*\*\*\*\* SIMULATION RESULTS \*\*\*\*\*\*\*\*\*\*\*

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

### PIPELINE RESULTS

| STATUS CODE: | XX -CLOSED PIPE | FG -FIXED GRADE NODE | PU -PUMP LINE    |
|--------------|-----------------|----------------------|------------------|
|              | CV -CHECK VALVE | RV -REGULATING VALVE | TK -STORAGE TANK |

| PIPE<br>NUMBER | NODE<br>#1 | NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|------------|------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-XXFG         | 0          | 9001       |          |                     |                     |                      |                        |                     |
| 2 - FG         | 0          | 9001       | 17.08    | 2.49                | .00                 | .00                  | 1.11                   | 9.9                 |
| 3              | 9001       | 9002       | 14.65    | 93.57               | .00                 | .00                  | 1.98                   | 51.9                |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 9001               |                   | 2.43                        | 706.51                    | 665.00                       | 41.51                   | 407.04                      |
| 9002               |                   | 14.65                       | 612.93                    | 565.00                       | 47.93                   | 470.05                      |

JOB NAME = GKWSAP - JICA - Mullepihilla Low New SR

### SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |   | FLOWRATE<br>(1/s)     |
|-----|----------------------------|----------------|---|-----------------------|
|     |                            | 2              |   | 17.08                 |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | ======================================= | 17.08<br>.00<br>17.08 |

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

### PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NODE<br>#1 | NOS.<br>#2 | FLOWRATE<br>(1/s) | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|------------|------------|-------------------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-XXFG         | 0          | 9001       |                   |                     |                     |                      |                        |                     |
| 2-FG           | 0          | 9001       | 5.12              | .27                 | .00                 | .00                  | .33                    | 1.0                 |
| 3              | 9001       | 9002       | 4.39              | 10.06               | .00                 | .00                  | .59                    | 5.5                 |

### JUNCTION NODE RESULTS

JUNCTION JUNCTION EXTERNAL HYDRAULIC JUNCTION PRESSURE JUNCTIO

JOB NAME = GKWSAP - JICA - Mullepihilla Low New SR

| NUMBER | TITLE | DEMAND<br>(1/s) | GRADE<br>(m) | ELEVATION (m) | HEAD<br>(m) | PRESSUR<br>(kpa) |
|--------|-------|-----------------|--------------|---------------|-------------|------------------|
| 9001   |       | .73             | 708.73       | 665.00        | 43.73       | 428.86           |
| 9002   |       | 4.39            | 698.67       | 565.00        | 133.67      | 1310.84          |

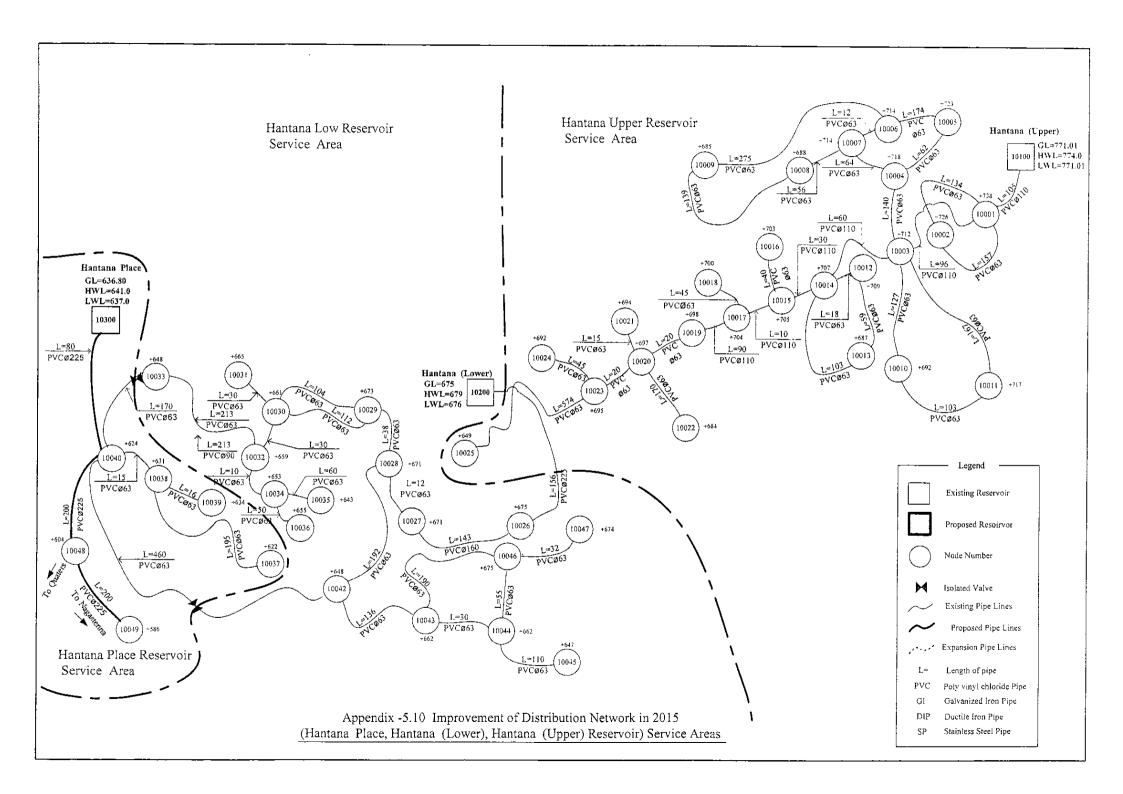
## SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE<br>(1/s)   |  |  |
|-----|----------------------------|----------------|-------------|---------------------|--|--|
|     |                            | 2              |             | 5.12                |  |  |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 5.12<br>.00<br>5.12 |  |  |

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 14: 0: 6



DATE: 3/ 7/2002 TIME: 14: 0:49

INPUT DATA FILENAME ----- c:\D\_nets\2015\HANP2015.DAT TABULATED OUTPUT FILENAME ---- c:\D\_nets\2015\HANP2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\HANP2015.RES

### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) ..... = meters
PRESSURE .... = kpa

## PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER | NOD<br>#1 | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|-----------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-FG           | 0         | 1040         | 80.0          | 19.8             | 130.00              | .00                  | 637.         |
| 2              | 1040      | 1048         | 180.0         | 19.8             | 130.00              | .00                  |              |
| 3              | 1048      | 1049         | 200.0         | 19.8             | 130.00              | .00                  |              |
| 4              | 1040      | 1038         | 15.0          | 5.5              | 120.00              | .00                  |              |
| 5              | 1038      | 1037         | 195.0         | 5.5              | 120.00              | .00                  |              |
| 6              | 1038      | 1039         | 16.0          | 5.5              | 120.00              | .00                  |              |

### JUNCTION NODE DATA

JUNCTION JUNCTION EXTERNAL JUNCTION

DATE = 03-07-2002 JOB NAME = GKWSAP - JICA - Hantana Place SR

| NUMBER | TITLE | DEMAND<br>(1/s) | ELEVATION (m) | CONNE | CTING | G PIPES |  |
|--------|-------|-----------------|---------------|-------|-------|---------|--|
| 1037   |       | 1.92            | 622.00        | 5     |       |         |  |
| 1038   |       | 1.92            | 631.00        | 4     | 5     | 6       |  |
| 1039   |       | 1.92            | 634.00        | 6     |       |         |  |
| 1040   |       | 1.92            | 624.00        | 1     | 2     | 4       |  |
| 1048   |       | 6.10            | 600.00        | 2     | 3     |         |  |
| 1049   |       | 8.26            | 575.00        | 3     |       |         |  |

## OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

### SYSTEM CONFIGURATION

| NUMBER | OF | PIPES(p)             | = | 6 |
|--------|----|----------------------|---|---|
| NUMBER | OF | JUNCTION NODES(j)    | = | 6 |
| NUMBER | OF | PRIMARY LOOPS(1)     | = | 0 |
| NUMBER | OF | FIXED GRADE NODES(f) | = | 1 |
| NUMBER | OF | SUPPLY ZONES(z)      | = | 1 |

### 

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

## PIPELINE RESULTS

| PIPE<br>NUMBER | NO!<br>#1 | DE NOS.<br>#2 | FLOWRATE<br>(1/s) | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|-------------------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 1040          | 22.04             | .24                 | .00                 | .00                  | .72                    | 2.9                 |
| 2              | 1040      | 1048          | 14.36             | .24                 | .00                 | .00                  | .47                    | 1.3                 |
| 3              | 1048      | 1049          | 8.26              | .10                 | .00                 | .00                  | .27                    | . 4                 |
| 4              | 1040      | 1038          | 5.76              | 2.19                | .00                 | .00                  | 2.42                   | 146.2               |
| 5              | 1038      | 1037          | 1.92              | 3.73                | .00                 | .00                  | .81                    | 19.1                |
| 6              | 1038      | 1039          | 1.92              | .31                 | .00                 | .00                  | .81                    | 19.1                |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 1037               |                   | 1.92                        | 630.84                    | 622.00                       | 8.84                    | 86.71                       |
| 1038               |                   | 1.92                        | 634.57                    | 631.00                       | 3.57                    | 35.01                       |
| 1039               |                   | 1.92                        | 634.26                    | 634.00                       | .26                     | 2.59                        |
| 1040               |                   | 1.92                        | 636.76                    | 624.00                       | 12.76                   | 125.17                      |
| 1048               |                   | 6.10                        | 636.52                    | 600.00                       | 36.52                   | 358.17                      |
| 1049               |                   | 8.26                        | 636.43                    | 575.00                       | 61.43                   | 602.39                      |

## SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATI<br>(1/s)     |  |  |
|-----|----------------------------|----------------|-------------|-----------------------|--|--|
|     |                            | 1              |             | 22.04                 |  |  |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 22.04<br>.00<br>22.04 |  |  |

## DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

## PIPELINE RESULTS

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 1040          | 6.61     | .03                 | .00                 | .00                  | .21                    | .3                  |
| 2              | 1040      | 1048          | 4.31     | .03                 | .00                 | .00                  | .14                    | . 1                 |
| 3              | 1048      | 1049          | 2.48     | .01                 | .00                 | .00                  | .08                    | . 0                 |
| 4              | 1040      | 1038          | 1.73     | .24                 | .00                 | .00                  | .73                    | 15.7                |
| 5              | 1038      | 1037          | .58      | .40                 | .00                 | .00                  | .24                    | 2.0                 |
| 6              | 1038      | 1039          | .58      | .03                 | .00                 | .00                  | .24                    | 2.0                 |

## JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 1037               |                   | .58                         | 636.34                    | 622.00                       | 14.34                   | 140.60                      |
| 1038               |                   | .58                         | 636.74                    | 631.00                       | 5.74                    | 56.28                       |
| 1039               |                   | .58                         | 636.71                    | 634.00                       | 2.71                    | 26.53                       |
| 1040               |                   | .58                         | 636.97                    | 624.00                       | 12.97                   | 127.24                      |
| 1048               |                   | 1.83                        | 636.95                    | 600.00                       | 36.95                   | 362.34                      |
| 1049               |                   | 2.48                        | 636.94                    | 575.00                       | 61.94                   | 607.41                      |

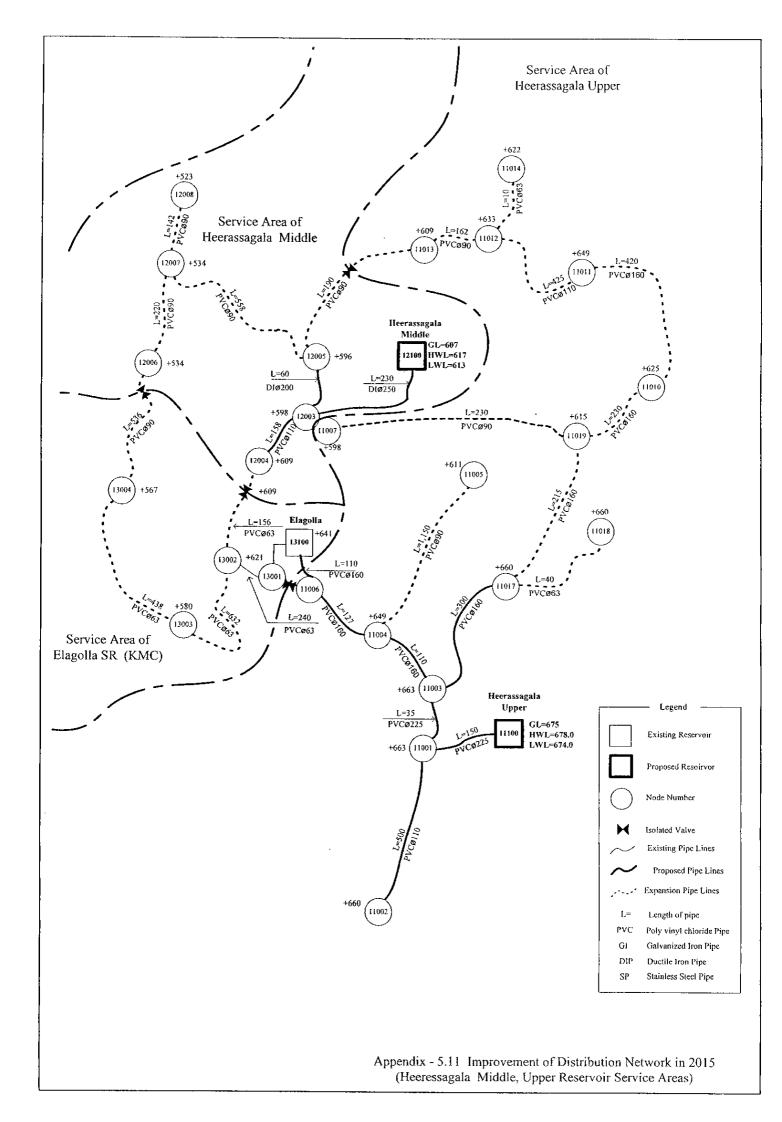
## SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE (1/s)      |  |  |
|-----|----------------------------|----------------|-------------|---------------------|--|--|
|     |                            | 1              |             | 6.61                |  |  |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 6.61<br>.00<br>6.61 |  |  |

## \*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 14: 0:49



DATE: 3/ 7/2002 TIME: 14:11:58

INPUT DATA FILENAME ------ C:\D\_nets\2015\HEEU2015.DAT TABULATED OUTPUT FILENAME ----- C:\D\_nets\2015\HEEU2015.OUT POSTPROCESSOR RESULTS FILENAME --- C:\D\_nets\2015\HEEU2015.RES

#### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) ..... = meters PRESSURE .... = kpa

## PIPELINE DATA

| PIPE<br>NUMBER |      | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-FG           | 0    | 1101         | 150.0         | 19.8             | 130.00              | .00                  | 674.         |
| 2              | 1101 | 1102         | 500.0         | 9.7              | 130.00              | .00                  |              |
| 3              | 1101 | 1103         | 1.0           | 19.8             | 130.00              | .00                  |              |
| 4              | 1103 | 1104         | 110.0         | 14.0             | 130.00              | .00                  |              |
| 5              | 1103 | 1117         | 300.0         | 14.0             | 130.00              | .00                  |              |
| 6              | 1104 | 1105         | 1150.0        | 7.9              | 130.00              | .00                  |              |
| 7              | 1117 | 1118         | 40.0          | 5.5              | 130.00              | .00                  |              |
| 8              | 1117 | 1119         | 215.0         | 14.0             | 130.00              | .00                  |              |
| 9              | 1119 | 1110         | 230.0         | 14.0             | 130.00              | .00                  |              |
| 10             | 1110 | 1111         | 420.0         | 14.0             | 130.00              | .00                  |              |
| 11             | 1111 | 1112         | 425.0         | 9.7              | 130.00              | .00                  |              |
| 12             | 1112 | 1113         | 162.0         | 7.9              | 130.00              | .00                  |              |
| 13             | 1112 | 1114         | 10.0          | 5.5              | 130.00              | .00                  |              |
|                |      |              |               |                  |                     |                      |              |

| 14 | 1119 | 1107 | 230.0 | 7.9  | 130.00 | .00  |
|----|------|------|-------|------|--------|------|
| 15 | 1104 | 1106 | 127.0 | 14.0 | 130.00 | .00  |
| 16 | 1106 | 1300 | 110.0 | 14.0 | 130.00 | - 00 |

## JUNCTION NODE DATA

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | JUNCTION<br>ELEVATION<br>(m) | CONNI | ECTING | PIPES |  |
|--------------------|-------------------|-----------------------------|------------------------------|-------|--------|-------|--|
| 1101               |                   | .89                         | 663.00                       | 1     | 2      | 3     |  |
| 1102               |                   | .89                         | 660.00                       | 2     |        |       |  |
| 1103               |                   | .89                         | 663.00                       | 3     | 4      | 5     |  |
| 1104               |                   | .89                         | 647.00                       | 4     | 6      | 15    |  |
| 1105               |                   | .90                         | 611.00                       | 6     |        |       |  |
| 1106               |                   | .89                         | 659.00                       | 15    | 16     |       |  |
| 1107               |                   | .89                         | 598.00                       | 14    |        |       |  |
| 1110               |                   | .89                         | 625.00                       | 9     | 10     |       |  |
| 1111               |                   | .89                         | 649.00                       | 10    | 11     |       |  |
| 1112               |                   | .90                         | 633.00                       | 11    | 12     | 13    |  |
| 1113               |                   | .89                         | 609.00                       | 12    |        |       |  |
| 1114               |                   | .89                         | 622.00                       | 13    |        |       |  |
| 1117               |                   | .89                         | 660.00                       | 5     | 7      | 8     |  |
| 1118               |                   | .89                         | 660.00                       | 7     |        |       |  |
| 1119               |                   | .90                         | 615.00                       | 8     | 9      | 14    |  |
| 1300               |                   | 17.99                       | 649.00                       | 16    |        |       |  |
|                    |                   |                             |                              |       |        |       |  |

## OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

## SYSTEM CONFIGURATION

| NUMBER | OF | PIPES(p)                         | = | 16 |
|--------|----|----------------------------------|---|----|
| NUMBER | OF | JUNCTION NODES $\dots (\bar{j})$ | = | 16 |
| NUMBER | OF | PRIMARY LOOPS(1)                 | = | 0  |
| NUMBER | OF | FIXED GRADE NODES(f)             | = | 1  |
| NUMBER | OF | SUPPLY ZONES(z)                  | = | 1  |

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

## PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) |      |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|------|
| 1-FG           | 0         | 1101          | 31.37    | . 85                | .00                 | .00                  | 1.02                   | 5.6  |
| 2              | 1101      | 1102          | .89      | .13                 | .00                 | .00                  | .12                    | .2   |
| 3              | 1101      | 1103          | 29.59    | .01                 | .00                 | .00                  | .96                    | 5.1  |
| 4              | 1103      | 1104          | 20.67    | 1.56                | .00                 | .00                  | 1.34                   | 14.2 |
| 5              | 1103      | 1117          | 8.03     | .74                 | .00                 | .00                  | .52                    | 2.4  |
| 6              | 1104      | 1105          | .90      | .80                 | .00                 | .00                  | .18                    | .6   |
| 7              | 1117      | 1118          | .89      | .16                 | .00                 | .00                  | .37                    | 3.9  |
| 8              | 1117      | 1119          | 6.25     | .33                 | .00                 | .00                  | .41                    | 1.5  |
| 9              | 1119      | 1110          | 4.46     | .19                 | .00                 | .00                  | .29                    | .8   |
| 10             | 1110      | 1111          | 3.57     | .23                 | .00                 | .00                  | .23                    | .5   |
| 11             | 1111      | 1112          | 2.68     | .82                 | .00                 | .00                  | .36                    | 1.9  |
| 12             | 1112      | 1113          | .89      | .11                 | .00                 | .00                  | .18                    | .6   |
| 13             | 1112      | 1114          | .89      | .04                 | .00                 | .00                  | .37                    | 3.9  |
| 14             | 1119      | 1107          | .89      | .16                 | .00                 | .00                  | .18                    | .6   |
| 15             | 1104      | 1106          | 18.88    | 1.53                | .00                 | .00                  | 1.23                   | 12.0 |
| 16             | 1106      | 1300          | 17.99    | 1.21                | .00                 | .00                  | 1.17                   | 10.9 |

## JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 1101               |                   | .89                         | 673.65                    | 663.00                       | 10.65                   | 104.41                      |
| 1102               |                   | .89                         | 673.52                    | 660.00                       | 13.52                   | 132.61                      |
| 1103               |                   | .89                         | 673.64                    | 663.00                       | 10.64                   | 104.36                      |
| 1104               |                   | .89                         | 672.08                    | 647.00                       | 25.08                   | 245.95                      |
| 1105               |                   | .90                         | 671.28                    | 611.00                       | 60.28                   | 591.16                      |
| 1106               |                   | .89                         | 670.55                    | 659.00                       | 11.55                   | 113.32                      |
| 1107               |                   | .89                         | 672.41                    | 598.00                       | 74.41                   | 729.74                      |
| 1110               |                   | .89                         | 672.38                    | 625.00                       | 47.38                   | 464.63                      |
| 1111               |                   | .89                         | 672.15                    | 649.00                       | 23.15                   | 227.00                      |
| 1112               |                   | .90                         | 671.33                    | 633.00                       | 38.33                   | 375.87                      |
| 1113               |                   | .89                         | 671.22                    | 609.00                       | 62.22                   | 610.15                      |
| 1114               |                   | .89                         | 671.29                    | 622.00                       | 49.29                   | 483.36                      |
| 1117               |                   | .89                         | 672.90                    | 660.00                       | 12.90                   | 126.53                      |
| 1118               |                   | .89                         | 672.74                    | 660.00                       | 12.74                   | 124.97                      |
| 1119               |                   | .90                         | 672.57                    | 615.00                       | 57.57                   | 564.57                      |
| 1300               |                   | 17.99                       | 669.35                    | 649.00                       | 20.35                   | 199.54                      |
|                    |                   |                             |                           | 4                            |                         |                             |

JOB NAME = GKWSAP - JICA - Heeressagala Upper SR

## SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE<br>(1/s)     |
|-----|----------------------------|----------------|-------------|-----------------------|
|     |                            | 1              |             | 31.37                 |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 31.37<br>.00<br>31.37 |

## DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

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THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

PIPELINE RESULTS

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 1101          | 9.41     | .09                 | .00                 | .00                  | .31                    | .6                  |
| 2              | 1101      | 1102          | .27      | .01                 | .00                 | .00                  | .04                    | . 0                 |
| 3              | 1101      | 1103          | 8.88     | .00                 | .00                 | .00                  | .29                    | .5                  |
| 4              | 1103      | 1104          | 6.20     | .17                 | .00                 | .00                  | .40                    | 1.5                 |
| 5              | 1103      | 1117          | 2.41     | .08                 | .00                 | .00                  | .16                    | . 2                 |
| 6              | 1104      | 1105          | .27      | .09                 | .00                 | .00                  | .06                    | .0                  |
| 7              | 1117      | 1118          | .27      | .02                 | .00                 | .00                  | .11                    | .4                  |
| 8              | 1117      | 1119          | 1.88     | .04                 | .00                 | .00                  | .12                    | .1                  |

| 9  | 1119 | 1110 | 1.34 | .02 | .00  | .00 | .09  | .0  |
|----|------|------|------|-----|------|-----|------|-----|
| 10 | 1110 | 1111 | 1.07 | .02 | .00  | .00 | .07  | .0  |
| 11 | 1111 | 1112 | .80  | .09 | .00  | .00 | .11  | .2  |
| 12 | 1112 | 1113 | .27  | .01 | .00  | .00 | . 05 | .0  |
| 13 | 1112 | 1114 | .27  | .00 | .00  | .00 | .11  | .4  |
| 14 | 1119 | 1107 | .27  | .02 | .00  | .00 | .05  | .0  |
| 15 | 1104 | 1106 | 5.66 | .16 | .00  | .00 | .37  | 1.2 |
| 16 | 1106 | 1300 | 5.40 | .13 | . 00 | .00 | .35  | 1.1 |

## JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 1101               |                   | .27                         | 674.41                    | 663.00                       | 11.41                   | 111.88                      |
| 1102               |                   | .27                         | 674.39                    |                              | 14.39                   |                             |
| 1103               |                   | .27                         | 674.41                    | 663.00                       | 11.41                   | 111.87                      |
| 1104               |                   | .27                         | 674.24                    | 647.00                       | 27.24                   | 267.13                      |
| 1105               |                   | .27                         | 674.15                    | 611.00                       | 63.15                   | 619.33                      |
| 1106               |                   | .27                         | 674.08                    | 659.00                       | 15.08                   | 147.84                      |
| 1107               |                   | .27                         | 674.28                    | 598.00                       | 76.28                   | 748.01                      |
| 1110               |                   | .27                         | 674.27                    | 625.00                       | 49.27                   | 483.19                      |
| 1111               |                   | .27                         | 674.25                    | 649.00                       | 25.25                   | 247.59                      |
| 1112               |                   | .27                         | 674.16                    | 633.00                       | 41.16                   | 403.63                      |
| 1113               |                   | .27                         | 674.15                    | 609.00                       | 65.15                   | 638.88                      |
| 1114               |                   | .27                         | 674.15                    | 622.00                       | 52.15                   | 511.46                      |
| 1117               |                   | .27                         | 674.33                    | 660.00                       | 14.33                   | 140.51                      |
| 1118               |                   | .27                         | 674.31                    | 660.00                       | 14.31                   | 140.34                      |
| 1119               |                   | .27                         | 674.29                    | 615.00                       | 59.29                   | 581.46                      |
| 1300               |                   | 5.40                        | 673.95                    | 649.00                       | 24.95                   | 244.64                      |

## SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |        | PIPE<br>NUMBER |   | FLOWRATE (1/s) |
|-----|--------|----------------|---|----------------|
|     |        | 1              |   | 9.41           |
| NET | SYSTEM | INFLOW         | = | 9.41           |
| NET | SYSTEM | OUTFLOW        | = | .00            |
| NET | SYSTEM | DEMAND         | = | 9.41           |

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 14:11:58 DATE: 3/ 7/2002 TIME: 14:20:22

INPUT DATA FILENAME ----- C:\D\_nets\2015\HEEM2015.DAT TABULATED OUTPUT FILENAME ---- C:\D\_nets\2015\HEEM2015.OUT POSTPROCESSOR RESULTS FILENAME --- C:\D\_nets\2015\HEEM2015.RES

### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) .... = meters PRESSURE .... = kpa

### PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE CV -CHECK VALVE RV -REGULATING VALVE

| PIPE<br>NUMBER | NOD<br>#1 | E NOS.<br>#2 | LENGTH<br>(m) | DIAMETER<br>(cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|-----------|--------------|---------------|------------------|---------------------|----------------------|--------------|
| 1-FG           | 0         | 1203         | 230.0         | 25.0             | 130.00              | .00                  | 613.         |
| 2              | 1203      | 1204         | 158.0         | 9.7              | 130.00              | .00                  | 020.         |
| 3              | 1203      | 1205         | 40.0          | 20.0             | 130.00              | .00                  |              |
| 4              | 1205      | 1207         | 558.0         | 7.9              | 130.00              | .00                  |              |
| 5              | 1207      | 1206         | 220.0         | 7.9              | 130.00              | .00                  |              |
| 6              | 1207      | 1208         | 142.0         | 7.9              | 130.00              | .00                  |              |

### JUNCTION NODE DATA

JUNCTION JUNCTION EXTERNAL JUNCTION

DATE = 03-07-2002

PAGE NO. 2 JOB NAME = GKWSAP - JICA - Heeressagala Middle SR

| NUMBER | TITLE | DEMAND<br>(1/s) | ELEVATION (m) | CONNE | CTING | PIPES |
|--------|-------|-----------------|---------------|-------|-------|-------|
| 1203   |       | 3.56            | 598.00        | 1     | 2     | 3     |
| 1204   |       | 3.56            | 609.00        | 2     |       |       |
| 1205   |       | 3.57            | 596.00        | 3     | 4     |       |
| 1206   |       | 3.56            | 534.00        | 5     |       |       |
| 1207   |       | 3.56            | 534.00        | 4     | 5     | 6     |
| 1208   |       | 3.56            | 523.00        | 6     |       |       |

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

## SYSTEM CONFIGURATION

| NUMBER | OF | PIPES(p)             | = | 6 |
|--------|----|----------------------|---|---|
| NUMBER | OF | JUNCTION NODES(j)    | = | 6 |
| NUMBER | OF | PRIMARY LOOPS(1)     | = | 0 |
| NUMBER | OF | FIXED GRADE NODES(f) | = | 1 |
| NUMBER | OF | SUPPLY ZONES (2)     | = | 1 |

### \*\*\*\*\*\*\*\*\*\* S I M U L A T I O N R E S U L T S \*\*\*\*\*\*\*\*\*\*

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

### PIPELINE RESULTS

| PIPE<br>NUMBER | NO)<br>#1 | DE NOS.<br>#2 | FLOWRATE      | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|---------------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 1203          | 21.37         | .21                 | .00                 | .00                  | .44                    | .9                  |
| 2              | 1203      | 1204          | 3 <i>.</i> 56 | . 52                | .00                 | .00                  | .48                    | 3.2                 |
| 3              | 1203      | 1205          | 14.25         | .05                 | .00                 | .00                  | .45                    | 1.2                 |
| 4              | 1205      | 1207          | 10.68         | 37.85               | .00                 | .00                  | 2.18                   | 67.8                |
| 5              | 1207      | 1206          | 3.56          | 1.95                | .00                 | .00                  | .73                    | 8.8                 |
| 6              | 1207      | 1208          | 3.56          | 1.26                | .00                 | .00                  | .73                    | 8.8                 |

### JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 1203               |                   | 3.56                        | 612.79                    | 598.00                       | 14.79                   | 145.08                      |
| 1204               |                   | 3.56                        | 612.28                    | 609.00                       | 3.28                    | 32.15                       |
| 1205               |                   | 3.57                        | 612.74                    | 596.00                       | 16.74                   | 164,20                      |
| 1206               |                   | 3.56                        | 572.94                    | 534.00                       | 38.94                   | 381.91                      |
| 1207               |                   | 3.56                        | 574.89                    | 534.00                       | 40.89                   | 401.04                      |
| 1208               |                   | 3.56                        | 573.63                    | 523.00                       | 50.63                   | 496.56                      |

## SUMMARY OF INFLOWS AND OUTFLOWS

- (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
- (-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |                            | PIPE<br>NUMBER |             | FLOWRATE<br>(1/s)     |
|-----|----------------------------|----------------|-------------|-----------------------|
|     |                            | 1              |             | 21.37                 |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | =<br>=<br>= | 21.37<br>.00<br>21.37 |

### DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

PIPELINE RESULTS

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FG           | 0         | 1203          | 6.41     | .02                 | .00                 | .00                  | .13                    | .1                  |
| 2              | 1203      | 1204          | 1.07     | .06                 | .00                 | .00                  | .14                    | .3                  |
| 3              | 1203      | 1205          | 4.27     | .01                 | .00                 | .00                  | .14                    | .1                  |
| 4              | 1205      | 1207          | 3.20     | 4.07                | .00                 | .00                  | .65                    | 7.3                 |
| 5              | 1207      | 1206          | 1.07     | .21                 | .00                 | .00                  | .22                    | .9                  |
| 6              | 1207      | 1208          | 1.07     | .14                 | .00                 | .00                  | .22                    | . 9                 |

# JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 1203               |                   | 1.07                        | 612.98                    | 598.00                       | 14.98                   | 146.88                      |
| 1204               |                   | 1.07                        | 612.92                    | 609.00                       | 3.92                    | 38.46                       |
| 1205               |                   | 1.07                        | 612.97                    | 596.00                       | 16.97                   | 166.44                      |
| 1206               |                   | 1.07                        | 608.69                    | 534.00                       | 74.69                   | 732.48                      |
| 1207               |                   | 1.07                        | 608.90                    | 534.00                       | 74.90                   | 734.54                      |
| 1208               |                   | 1.07                        | 608.77                    | 523.00                       | 85.77                   | 841.08                      |

## SUMMARY OF INFLOWS AND OUTFLOWS

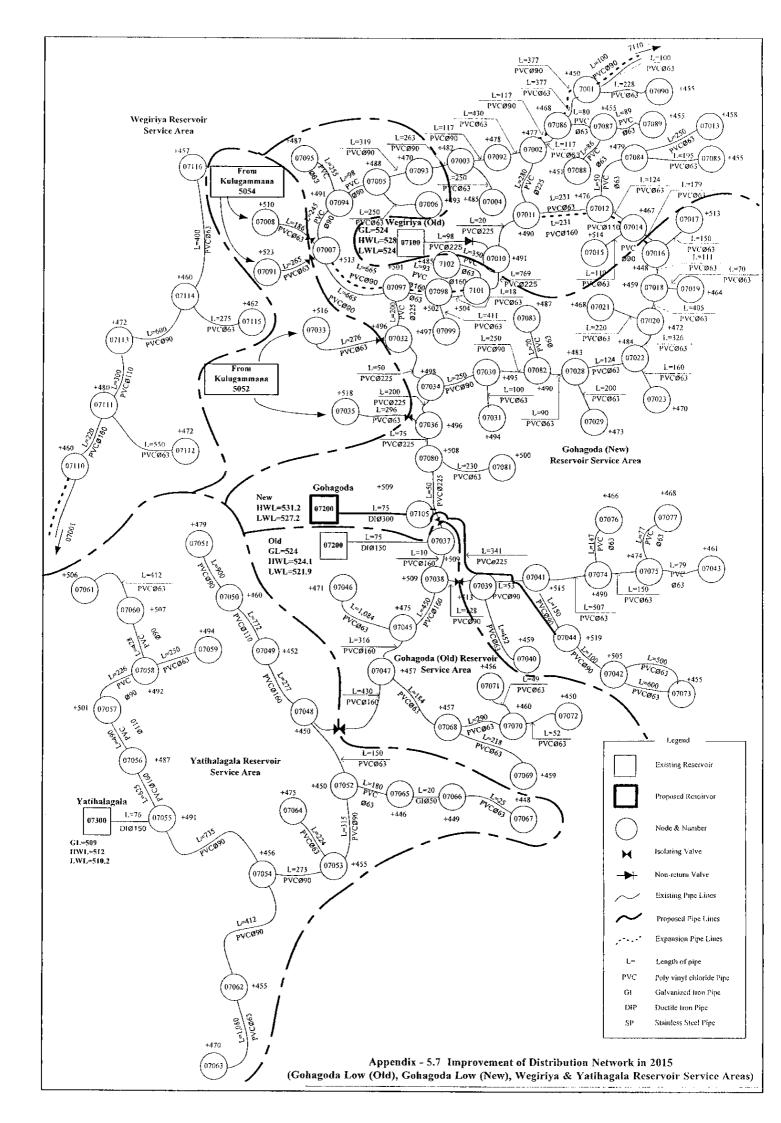
(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES

(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |        | PIPE<br>NUMBER |   | FLOWRATE<br>(1/s) |
|-----|--------|----------------|---|-------------------|
|     |        | 1              |   | 6.41              |
| NET | SYSTEM | INFLOW         | = | 6.41              |
| NET | SYSTEM | OUTFLOW        | = | .00               |
| NET | SYSTEM | DEMAND         | = | 6.41              |

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/ 7/2002 TIME: 14:20:22



DATE: 3/12/2002 TIME: 8:50:25

INPUT DATA FILENAME ----- C:\D\_nets\2015\GOHA2015.DAT TABULATED OUTPUT FILENAME ---- C:\D\_nets\2015\GOHA2015.OUT POSTPROCESSOR RESULTS FILENAME --- C:\D\_nets\2015\GOHA2015.RES

#### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) ..... = meters PRESSURE .... = kpa

### PIPELINE DATA

| NOD<br>#1 | E NOS.<br>#2  | LENGTH<br>(m)   | DIAMETER<br>(cm)   | ROUGHNESS<br>COEFF.   | MINOR LOSS<br>COEFF.  | FGN-H<br>(m)   |
|-----------|---|---|--|---|---|--|
| 0         | 7037  | 75.0  | 15.0   | 120.00  | .00   | 521.   |
| 7037      | 7038  | 10.0  | 14.0   | 120.00  |   |  |
| 7038      | 7045  | 450.0   | 14.0   | 120.00  | .00   |  |
| 7045      | 7047  | 316.0   | 14.0   | 120.00  | .00   |  |
| 7045      | 7046  | 1084.0  | 5.5  | 120.00  | .00   | •  |
| 7047      | 7068  | 184.0   | 5.5  | 120.00  | .00   |  |
| 7068      | 7069  | 218.0   | 5.5  | 120.00  | .00   |  |
| 7068      | 7070  | 290.0   | 5.5  | 120.00  | .00   |  |
| 7070      | 7072  | 52.0  | 5.5  | 120.00  | .00   |  |
| 7070      | 7071  | 49.0  | 5.5  | 120.00  | .00   |  |
| 7038      | 7039  | 128.0   | 7.9  | 120.00  | .00   |  |
| 7039      | 7041  | 53.0  | 7.9  | 120.00  | .00   |  |
| 7039      | 7040  | 452.0   | 5.5  | 120.00  | .00   |  |
|           | #1<br>0<br>7037<br>7038<br>7045<br>7045<br>7047<br>7068<br>7068<br>7070<br>7070<br>7038<br>7039 | 0 7037<br>7037 7038<br>7038 7045<br>7045 7047<br>7045 7046<br>7047 7068<br>7068 7069<br>7068 7070<br>7070 7072<br>7070 7071<br>7038 7039<br>7039 7041 | #1 #2 (m)  7037 75.0  7037 7038 10.0  7038 7045 450.0  7045 7047 316.0  7045 7046 1084.0  7047 7068 184.0  7068 7069 218.0  7068 7070 290.0  7070 7072 52.0  7070 7071 49.0  7038 7039 128.0  7039 7041 53.0 | #1 #2 (m) (cm)  0 7037 75.0 15.0  7037 7038 10.0 14.0  7038 7045 450.0 14.0  7045 7047 316.0 14.0  7045 7068 184.0 5.5  7068 7069 218.0 5.5  7068 7070 290.0 5.5  7070 7072 52.0 5.5  7070 7071 49.0 5.5  7038 7039 128.0 7.9  7039 7041 53.0 7.9 | #1 #2 (m) (cm) COEFF.  0 7037 75.0 15.0 120.00 7037 7038 10.0 14.0 120.00 7038 7045 450.0 14.0 120.00 7045 7047 316.0 14.0 120.00 7045 7046 1084.0 5.5 120.00 7047 7068 184.0 5.5 120.00 7068 7069 218.0 5.5 120.00 7068 7070 290.0 5.5 120.00 7070 7072 52.0 5.5 120.00 7070 7071 49.0 5.5 120.00 7038 7039 128.0 7.9 120.00 7039 7041 53.0 7.9 120.00 | #1 #2 (m) (cm) COEFF. COEFF.  0 7037 75.0 15.0 120.00 .00 7037 7038 10.0 14.0 120.00 .00 7038 7045 450.0 14.0 120.00 .00 7045 7047 316.0 14.0 120.00 .00 7045 7046 1084.0 5.5 120.00 .00 7047 7068 184.0 5.5 120.00 .00 7068 7069 218.0 5.5 120.00 .00 7068 7070 290.0 5.5 120.00 .00 7070 7072 52.0 5.5 120.00 .00 7070 7071 49.0 5.5 120.00 .00 7038 7039 128.0 7.9 120.00 .00 7039 7041 53.0 7.9 120.00 .00 |

| 14             | 7041 | 7074 | 507.0          | 5.5        | 120.00           | .00 |
|----------------|------|------|----------------|------------|------------------|-----|
| 15             | 7041 | 7044 | 150.0          | 7.9        | 120.00           | .00 |
| 16             | 7044 | 7042 | 100.0          | 7.9        | 120.00           | .00 |
| 17             | 7074 | 7076 | 147.0          | 5.5        | 120.00           | .00 |
| 18             | 7074 | 7075 | 150.0          | 5.5        | 120.00           | .00 |
| 19             | 7075 | 7043 | 79.0           | 5.5        | 120.00           | .00 |
| 20-XX          | 7037 | 7080 | 50.0           | 19.8       | 120.00           | .00 |
| 21             | 7081 | 7080 | 230.0          | 5.5        | 120.00           | .00 |
| 22             | 7036 | 7080 | 75.0           | 19.8       | 120.00           | .00 |
| 23-XX          | 7035 | 7036 | 296.0          | 5.5        | 120.00           | .00 |
| 24             | 7036 | 7034 | 200.0          | 19.8       | 120.00           | .00 |
| 25             | 7034 | 7034 | 250.0          | 7.9        | 120.00           | .00 |
| 26             | 7034 | 7030 | 50.0           | 19.8       | 120.00           | .00 |
| 27             | 7034 | 7032 | 100.0          | 5.5        | 120.00           | .00 |
| 28             | 7030 | 7082 | 250.0          | 7.9        | 120.00           | .00 |
| 29             | 7030 | 7082 | 70.0           | 5.5        | 120.00           | .00 |
| 30             | 7082 | 7028 | 90.0           | 5.5        | 120.00           | .00 |
| 31             | 7028 | 7028 | 200.0          | 5.5<br>5.5 | 120.00           | .00 |
| 32             | 7028 | 7023 | 124.0          | 5.5<br>5.5 |                  |     |
| 33             | 7028 |      |                |            | 120.00<br>120.00 | .00 |
|                | 7022 | 7023 | 160.0<br>326.0 | 5.5        |                  | .00 |
| 34             |      | 7020 |                | 5.5        | 120.00           | .00 |
| 35             | 7021 | 7020 | 220.0          | 5.5        | 120.00           | .00 |
| 36             | 7020 | 7018 | 405.0          | 5.5        | 120.00           | .00 |
| 37             | 7018 | 7019 | 70.0           | 5.5        | 120.00           | .00 |
| 38             | 7018 | 7016 | 111.0          | 5.5        | 120.00           | .00 |
| 39             | 7016 | 7017 | 150.0          | 5.5        | 120.00           | .00 |
| 40             | 7016 | 7014 | 179.0          | 5.5        | 120.00           | .00 |
| 41             | 7014 | 7015 | 110.0          | 5.5        | 120.00           | .00 |
| 42             | 7014 | 7012 | 124.0          | 5.5        | 120.00           | .00 |
| 43             | 7012 | 7011 | 231.0          | 5.5        | 120.00           | .00 |
| 44             | 7012 | 7084 | 50.0           | 5.5        | 120.00           | .00 |
| 45             | 7084 | 7013 | 250.0          | 5.5        | 120.00           | .00 |
| 46             | 7084 | 7085 | 195.0          | 5.5        | 120.00           | .00 |
| 47             | 7011 | 7010 | 20.0           | 19.8       | 120.00           | .00 |
| 48             | 7010 | 7101 | 769.0          | 19.8       | 120.00           | .00 |
| 49-FGCV        | 0    | 7010 | 98.0           | 19.8       | 120.00           | .00 |
| 50             | 7101 | 7102 | 350.0          | 5.5        | 120.00           | .00 |
| 51             | 7101 | 7098 | 18.0           | 5.5        | 120.00           | .00 |
| 52             | 7098 | 7099 | 411.0          | 5.5        | 120.00           | .00 |
| 53             | 7098 | 7097 | 93.0           | 5.5        | 120.00           | .00 |
| 54             | 7097 | 7032 | 200.0          | 19.8       | 120.00           | .00 |
| 55 <b>-</b> XX | 7032 | 7033 | 276.0          | 5.5        | 120.00           | .00 |
| 56             | 7097 | 7007 | 665.0          | 7.9        | 120.00           | .00 |
| 57             | 7007 | 7091 | 265.0          | 5.5        | 120.00           | .00 |
| 58             | 7007 | 7008 | 186.0          | 5.5        | 120.00           | .00 |
| 59             | 7007 | 7094 | 245.0          | 7.9        | 120.00           | .00 |
| 60             | 7094 | 7095 | 255.0          | 5.5        | 120.00           | .00 |
| 61             | 7094 | 7005 | 98.0           | 7.9        | 120.00           | .00 |
| 62             | 7005 | 7006 | 250.0          | 5.5        | 120.00           | .00 |
| 63             | 7005 | 7093 | 319.0          | 7.9        | 120.00           | .00 |
| 64             | 7093 | 7003 | 263.0          | 7.9        | 120.00           | .00 |
| 65             | 7003 | 7004 | 250.0          | 5.5        | 120.00           | .00 |
| 66             | 7003 | 7092 | 117.0          | 7.9        | 120.00           | .00 |
|                |      |      |                |            |                  |     |

526.

| 67             | 7092<br>7011 | 7002 | 430.0 |      | 700 00 |     |      |
|----------------|--------------|------|-------|------|--------|-----|------|
|                | 7011         |      | 400.0 | 5.5  | 120.00 | .00 |      |
| 68             | / U T T      | 7002 | 280.0 | 19.8 | 120.00 | .00 |      |
| 69             | 7002         | 7086 | 117.0 | 5.5  | 120.00 | .00 |      |
| 70             | 7086         | 7001 | 377.0 | 5.5  | 120.00 | .00 |      |
| 71             | 7086         | 7087 | 80.0  | 5.5  | 120.00 | .00 |      |
| 72             | 7087         | 7088 | 86.0  | 5.5  | 120.00 | .00 |      |
| 73             | 7087         | 7089 | 89.0  | 5.5  | 120.00 | .00 |      |
| 7 <del>4</del> | 7001         | 7090 | 228.0 | 5.5  | 120.00 | .00 |      |
| <b>7</b> 5     | 7001         | 7110 | 100.0 | 5.5  | 120.00 | .00 |      |
| 76             | 7110         | 7111 | 220.0 | 14.0 | 120.00 | .00 |      |
| 77             | 7112         | 7111 | 550.0 | 5.5  | 120.00 | .00 |      |
| 78             | 7111         | 7113 | 300.0 | 9.7  | 120.00 | .00 |      |
| 79             | 7113         | 7114 | 600.0 | 7.9  | 120.00 | .00 |      |
| 80             | 7114         | 7115 | 275.0 | 5.5  | 120.00 | .00 |      |
| 81             | 7114         | 7116 | 400.0 | 5.5  | 120.00 | .00 |      |
| 82             | 7075         | 7077 | 77.0  | 5.5  | 120.00 | .00 |      |
| 83-FG          | 0            | 7105 | 75.0  | 30.0 | 130.00 | .00 | 527. |
| 84             | 7105         | 7080 | 50.0  | 19.8 | 120.00 | .00 |      |
| 85             | 7012         | 7011 | 231.0 | 14.0 | 130.00 | .00 |      |
| 86             | 7101         | 7098 | 18.0  | 14.0 | 130.00 | .00 |      |
| 87             | 7098         | 7097 | 93.0  | 14.0 | 130.00 | .00 |      |
| 88             | 7002         | 7086 | 117.0 | 9.7  | 130.00 | .00 |      |
| 89             | 7086         | 7001 | 377.0 | 9.7  | 130.00 | .00 |      |
| 90             | 7001         | 7110 | 100.0 | 7.9  | 130.00 | .00 |      |
| 91             | 7012         | 7014 | 124.0 | 14.0 | 130.00 | .00 |      |
| 92             | 7014         | 7016 | 179.0 | 9.7  | 130.00 | .00 |      |
| 93             | 7097         | 7007 | 665.0 | 9.7  | 130.00 | .00 |      |
| 94             | 7105         | 7044 | 341.0 | 19.8 | 130.00 | .00 |      |
| 95             | 7042         | 7073 | 500.0 | 5.5  | 120.00 | .00 |      |
| 96             | 7042         | 7073 | 600.0 | 5.5  | 120.00 | .00 |      |
| 97             | 7034         | 7030 | 250.0 | 7.9  | 130.00 | .00 |      |
| 98             | 7030         | 7082 | 250.0 | 7.9  | 130.00 | .00 |      |
| 99-FGCV        | 0            | 7010 | 98.0  | 19.8 | 130.00 | .00 | 526. |

# JUNCTION NODE DATA

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | JUNCTION<br>ELEVATION<br>(m) | CONNI | ECTINO | ; PIPI | ES |    |  |
|--------------------|-------------------|-----------------------------|------------------------------|-------|--------|--------|----|----|--|
| 7001               |                   | 1.53                        | 450.00                       | 70    | 74     | 75     | 89 | 90 |  |
| 7002               |                   | .89                         | 477.00                       | 67    | 68     | 69     | 88 |    |  |
| 7003               |                   | .89                         | 482.00                       | 64    | 65     | 66     |    |    |  |
| 7004               |                   | 1.13                        | 485.00                       | 65    |        |        |    |    |  |
| 7005               |                   | .20                         | 488.00                       | 61    | 62     | 63     |    |    |  |
| 7006               |                   | .20                         | 493.00                       | 62    |        |        |    |    |  |
| 7007               |                   | .20                         | 513.00                       | 56    | 57     | 58     | 59 | 93 |  |
| 7008               |                   | .00                         | 510.00                       | 58    |        |        |    |    |  |
| 7010               |                   | .89                         | 491.00                       | 47    | 48     | 49     | 99 |    |  |
| 7011               |                   | .89                         | 490.00                       | 43    | 47     | 68     | 85 |    |  |

| 7012 | .71  | 476.00 | 42 | 43         | 44  | 85         | 91       |
|------|------|--------|----|------------|-----|------------|----------|
| 7013 | .89  | 458.00 | 45 |            |     |            |          |
| 7014 | .71  | 467.00 | 40 | 41         | 42  | 91         | 92       |
| 7015 | .71  | 514.00 | 41 |            |     |            |          |
| 7016 | .89  | 448.00 | 38 | 39         | 40  | 92         |          |
| 7017 | .89  | 513.00 | 39 |            | - • |            |          |
| 7018 | .15  | 459.00 | 36 | 37         | 38  |            |          |
| 7019 | .18  | 464.00 | 37 | J ,        | 30  |            |          |
| 7020 | .15  | 472.00 | 34 | 35         | 36  |            |          |
| 7021 | .15  | 468.00 | 35 | 22         | 20  |            |          |
| 7022 | .15  | 484.00 | 32 | 33         | 34  |            |          |
| 7023 | .15  | 470.00 | 33 | 55         | 24  |            |          |
| 7028 | .15  | 483.00 | 30 | 31         | 32  |            |          |
| 7029 | .15  |        |    | 31         | 32  |            |          |
| 7029 |      | 473.00 | 31 | 27         | 20  | 07         | 0.0      |
|      | .12  | 495.00 | 25 | 27         | 28  | 97         | 98       |
| 7031 | .18  | 494.00 | 27 | <b>-</b> 4 |     |            |          |
| 7032 | . 65 | 496.00 | 26 | 54         | 55  |            |          |
| 7033 | .00  | 516.00 | 55 |            | ~ ~ |            |          |
| 7034 | .18  | 498.00 | 24 | 25         | 26  | 97         |          |
| 7035 | .00  | 518.00 | 23 |            |     |            |          |
| 7036 | .18  | 496.00 | 22 | 23         | 24  |            |          |
| 7037 | .72  | 509.00 | 1  | 2          | 20  |            |          |
| 7038 | . 72 | 509.00 | 2  | 3          | 11  |            |          |
| 7039 | .10  | 513.00 | 11 | 12         | 13  |            |          |
| 7040 | .10  | 459.00 | 13 |            |     |            |          |
| 7041 | .10  | 515.00 | 12 | 14         | 15  |            |          |
| 7042 | .10  | 512.00 | 16 | 95         | 96  |            |          |
| 7043 | .10  | 461.00 | 19 |            |     |            |          |
| 7044 | .10  | 519.00 | 15 | 16         | 94  |            |          |
| 7045 | .72  | 475.00 | 3  | 4          | 5   |            |          |
| 7046 | 2.43 | 471.00 | 5  |            |     |            |          |
| 7047 | 1.17 | 457.00 | 4  | 6          |     |            |          |
| 7068 | 1.16 | 457.00 | 6  | 7          | 8   |            |          |
| 7069 | 1.17 | 459.00 | 7  |            |     |            |          |
| 7070 | 1.16 | 460.00 | 8  | 9          | 10  |            |          |
| 7071 | 1.17 | 456.00 | 10 |            |     |            |          |
| 7072 | 1.16 | 450.00 | 9  |            |     |            |          |
| 7073 | .10  | 455.00 | 95 | 96         |     |            |          |
| 7074 | .10  | 490.00 | 14 | 17         | 18  |            |          |
| 7075 | .10  | 474.00 | 18 | 19         | 82  |            |          |
| 7076 | .10  | 466.00 | 17 |            | 01  |            |          |
| 7077 | .10  | 468.00 | 82 |            |     |            |          |
| 7080 | .10  | 508.00 | 20 | 21         | 22  | 84         |          |
| 7081 | .10  | 500.00 | 21 | 24 1.      | 24  | 04         |          |
| 7082 | .10  |        |    | 20         | 20  | 98         |          |
| 7083 |      | 490.00 | 28 | 29         | 30  | 90         |          |
|      | .10  | 487.00 | 29 | 4 15       | 1.0 |            |          |
| 7084 | .71  | 479.00 | 44 | 45         | 46  |            |          |
| 7085 | .89  | 455.00 | 46 |            |     | <b>-</b> - | <u> </u> |
| 7086 | .89  | 468.00 | 69 | 70         | 71  | 88         | 89       |
| 7087 | .89  | 455.00 | 71 | 72         | 73  |            |          |
| 7088 | 1.60 | 451.00 | 72 |            |     |            |          |
| 7089 | 1.60 | 455.00 | 73 |            |     |            |          |
| 7090 | 1.60 | 455.00 | 74 |            |     |            |          |
|      |      |        |    |            |     |            |          |

| .00  | 523.00  | 57  |  |  |  |  |
|------|---|-----|--|--|--|--|
| .92  | 478.00  | 66  | 67   |  |  |  |
| .13  | 470.00  | 63  | 64   |  |  |  |
| .13  | 491.00  | 59  | 60   | 61   |  |  |
| .13  | 487.00  | 60  |  |  |  |  |
| .13  | 501.00  | 53  | 54   | 56   | 87   | 93   |
| 1.03 | 502.00  | 51  | 52   | 53   | 86   | 87   |
| .13  | 497.00  | 52  |  |  |  |  |
| 1.03 | 504.00  | 48  | 50   | 51   | 86   |  |
| .13  | 485.00  | 50  |  |  |  |  |
| .00  | 509.00  | 83  | 84   | 94   |  |  |
| 1.60 | 460.00  | 75  | 76   | 90   |  |  |
| 1.60 | 480.00  | 76  | 77   | 78   |  |  |
| 1.60 | 472.00  | 77  |  |  |  |  |
| 1.60 | 472.00  | 78  | 79   |  |  |  |
| 1.60 | 460.00  | 79  | 80   | 81   |  |  |
| 1.60 | 462.00  | 80  |  |  |  |  |
| 1.60 | 457.00  | 81  |  |  |  |  |
|      | .13<br>.13<br>.13<br>.13<br>1.03<br>.13<br>1.03<br>.13<br>.00<br>1.60<br>1.60<br>1.60<br>1.60 | .92 | .92       478.00       66         .13       470.00       63         .13       491.00       59         .13       487.00       60         .13       501.00       53         1.03       502.00       51         .13       497.00       52         1.03       504.00       48         .13       485.00       50         .00       509.00       83         1.60       460.00       75         1.60       472.00       77         1.60       472.00       78         1.60       460.00       79         1.60       462.00       80 | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ |

### OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

## SYSTEM CONFIGURATION

| NUMBER OF | PIPES(p)             | = | 99 |
|-----------|----------------------|---|----|
| NUMBER OF | JUNCTION NODES(j)    | = | 81 |
| NUMBER OF | PRIMARY LOOPS(1)     | = | 15 |
| NUMBER OF | FIXED GRADE NODES(f) | = | 4  |
| NUMBER OF | SUPPLY ZONES(z)      | = | 1  |

\*\*\* WARNING - A PORTION OF THE SYSTEM IS DISCONNECTED BY CLOSED LINES FROM A

\*\*\*\* A FIX WILL BE ATTEMPTED

\*\*\* WARNING - THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO: 7033 7035

PIPE NO. 23 HAS BEEN OPENED TO REMOVE DISCONNECTION

\*\*\* WARNING - A PORTION OF THE SYSTEM IS DISCONNECTED BY CLOSED LINES FROM A \*\*\*\* A FIX WILL BE ATTEMPTED

\*\*\* WARNING - THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO: 7033

PIPE NO. 55 HAS BEEN OPENED TO REMOVE DISCONNECTION

THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00495

### PIPELINE RESULTS

| PIPE<br>NUMBER | NOI<br>#1 | DE <b>N</b> OS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) |     |       | 1000  |
|----------------|-----------|-----------------------|----------|---------------------|---------------------|-----|-------|-------|
| 1-FG           | 0         | 7037                  | 11.58    | .30                 | .00                 | .00 | .66   | 4.0   |
| 2              | 7037      | 7038                  | 10.86    | .05                 | .00                 | .00 | .71   | 5.0   |
| 3              | 7038      | 7045                  | 10.14    | 1.98                | .00                 | .00 | .66   | 4.4   |
| 4              | 7045      | 7047                  | 6.99     | .70                 | .00                 | .00 | .45   | 2.2   |
| 5              | 7045      | 7046                  | 2.43     | 32.06               | .00                 | .00 | 1.02  | 29.5  |
| 6              | 7047      | 7068                  | 5.82     | 27.43               | .00                 | .00 | 2.45  | 149.0 |
| 7              | 7068      | 7069                  | 1.17     | 1.67                | .00                 | .00 | .49   | 7.6   |
| 8              | 7068      | 7070                  |          | 16.77               | .00                 | .00 | 1.47  | 57.8  |
| 9              | 7070      | 7072                  |          | .39                 |                     | .00 | .49   | 7.5   |
| 10             | 7070      | 7071                  | 1.17     | .37                 | .00                 | .00 | .49   | 7.6   |
| 11-XX          | 7038      | 7039                  |          |                     |                     |     |       |       |
| 12             | 7039      | 7041                  | 20       |                     |                     |     | .04   | .0    |
| 13             | 7039      | 7040                  | .10      | .04                 | .00                 | .00 | .04   | . 0   |
| 14             | 7041      | 7074                  | .50      | .80                 |                     | .00 | .21   | 1.5   |
| 15             | 7041      | 7044                  | 80       | .10                 | .00                 |     | .16   | .6    |
| 16             | 7044      | 7042                  | .20      | .00                 | .00                 | .00 | .04   | . 0   |
| 17             | 7074      | 7076                  | .10      | .01                 |                     | .00 | .04   | . 0   |
| 18             | 7074      | 7075                  | .30      |                     |                     | .00 | .13   | .6    |
| 19             | 7075      | 7043                  | .10      | .01                 | .00                 | .00 | .04   | . 0   |
| 20-XX          | 7037      | 7080                  |          |                     |                     |     |       |       |
| 21             | 7081      | 7080                  | 10       |                     |                     | .00 | .04   | .0    |
| 22             | 7036      | 7080                  | -14.15   | .11                 | .00                 | .00 | .46   | 1.5   |
| 23-XX          | 7035      | 7036                  | .00      | .00                 | .00                 | .00 | .00   | . 0   |
| 24             | 7036      | 7034                  | 13.97    | .29                 | .00                 | .00 | .45   | 1.4   |
| 25             | 7034      | 7030                  | .72      | .13                 | .00                 | .00 | . 1.5 | .5    |
| 26             | 7034      | 7032                  | 12.29    | .06                 |                     | .00 | .40   | 1.1   |
| 27             | 7030      | 7031                  | .18      |                     |                     | .00 | .08   | .2    |
| 28             | 7030      | 7082                  | .57      | .09                 | .00                 | .00 | .12   | .3    |

| 20       | 7000 | 7002 | 1 ^    | 0.1   | ^^  | 0.0 | 0.4  | ^    |
|----------|------|------|--------|-------|-----|-----|------|------|
| 29       | 7082 | 7083 | .10    | .01   | .00 | .00 | .04  | .0   |
| 30       | 7082 | 7028 | 1.00   | .51   | .00 | .00 | .42  | 5.6  |
| 31       | 7028 | 7029 | .15    | .03   | .00 | .00 | .06  | .1   |
| 32       | 7028 | 7022 | .70    | .36   | .00 | .00 | .29  | 2.9  |
| 33       | 7022 | 7023 | .15    | .03   | .00 | .00 | .06  | .1   |
| 34       | 7022 | 7020 | .40    | .33   | .00 | .00 | .17  | 1.0  |
| 35       | 7021 | 7020 | 15     | .04   | .00 | .00 | .06  | .1   |
| 36       | 7020 | 7018 | .10    | .03   | .00 | .00 | .04  | .0   |
| 37       | 7018 | 7019 | .18    | .02   | .00 | .00 | .08  | . 2  |
| 38       | 7018 | 7016 | 23     | .04   | .00 | .00 | .10  | .3   |
| 39       | 7016 | 7017 | .89    |       |     |     | .37  |      |
|          |      |      |        | .69   | .00 | .00 |      | 4.6  |
| 40       | 7016 | 7014 | 54     | .32   | .00 | .00 | .23  | 1.8  |
| 41       | 7014 | 7015 | .71    | .33   | .00 | .00 | .30  | 3.0  |
| 42       | 7014 | 7012 | 26     | .06   | .00 | .00 | .11  | . 4  |
| 43       | 7012 | 7011 | 51     | .38   | .00 | .00 | .21  | 1.6  |
| 44       | 7012 | 7084 | 2.49   | 1.55  | .00 | .00 | 1.05 | 30.9 |
| 45       | 7084 | 7013 | .89    | 1.15  | .00 | .00 | .37  | 4.6  |
| 46       | 7084 | 7085 | .89    | .90   | .00 | .00 | .37  | 4.6  |
| 47       | 7011 | 7010 | -28.82 | .11   | .00 | .00 | .94  | 5.6  |
| 48       | 7010 | 7101 | -6.36  | .26   | .00 | .00 | .21  | . 3  |
| 49-FGCV  |      | 7010 | 11.21  | .10   | .00 | .00 | .36  | .9   |
| 50       | 7101 | 7102 | .13    | .05   | .00 | .00 | .05  | .1   |
| 51       | 7101 | 7098 | 55     | .03   | .00 | .00 | .23  | 1.9  |
| 52       | 7098 | 7099 | .13    |       |     |     |      |      |
|          |      |      |        | .05   | .00 | .00 | .05  | .1   |
| 53       | 7098 | 7097 | 64     | .23   | .00 | .00 | .27  | 2.4  |
| 54       | 7097 | 7032 | -11.64 | .21   | .00 | .00 | .38  | 1.0  |
| 55-XX    | 7032 | 7033 | .00    | .00   | .00 | .00 | .00  | .0   |
| 56       | 7097 | 7007 | .99    | .64   | .00 | .00 | .20  | . 9  |
| 57       | 7007 | 7091 | .00    | .00   | .00 | .00 | .00  | . 0  |
| 58       | 7007 | 7008 | .00    | .00   | .00 | .00 | .00  | .0   |
| 59       | 7007 | 7094 | 2.63   | 1.44  | .00 | .00 | .54  | 5.8  |
| 60       | 7094 | 7095 | .13    | .03   | .00 | .00 | .05  | .1   |
| 61       | 7094 | 7005 | 2.37   | .48   | .00 | .00 | .48  | 4.8  |
| 62       | 7005 | 7006 | .20    | .07   | .00 | .00 | .08  | .2   |
| 63       | 7005 | 7093 | 1.97   | 1.10  | .00 | .00 | .40  | 3.4  |
| 64       | 7093 | 7003 | 1.84   | .80   | .00 | .00 | .38  | 3.0  |
| 65       | 7003 | 7003 | 1.13   | 1.79  |     |     | .48  | 7.1  |
|          |      | 7092 |        |       | .00 | .00 |      |      |
| 66<br>67 | 7003 |      | 18     | .00   | .00 | .00 | .04  | .0   |
| 67       | 7092 | 7002 | -1.10  | 2.91  | .00 | .00 | .46  | 6.7  |
| 68       | 7011 | 7002 | 21.30  | .90   | .00 | .00 | .69  | 3.2  |
| 69       | 7002 | 7086 | 3.32   | 6.17  | .00 | .00 | 1.40 | 52.7 |
| 70       | 7086 | 7001 | 2.46   | 11.44 | .00 | .00 | 1.04 | 30.3 |
| 71       | 7086 | 7087 | 4.09   | 6.21  | .00 | .00 | 1.72 | 77.5 |
| 72       | 7087 | 7088 | 1.60   | 1.17  | .00 | .00 | .67  | 13.6 |
| 73       | 7087 | 7089 | 1.60   | 1.21  | .00 | .00 | .67  | 13.6 |
| 74       | 7001 | 7090 | 1.60   | 3.11  | .00 | .00 | .67  | 13.6 |
| 75       | 7001 | 7110 | 2.94   | 4.21  | .00 | .00 | 1.24 | 42.1 |
| 76       | 7110 | 7111 | 9.60   | .88   | .00 | .00 | .62  | 3.9  |
| 77       | 7112 | 7111 | -1.60  | 7.50  | .00 | .00 | .67  | 13.6 |
| 78       | 7111 | 7113 | 6.40   | 3.36  | .00 | .00 | .87  | 11.2 |
|          |      |      |        |       |     |     |      |      |
| 79       | 7113 | 7114 | 4.80   | 10.73 | .00 | .00 | .98  | 17.8 |
| 80       | 7114 | 7115 | 1.60   | 3.75  | .00 | .00 | .67  | 13.6 |
| 81       | 7114 | 7116 | 1.60   | 5.46  | .00 | .00 | .67  | 13.6 |
|          |      |      |        |       |     |     |      |      |

| 82      | 7075 | 7077 | .10   | .01   | .00 | .00 | .04  | .0   |
|---------|------|------|-------|-------|-----|-----|------|------|
| 83-FG   | 0    | 7105 | 15.44 | .02   | .00 | .00 | .22  | . 2  |
| 84      | 7105 | 7080 | 14.35 | .08   | .00 | .00 | .47  | 1.5  |
| 85      | 7012 | 7011 | -6.13 | .34   | .00 | .00 | .40  | 1.4  |
| 86      | 7101 | 7098 | -6.96 | .03   | .00 | .00 | .45  | 1.8  |
| 87      | 7098 | 7097 | -8.04 | .23   | .00 | .00 | .52  | 2.4  |
| 88      | 7002 | 7086 | 15.99 | 6.17  | .00 | .00 | 2.16 | 52.7 |
| 89      | 7086 | 7001 | 11.87 | 11.44 | .00 | .00 | 1.61 | 30.3 |
| 90      | 7001 | 7110 | 8.26  | 4.21  | .00 | .00 | 1.68 | 42.1 |
| 91      | 7012 | 7014 | 3.18  | .05   | .00 | .00 | .21  | .4   |
| 92      | 7014 | 7016 | 1.48  | .11   | .00 | .00 | .20  | .6   |
| 93      | 7097 | 7007 | 1.84  | .64   | .00 | .00 | .25  | . 9  |
| 94      | 7105 | 7044 | 1.10  | .00   | .00 | .00 | .04  | . 0  |
| 95      | 7042 | 7073 | .05   | .01   | .00 | .00 | .02  | .0   |
| 96      | 7042 | 7073 | .05   | .01   | .00 | .00 | .02  | .0   |
| 97      | 7034 | 7030 | .78   | .13   | .00 | .00 | .16  | .5   |
| 98      | 7030 | 7082 | .62   | .09   | .00 | .00 | .13  | .3   |
| 99-FGCV | 0    | 7010 | 12.14 | .10   | .00 | .00 | .39  | . 9  |

# JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s) | HYDRAULIC<br>GRADE<br>(m) | JUNCTION<br>ELEVATION<br>(m) | PRESSURE<br>HEAD<br>(m) | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------------|-------------------|-----------------------------|---------------------------|------------------------------|-------------------------|-----------------------------|
| 7001               |                   | 1.53                        | 507.29                    | 450.00                       | 57.29                   | 561.78                      |
| 7002               |                   | .89                         | 524.89                    | 477.00                       | 47.89                   |                             |
| 7003               |                   | .89                         | 521.97                    | 482.00                       | 39.97                   | 392.01                      |
| 7004               |                   | 1.13                        | 520.18                    | 485.00                       | 35.18                   | 345.02                      |
| 7005               |                   | .20                         | 523.87                    | 488.00                       | 35.87                   |                             |
| 7006               |                   | .20                         | 523.80                    | 493.00                       | 30.80                   | 302.05                      |
| 7007               |                   | .20                         | 525.79                    | 513.00                       | 12.79                   | 125.44                      |
| 7008               |                   | .00                         | 525.79                    | 510.00                       | 15.79                   | 154.86                      |
| 7010               |                   | .89                         | 525.90                    | 491.00                       | 34.90                   | 342.29                      |
| 7011               |                   | .89                         | 525.79                    | 490.00                       | 35.79                   | 350.99                      |
| 7012               |                   | .71                         | 525.41                    | 476.00                       | 49.41                   | 484.59                      |
| 7013               |                   | .89                         | 522.72                    | 458.00                       | 64.72                   | 634.65                      |
| 7014               |                   | .71                         | 525.36                    | 467.00                       | 58.36                   | 572.29                      |
| 7015               |                   | .71                         | 525.02                    | 514.00                       | 11.02                   | 108.11                      |
| 7016               |                   | .89                         | 525.04                    | 448.00                       | 77.04                   | 755.46                      |
| 7017               |                   | .89                         | 524.34                    | 513.00                       | 11.34                   | 111.25                      |
| 7018               |                   | .15                         | 524.99                    | 459.00                       | 65.99                   | 647.16                      |
| 7019               |                   | .18                         | 524.98                    | 464.00                       | 60.98                   | 597.97                      |
| 7020               |                   | .15                         | 525.02                    | 472.00                       | 53.02                   | 519.97                      |
| 7021               |                   | .15                         | 524.98                    | 468.00                       | 56.98                   | 558.83                      |
| 7022               |                   | .15                         | 525.61                    | 484.00                       | 41.61                   | 408.03                      |
| 7023               |                   | .15                         | 525.58                    | 470.00                       | 55.58                   | 545.06                      |
| 7028               |                   | .15                         | 525.97                    | 483.00                       | 42.97                   | 421.39                      |
| 7029               |                   | .15                         | 525.94                    | 473.00                       | 52.94                   | 519.12                      |
| 7030               |                   | .12                         | 526.57                    | 495.00                       | 31.57                   | 309.57                      |
| 7031               |                   | .18                         | 526.54                    | 494.00                       | 32.54                   | 319.14                      |

| 7032 | .65  | 526.64 | 496.00 | 30.64         | 300.49          |
|------|------|--------|--------|---------------|-----------------|
| 7033 | .00  | 526.64 | 516.00 | 10.64         | 104.36          |
| 7034 | .18  | 526.70 | 498.00 | 28.70         | 281.45          |
| 7035 | .00  | 526.99 | 518.00 | 8.99          | 88.20           |
| 7036 | .18  | 526.99 | 496.00 | 30.99         | 303.95          |
| 7037 | .72  | 521.60 | 509.00 | 12.60         | 123.55          |
| 7038 | .72  | 521.55 | 509.00 | 12.55         | 123.06          |
| 7039 | .10  | 527.08 | 513.00 | 14.08         | 138.09          |
| 7040 | .10  | 527.08 | 459.00 | 68.04         | 667.29          |
| 7041 | .10  | 527.04 | 515.00 | 12.08         | 118.50          |
| 7042 |      | 527.18 | 513.00 | 15.18         | 148.83          |
| 7043 | .10  |        |        |               |                 |
| 7044 | .10  | 526.18 | 461.00 | 65.18<br>8.18 | 639.23<br>80.23 |
|      | .10  | 527.18 | 519.00 |               |                 |
| 7045 | .72  | 519.57 |        | 44.57         | 437.05          |
| 7046 | 2.43 | 487.51 | 471.00 | 16.51         | 161.89          |
| 7047 | 1.17 | 518.87 |        | 61.87         | 606.72          |
| 7068 | 1.16 | 491.44 | 457.00 | 34.44         | 337.72          |
| 7069 | 1.17 | 489.77 | 459.00 | 30.77         | 301.77          |
| 7070 | 1.16 | 474.67 | 460.00 | 14.67         | 143.86          |
| 7071 | 1.17 | 474.30 | 456.00 | 18.30         | 179.42          |
| 7072 | 1.16 | 474.28 | 450.00 | 24.28         | 238.09          |
| 7073 | .10  | 527.16 | 455.00 | 72.16         | 707.69          |
| 7074 | .10  | 526.28 | 490.00 | 36.28         | 355.80          |
| 7075 | .10  | 526.19 | 474.00 | 52.19         | 511.81          |
| 7076 | .10  | 526.27 | 466.00 | 60.27         | 591.05          |
| 7077 | .10  | 526.18 | 468.00 | 58.18         | 570.59          |
| 7080 | .10  | 527.11 | 508.00 | 19.11         | 187.38          |
| 7081 | .10  | 527.09 | 500.00 | 27.09         | 265.65          |
| 7082 | .10  | 526.48 | 490.00 | 36.48         | 357.74          |
| 7083 | .10  | 526.47 | 487.00 | 39.47         | 387.11          |
| 7084 | .71  | 523.87 | 479.00 | 44.87         | 440.00          |
| 7085 | .89  | 522.97 | 455.00 | 67.97         | 666.56          |
| 7086 | .89  | 518.72 | 468.00 | 50.72         | 497.42          |
| 7087 | .89  | 512.52 | 455.00 | 57.52         | 564.06          |
| 7088 | 1.60 | 511.34 | 451.00 | 60.34         | 591.78          |
| 7089 | 1.60 | 511.30 | 455.00 | 56.30         | 552.15          |
| 7090 | 1.60 | 504.18 | 455.00 | 49.18         | 482.25          |
| 7091 | .00  | 525.79 | 523.00 | 2.79          | 27.37           |
| 7092 | .92  | 521.98 | 478.00 | 43.98         | 431.28          |
| 7093 | .13  | 522.77 | 470.00 | 52.77         | 517.53          |
| 7094 | .13  | 524.35 | 491.00 | 33.35         | 327.04          |
| 7095 | .13  | 524.32 | 487.00 | 37.32         | 365.95          |
| 7097 | .13  | 526.43 | 501.00 | 25.43         | 249.40          |
| 7098 | 1.03 | 526.20 | 502.00 | 24.20         | 237.34          |
| 7099 | .13  | 526.15 | 497.00 | 29.15         | 285.85          |
| 7101 | 1.03 | 526.17 | 504.00 | 22.17         | 217.39          |
| 7102 | .13  | 526.12 | 485.00 | 41.12         | 403.27          |
| 7105 | .00  | 527.18 | 509.00 | 18.18         | 178.33          |
| 7110 | 1.60 | 503.07 | 460.00 | 43.07         | 422.39          |
| 7111 | 1.60 | 502.20 | 480.00 | 22.20         | 217.67          |
| 7112 | 1.60 | 494.69 | 472.00 | 22.69         | 222.56          |
| 7113 | 1.60 | 498.83 | 472.00 | 26.83         | 263.13          |
| 7114 | 1.60 | 488.10 | 460.00 | 28.10         | 275.56          |
|      |      |        |        |               |                 |

 7115
 1.60
 484.35
 462.00
 22.35
 219.17

 7116
 1.60
 482.64
 457.00
 25.64
 251.48

## SUMMARY OF INFLOWS AND OUTFLOWS

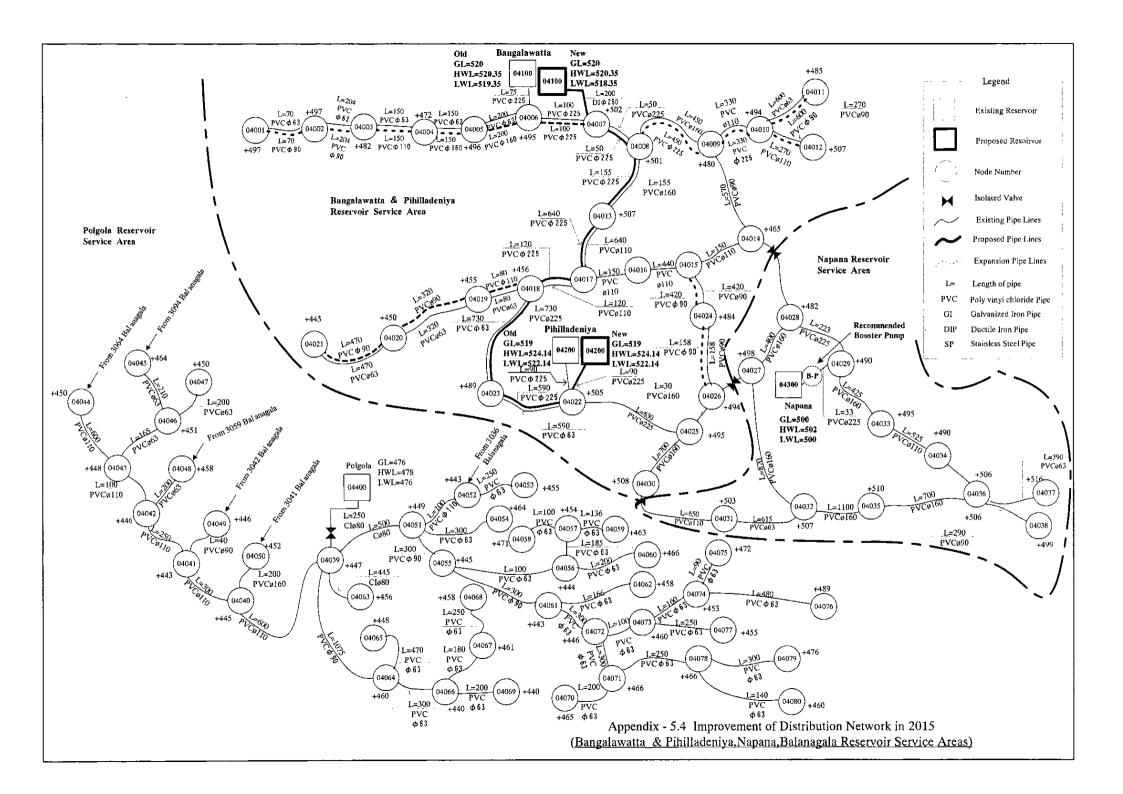
(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES

(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|     |        | PIPE<br>NUMBER |    | FLOWRATE<br>(1/s) |
|-----|--------|----------------|----|-------------------|
|     |        | 1              |    | 11.58             |
|     |        | 49             |    | 11.21             |
|     |        | 83             |    | 15.44             |
|     |        | 99             |    | 12.14             |
| NET | SYSTEM | INFLOW         | =  | 50.38             |
| NET | SYSTEM | OUTFLOW        | == | .00               |
| NET | SYSTEM | DEMAND         | =  | 50.38             |

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/12/2002 TIME: 8:50:25



DATE: 3/12/2002 TIME: 8:47:44

INPUT DATA FILENAME ------ c:\D\_nets\2015\B&P2015.DAT TABULATED OUTPUT FILENAME ---- c:\D\_nets\2015\B&P2015.OUT POSTPROCESSOR RESULTS FILENAME --- c:\D\_nets\2015\B&P2015.RES

#### UNITS SPECIFIED

FLOWRATE ..... = liters/second

HEAD (HGL) .... = meters
PRESSURE ... = kpa

### PIPELINE DATA

| PIPE<br>NUMBER | NOD<br>#1 | E NOS.<br>#2 | LENGTH (m) | DIAMETER (cm) | ROUGHNESS<br>COEFF. | MINOR LOSS<br>COEFF. | FGN-H<br>(m) |
|----------------|-----------|--------------|------------|---------------|---------------------|----------------------|--------------|
| 1-FGCV         | 0         | 4006         | 75.0       | 19.8          | 120.00              | .00                  | 519.         |
| 2              | 4006      | 4005         | 200.0      | 5.5           | 120.00              | .00                  |              |
| 3              | 4006      | 4007         | 100.0      | 19.8          | 120.00              | .00                  |              |
| 4              | 4005      | 4004         | 150.0      | 5.5           | 120.00              | .00                  |              |
| 5              | 4004      | 4003         | 150.0      | 5.5           | 120.00              | .00                  |              |
| 6              | 4003      | 4002         | 204.0      | 5.5           | 120.00              | .00                  |              |
| 7              | 4002      | 4001         | 70.0       | 5.5           | 120.00              | .00                  |              |
| 8              | 4007      | 4008         | 50.0       | 19.8          | 120.00              | .00                  |              |
| 9              | 4008      | 4013         | 155.0      | 14.0          | 120.00              | .00                  |              |
| 10             | 4008      | 4009         | 450.0      | 14.0          | 120.00              | .00                  |              |
| 11             | 4009      | 4010         | 330.0      | 9.7           | 120.00              | .00                  |              |
| 12             | 4009      | 4014         | 570.0      | 7.9           | 120.00              | .00                  |              |
| 13             | 4010      | 4011         | 600.0      | 5.5           | 120.00              | .00                  |              |

| 14      | 4010 | 4012 | 270.0  | 7.9  | 120.00 | .00 |      |
|---------|------|------|--------|------|--------|-----|------|
| 15      | 4014 | 4015 | 150.0  |      |        | .00 |      |
| 16      | 4015 | 4016 |        | 9.7  | 120.00 | .00 |      |
| 17      | 4015 | 4024 | 420.0  |      | 120.00 | .00 |      |
| 18      | 4016 | 4017 | 150.0  | 9.7  | 120.00 | .00 |      |
| 19      | 4017 | 4013 |        | 9.7  | 120.00 | .00 |      |
| 20      | 4017 | 4018 | 120.0  |      | 120.00 | .00 |      |
| 21      | 4018 | 4019 | 80.0   |      | 120.00 | .00 |      |
| 22      | 4018 | 4023 |        | 5.5  | 120.00 | .00 |      |
| 23      | 4019 | 4020 |        | 5.5  | 120.00 | .00 |      |
| 24      | 4020 | 4021 |        | 5.5  | 120.00 | .00 |      |
| 25      | 4022 | 4023 | 590.0  |      | 120.00 | .00 |      |
| 26      | 4022 | 4025 | 640.0  |      | 120.00 | .00 |      |
| 27-FG   | 0    | 4022 | 90.0   | 19.8 |        | .00 | 522. |
| 28      | 4024 | 4026 |        | 7.9  |        | .00 |      |
| 29      | 4025 | 4026 | 30.0   |      | 120.00 | .00 |      |
| 30      | 4025 | 4030 | 700.0  | 14.0 |        | .00 |      |
| 31-XX   | 4030 | 4031 |        | 9.7  |        | .00 |      |
| 32      | 4031 | 4032 | 615.0  |      | 120.00 | .00 |      |
| 33      | 4032 | 4035 | 1100.0 |      | 120.00 | .00 |      |
| 34      | 4035 | 4036 | 700.0  | 14.0 | 120.00 | .00 |      |
| 35      | 4036 | 4037 |        | 5.5  |        | .00 |      |
| 36      | 4036 | 4038 |        | 7.9  |        | _00 |      |
| 37-FGCV | 0    | 4007 | 200.0  | 25.0 | 130.00 | .00 | 518. |
| 38      | 4018 | 4019 |        | 9.7  | 130.00 | .00 | 0_0  |
| 39      | 4007 | 4008 | 50.0   | 25.0 | 130.00 | .00 |      |
| 40      | 4008 | 4013 | 155.0  | 19.8 | 130.00 | .00 |      |
| 41      | 4013 | 4017 | 640.0  | 19.8 | 130.00 | .00 |      |
| 42      | 4017 | 4018 | 120.0  | 19.8 | 130.00 | .00 |      |
| 43-FG   | 0    | 4022 | 90.0   | 19.8 | 130.00 | .00 | 522. |
| 44      | 4022 | 4023 | 590.0  | 19.8 | 130.00 | .00 |      |
| 45      | 4023 | 4018 | 730.0  | 19.8 | 130.00 | .00 |      |
| 46      | 4008 | 4009 | 450.0  | 19.8 | 130.00 | .00 |      |
| 47      | 4009 | 4010 | 330.0  | 14.0 | 130.00 | .00 |      |
| 48      | 4010 | 4012 | 270.0  | 9.7  | 130.00 | .00 |      |
| 49-XX   | 4015 | 4024 | 420.0  | 7.9  | 130.00 | .00 |      |
| 50-XX   | 4024 | 4026 | 158.0  | 7.9  | 130.00 | .00 |      |
| 51      | 4031 | 4032 | 615.0  | 7.9  | 130.00 | .00 |      |
| 52      | 4006 | 4005 | 200.0  | 14.0 | 130.00 | .00 |      |
| 53      | 4005 | 4004 | 150.0  | 14.0 | 130.00 | .00 |      |
| 54      | 4004 | 4003 | 150.0  | 9.7  | 130.00 | .00 |      |
| 55      | 4003 | 4002 | 204.0  | 7.9  | 130.00 | .00 |      |
| 56      | 4002 | 4001 | 70.0   | 7.9  | 130.00 | .00 |      |
| 57      | 4010 | 4011 | 600.0  | 9.7  | 130.00 | .00 |      |
| 58      | 4019 | 4020 | 320.0  | 7.9  | 130.00 | .00 |      |
| 59      | 4020 | 4021 | 470.0  | 7.9  | 130.00 | .00 |      |
| 60      | 4006 | 4007 | 100.0  | 19.8 | 130.00 | .00 |      |
| 61-FG   | 0    | 4029 | 25.0   | 19.8 | 120.00 | .00 | 540. |
| 62-XXFG | 0    | 4029 | 33.0   | 19.8 | 120.00 | .00 | 500. |
| 63      | 4029 | 4028 | 223.0  | 19.8 | 120.00 | .00 |      |
| 64      | 4029 | 4033 | 425.0  | 19.8 | 120.00 | .00 |      |
| 65      | 4028 | 4027 | 400.0  | 14.0 | 120.00 | .00 |      |
| 66      | 4033 | 4034 | 525.0  | 9.7  | 120.00 | .00 |      |
|         |      |      |        |      |        |     |      |

JOB NAME = GKWSAP - JICA - Bangalawatta SR & Pihilladeniya SR

| 67-XX    | 4014 | 4028 | 300.0   | 9.7  | 120.00 | .00 |
|----------|------|------|---------|------|--------|-----|
| <b>.</b> |      |      | 7.7.7.7 |      |        |     |
| 68-XX    | 4026 | 4027 | 100.0   | 9.7  | 120.00 | .00 |
| 69       | 4027 | 4032 | 870.0   | 14.0 | 120.00 | .00 |
| 70       | 4034 | 4036 | 490.0   | 5.5  | 120.00 | .00 |

## JUNCTION NODE DATA

| NUMBER | JUNCTION<br>TITLE | DEMAND<br>(1/s) | JUNCTION ELEVATION CONN (m) |    | ECTING | PIPE | IS   |     |
|--------|-------------------|-----------------|-----------------------------|----|--------|------|------|-----|
| 4001   |                   | .79             | 497.00                      | 7  | 56     |      |      |     |
| 4002   |                   | 1.84            | 497.00                      | 6  |        | 55   | 56   |     |
| 4003   |                   | 1.64            | 482.00                      | 5  | 6      | 54   | 55   |     |
| 4004   |                   | 2.61            | 472.00                      | 4  | 5      | 53   | 54   |     |
| 4005   |                   | 3.51            | 496.00                      | 2  | 4      | 52   | 53   |     |
| 4006   |                   | 3.34            | 495.00                      | 1  |        | 3    | 52   | 60  |
| 4007   |                   | 4.59            | 502.00                      | 3  | 8      | 37   |      | 60  |
| 4008   |                   | 3.62            | 501.00                      | 8  | 9      | 10   | 39   | 40  |
| 4009   |                   | 4.66            | 480.00                      | 10 | 11     | 12   | 46   | 47  |
| 4010   |                   | 5.51            | 494.00                      | 11 | 13     | 14   | 47   | 48  |
| 4011   |                   | 3.92            | 485.00                      | 13 | 57     |      |      |     |
| 4012   |                   | 2.49            | 507.00                      | 14 | 48     |      |      |     |
| 4013   |                   | 2.22            | 507.00                      | 9  | 19     | 40   | 41   |     |
| 4014   |                   | 6.96            | 465.00                      | 12 | 15     | 67   |      |     |
| 4015   |                   | 1.05            | 463.00                      | 15 | 16     | 17   | 49   |     |
| 4016   |                   | .89             | 456.00                      | 16 | 18     |      |      | 4.0 |
| 4017   |                   | .61             | 457.00                      | 18 | 19     | 20   | 41   | 42  |
| 4018   |                   | .55             | 456.00                      | 20 | 21     | 22   | 38   | 42  |
| 4019   |                   | .35             | 455.00                      | 21 | 23     | 38   | 58   |     |
| 4020   |                   | .56             | 450.00                      | 23 | 24     | 58   | 59   |     |
| 4021   |                   | .44             | 445.00                      | 24 | 59     |      |      |     |
| 4022   |                   | .71             | 505.00                      | 25 | 26     | 27   | 43   | 44  |
| 4023   |                   | .34             | 489.00                      | 22 | 25     | 44   | 45   |     |
| 4024   |                   | .13             | 484.00                      | 17 | 28     | 49   | 50   |     |
| 4025   |                   | .15             | 495.00                      | 26 | 29     | 30   |      |     |
| 4026   |                   | .16             | 494.00                      | 28 | 29     | 50   | 68   |     |
| 4027   |                   | . 52            | 498.00                      | 65 | 68     | 69   |      |     |
| 4028   |                   | 1.31            | 482.00                      | 63 | 65     | 67   |      |     |
| 4029   |                   | 1.51            | 490.00                      | 61 | 62     | 63   | 64   |     |
| 4030   |                   | .37             | 503.00                      | 30 | 31     |      |      |     |
| 4031   |                   | 1.61            | 493.00                      | 31 | 32     | 51   |      |     |
| 4032   |                   | 3.01            | 507.00                      | 32 | 33     | 51   | 69   |     |
| 4033   |                   | 1.13            | 495.00                      | 64 | 66     |      |      |     |
| 4034   |                   | 1.13            | 490.00                      | 66 | 70     |      |      |     |
| 4035   |                   | 1.32            | 510.00                      | 33 | 34     |      | E7.0 |     |
| 4036   |                   | .02             | 506.00                      | 34 | 35     | 36   | 70   |     |

DATE = 03-12-2002 PAGE NO. 4 JOB NAME = GKWSAP - JICA - Bangalawatta SR & Pihilladeniya SR

 4037
 .01
 516.00
 35

 4038
 .01
 499.00
 36

## OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

#### SYSTEM CONFIGURATION

| NUMBER | OF | PIPES(p)             | = | 70 |
|--------|----|----------------------|---|----|
| NUMBER | OF | JUNCTION NODES(j)    | = | 38 |
| NUMBER | OF | PRIMARY LOOPS(1)     | = | 27 |
| NUMBER | OF | FIXED GRADE NODES(f) | = | 6  |
| NUMBER | OF | SUPPLY ZONES(z)      | = | 1  |

THE RESULTS ARE OBTAINED AFTER 7 TRIALS WITH AN ACCURACY = .00159

### PIPELINE RESULTS

| PIPE<br>NUMBER | NO)<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-FGCV         | 0         | 4006          | 30.86    | .48                 | .00                 | .00                  | 1.00                   | 6.3                 |
| 2              | 4006      | 4005          | .76      | .69                 | .00                 | .00                  | .32                    | 3.4                 |
| 3              | 4006      | 4007          | 8.22     | .06                 | .00                 | .00                  | .27                    | .5                  |
| 4              | 4005      | 4004          | .50      | .24                 | .00                 | .00                  | .21                    | 1.6                 |
| 5              | 4004      | 4003          | .73      | .48                 | .00                 | .00                  | .31                    | 3.2                 |
| 6              | 4003      | 4002          | .69      | .59                 | .00                 | .00                  | .29                    | 2.8                 |
| 7              | 4002      | 4001          | .21      | .02                 | .00                 | .00                  | .09                    | .3                  |
| 8              | 4007      | 4008          | 4.18     | .01                 | .00                 | .00                  | .14                    | .1                  |
| 9              | 4008      | 4013          | -2.60    | .05                 | .00                 | .00                  | .17                    | .3                  |
| 10             | 4008      | 4009          | 5.01     | .54                 | .00                 | .00                  | .33                    | 1.1                 |
| 11             | 4009      | 4010          | 3.10     | .97                 | .00                 | .00                  | .42                    | 2.9                 |
| 12             | 4009      | 4014          | 1.94     | 1.91                | .00                 | .00                  | .40                    | 3.3                 |
| 13             | 4010      | 4011          | .67      | 1.65                | .00                 | .00                  | .28                    | 2.7                 |
| 14             | 4010      | 4012          | .87      | .20                 | .00                 | .00                  | .18                    | . 7                 |
| 15             | 4014      | 4015          | -5.02    | 1.07                | .00                 | .00                  | .68                    | 7.1                 |

| 16      | 4015 | 4016 | -3.01  | 1.22  | .00     | .00     | .41 | 2.7 |
|---------|------|------|--------|-------|---------|---------|-----|-----|
| 17      | 4015 | 4024 | -3.06  | 3.26  | .00     | .00     | .62 | 7.7 |
| 18      | 4016 | 4017 | -3.90  | .67   | .00     | .00     | .53 | 4.4 |
| 19      | 4017 | 4013 | 1.46   | .47   | .00     | .00     | .20 | .7  |
| 20      | 4017 | 4018 | -2.03  | .16   | .00     | .00     | .27 | 1.3 |
| 21      | 4018 | 4019 | .23    | .03   | .00     | .00     | .10 | .3  |
| 22      | 4018 | 4023 | 56     | 1.43  | .00     | .00     | .24 | 1.9 |
| 23      | 4019 | 4020 | .26    | .15   | .00     | .00     | .11 | .4  |
| 24      | 4020 | 4021 | .12    | .05   | .00     | .00     | .05 | .1  |
| 25      | 4022 | 4023 | .57    | 1.20  | .00     | .00     | .24 | 2.0 |
| 26      | 4022 | 4025 | 3.87   | .09   | .00     | .00     | .13 | .1  |
| 27-FG   | 0    | 4022 | 11.11  | .09   | .00     | .00     | .36 | .9  |
| 28      | 4024 | 4026 | -3.19  | 1.32  | .00     | .00     | .65 | 8.3 |
| 29      | 4025 | 4026 | 3.35   | .02   | .00     | .00     | .22 | .5  |
| 30      | 4025 | 4030 | .37    | .01   | .00     | .00     | .02 | .0  |
| 31-XX   | 4030 | 4031 | .57    | - 0 - | .00     | .00     | .02 | . 0 |
| 32      | 4031 | 4032 | 42     | .71   | .00     | .00     | .18 | 1.1 |
| 33      | 4032 | 4035 | .70    | .03   | .00     | .00     | .05 | .0  |
| 34      | 4035 | 4036 | 62     | .02   | .00     | .00     | .04 | .0  |
| 35      | 4036 | 4037 | .01    | .00   | .00     | .00     | .00 | .0  |
| 36      | 4036 | 4038 | .01    | .00   | .00     | .00     | .00 | .0  |
| 37-XXFG |      | 4007 | •01    | .00   |         | .00     |     |     |
| 38      | 4018 | 4019 | 1.12   | .03   | .00     | .00     | .15 | .3  |
| 39      | 4007 | 4008 | 8.36   | .01   | .00     | .00     | .17 | .1  |
| 40      | 4008 | 4013 | -7.01  | .05   | .00     | .00     | .23 | .3  |
| 41      | 4013 | 4017 | -10.36 | .47   | .00     | .00     | .34 | .7  |
| 42      | 4017 | 4018 | -14.31 | .16   | .00     | .00     | .46 | 1.3 |
| 43-FG   | 0    | 4022 | 12.04  | .09   | .00     | .00     | .39 | .9  |
| 44      | 4022 | 4023 | 18.00  | 1.20  | .00     | .00     | .58 | 2.0 |
| 45      | 4023 | 4018 | 17.68  | 1.43  | .00     | .00     | .57 | 1.9 |
| 46      | 4008 | 4009 | 13.51  | .54   | .00     | .00     | .44 | 1.1 |
| 47      | 4009 | 4010 | 8.82   | .97   | .00     | .00     | .57 | 2.9 |
| 48      | 4010 | 4012 | 1.62   | .20   | .00     | .00     | .22 | .7  |
| 49-XX   | 4015 | 4024 | 2.02   |       | • • • • | • • • • |     | • / |
| 50-XX   | 4024 | 4026 |        |       |         |         |     |     |
| 51      | 4031 | 4032 | -1.19  | .71   | .00     | .00     | .24 | 1.1 |
| 52      | 4006 | 4005 | 9.63   | .69   | .00     | .00     | .63 | 3.4 |
| 53      | 4005 | 4004 | 6.38   | .24   | .00     | .00     | .41 | 1.6 |
| 54      | 4004 | 4003 | 3.54   | .48   | .00     | .00     | .48 | 3.2 |
| 55      | 4003 | 4002 | 1.94   | .59   | .00     | .00     | .40 | 2.8 |
| 56      | 4002 | 4001 | .58    | .02   | .00     | .00     | .12 | .3  |
| 57      | 4010 | 4011 | 3.25   | 1.65  | .00     | .00     | .44 | 2.7 |
| 58      | 4019 | 4020 | .74    | .15   | .00     | .00     | .15 | .4  |
| 59      | 4020 | 4021 | .32    | .05   | .00     | .00     | .07 | . 1 |
| 60      | 4006 | 4007 | 8.91   | .06   | .00     | .00     | .29 | .5  |
| 61-FG   | 0    | 4029 | 11.58  | .03   | .00     | .00     | .38 | 1.0 |
| 62-XXFG |      | 4029 |        |       |         |         |     |     |
| 63      | 4029 | 4028 | 7.15   | .09   | .00     | .00     | .23 | .4  |
| 64      | 4029 | 4033 | 2.92   | .03   | .00     | .00     | .09 | .0  |
| 65      | 4028 | 4027 | 5.84   | .63   | .00     | .00     | .38 | 1.5 |
| 66      | 4033 | 4034 | 1.79   | .56   | .00     | .00     | .24 | 1.0 |
| 67-XX   | 4014 | 4028 |        |       |         |         |     |     |
| 68-XX   | 4026 | 4027 |        |       |         |         |     |     |
|         |      |      |        |       |         |         |     |     |

 69
 4027
 4032
 5.32
 1.16
 .00
 .00
 .35
 1.3

 70
 4034
 4036
 .66
 1.31
 .00
 .00
 .28
 2.6

## JUNCTION NODE RESULTS

| MILIMEED     | ጥፐጥፒው | EXTERNAL DEMAND (1/s)  .79 1.84 1.64 2.61 3.51 3.34 4.59 3.62 4.66 5.51 3.92 2.49 2.22 6.96 1.05 .89 .61 .55 .35 .44 .71 .34 .13 .15 .16 .52 1.31 1.51 .37 1.61 3.01 1.13 1.13 1.32 .02 .01 | CDADE            | JUNCTION<br>ELEVATION<br>(m) | HEAD           | JUNCTIO<br>PRESSUR<br>(kpa) |
|--------------|-------|---|------------------|------------------------------|----------------|-----------------------------|
| 4001         |       | .79   | 516.78           | 497.00                       | 19.78          | 193.94                      |
| 4002         |       | 1.84  | 516.80           | 497.00                       | 19.80          | 194.16                      |
| 4003         |       | 1.64  | 517.39           | 482.00                       | 35.39          | 347.02                      |
| 4004         |       | 2.61  | 517.87           | 472.00                       | 45.87          | 449.82                      |
| 4005         |       | 3.51  | 518.11           | 496.00                       | 22.11          | 216.83                      |
| 4006         |       | 3.34  | 518.80           | 472.00<br>496.00<br>495.00   | 23.80          | 233.40                      |
| 4007         |       | 4.59  | 518.75           | 502.00                       | 16.75          | 164.22                      |
| 4008         |       | 3.62  | 518.74           | 501.00<br>480.00             | 17.74          | 173.95                      |
| 4009         |       | 4.66  | 518.20           | 480.00                       | 38.20          | 374.62                      |
| 4010         |       | 5.51  | 517.23           | 494.00                       | 23.23          | 227.83                      |
| 4011         |       | 3.92  | 515.58           | 485.00<br>507.00<br>507.00   | 30.58          | 299.91                      |
| 4012         |       | 2.49  | 517.03           | 507.00                       | 10.03<br>11.79 | 98.34                       |
| 4013         |       | 2.22  | 518.79           | 507.00                       | 11.79          | 115.64                      |
| 4014         |       | 6.96  | 516.29           |                              | 51.29          |                             |
| 4015         |       | 1.05  | 517.37           |                              | 54.37          | 533.15                      |
| 4016         |       | .89   | 518.59           | 456.00<br>457.00             | 62.59          | 613.76                      |
| 4017         |       | .61   | 519.26           | 457.00                       | 62.26          | 610.55                      |
| 4018         |       | .55   | 519.42           | 456.00                       | 63.42          | 621.93                      |
| 4019         |       | .35   | 519.39           | 455.00<br>450.00<br>445.00   | 64.39          | 631.44                      |
| 4020         |       | .56   | 519.23           | 450.00                       | 69.23          | 678.97                      |
| 4021         |       | .44   | 519.19           | 445.00                       | 74.19          | 727.52                      |
| 4022         |       | .71   | 522.05           | 505.00                       | 17.05          | 167.24                      |
| 4023         |       | .34   | 520.85           | 489.00                       | 31.85          | 312.38                      |
| 4024         |       | .13   | 520.62           | 484.00<br>495.00             | 36.62          | 359.17                      |
| 4025         |       | .15   | 521.97           | 495.00                       | 26.97          | 264.44                      |
| 4026         |       | .16   | 521.95           | 494.00                       | 27.95          | 274.08                      |
| 4027         |       | .52   | 539.25           | 498.00<br>482.00<br>490.00   | 41.25          | 404.48                      |
| 4028         |       | 1.31  | 539.88           | 482.00                       | 57.88          | 567.60                      |
| 4029         |       | 1.51  | 539.97           | 490.00                       | 49.97          | 490.08                      |
| 4030<br>4031 |       | .3/   | 521.96           | 503.00                       | 18.96          | 185.93                      |
| 4031<br>4032 |       | 1.61  | 537.37           | 493.00                       | 44.37<br>31.09 | 435.16                      |
| 4032         |       | 3.UL  | 538.09           | 507.00                       | 31.09<br>44.94 | 304.86                      |
| 4033         |       | 1.13  | 539.94           |                              |                |                             |
| 4034<br>4035 |       | 1.13  | 539.38           | 490.00                       | 49.38          | 484.27                      |
| 4035<br>4036 |       | 1.32  | 538.05<br>538.07 | 510.00                       | 28.05<br>32.07 | 275.11                      |
| 4036         |       | .02<br>.01  | 538.07<br>538.07 | 506.00                       | 32.07<br>22.07 | 314.51                      |
| 4037<br>4038 |       | . U.L   | 538.07           |                              |                |                             |
| 4038         |       | .01   | 538.07           | 499.00                       | 39.07          | 383.15                      |

SUMMARY OF INFLOWS AND OUTFLOWS

DATE = 03-12-2002 PAGE NO. 7 JOB NAME = GKWSAP - JICA - Bangalawatta SR & Pihilladeniya SR

## (+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES

(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

|            | PIPE<br>NUMBER |       |       |  |  |
|------------|----------------|-------|-------|--|--|
|            |                |       |       |  |  |
|            | 1              |       | 30.86 |  |  |
|            |                | 11.11 |       |  |  |
|            |                | 12.04 |       |  |  |
|            |                | 11.58 |       |  |  |
|            |                |       |       |  |  |
| NET SYSTEM | INFLOW         | ==    | 65.59 |  |  |
| NET SYSTEM | OUTFLOW        | =     | .00   |  |  |
| NET SYSTEM | DEMAND         | =     | 65.59 |  |  |

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = .300

THE RESULTS ARE OBTAINED AFTER 3 TRIALS WITH AN ACCURACY = .00408

## PIPELINE RESULTS

| PIPE<br>NUMBER | NOI<br>#1 | DE NOS.<br>#2 | FLOWRATE | HEAD<br>LOSS<br>(m) | PUMP<br>HEAD<br>(m) | MINOR<br>LOSS<br>(m) | LINE<br>VELO.<br>(m/s) | HL/<br>1000<br>(m/m |
|----------------|-----------|---------------|----------|---------------------|---------------------|----------------------|------------------------|---------------------|
| 1-XXFG         | 0         | 4006          |          |                     |                     |                      |                        |                     |
| 2              | 4006      | 4005          | .23      | .07                 | .00                 | .00                  | .10                    | .3                  |
| 3              | 4006      | 4007          | -1.98    | .00                 | .00                 | .00                  | .06                    | . 0                 |
| 4              | 4005      | 4004          | .15      | .03                 | .00                 | .00                  | .06                    | .1                  |
| 5              | 4004      | 4003          | .22      | .05                 | .00                 | .00                  | .09                    | .3                  |
| 6              | 4003      | 4002          | .21      | .06                 | .00                 | .00                  | .09                    | .3                  |
| 7              | 4002      | 4001          | .06      | .00                 | .00                 | .00                  | .03                    | .0                  |
| 8              | 4007      | 4008          | -1.83    | .00                 | .00                 | .00                  | .06                    | .0                  |
| 9              | 4008      | 4013          | -3.02    | .07                 | .00                 | .00                  | .20                    | . 4                 |

| 10            | 4008 | <b>4</b> 009 | 1.24                    | .04  | .00   | .00        | .08  | .0  |
|---------------|------|--------------|-------------------------|------|-------|------------|------|-----|
| 11            | 4009 | 4010         | . 93                    | .10  | .00   | .00        | .13  | . 3 |
| 12            | 4009 | 4014         | 38                      | .09  | .00   | .00        | .08  | .1  |
| 13            | 4010 | 4011         | .20                     | .18  | .00   | .00        | .09  | .3  |
| 14            | 4010 | 4012         | .26                     | .02  | .00   | .00        | .05  | . 0 |
| 15            | 4014 | 4015         | -2.47                   | .29  | .00   | .00        | .33  | 1.9 |
| 16            | 4015 | 4016         | 91                      | .13  | .00   | .00        | .12  | . 3 |
| 17            | 4015 | 4024         | -1.87                   | 1.31 | .00   | .00        | .38  | 3.1 |
| 18            | 4016 | 4017         | -1.18                   | .07  | .00   | .00        | .16  | . 4 |
| 19            | 4017 | 4013         | 1.47                    | .47  | .00   | .00        | .20  | .7  |
| 20            | 4017 | 4018         | -1.64                   | .11  | .00   | .00        | .22  | . 9 |
| 21            | 4018 | 4019         | .07                     | .00  | .00   | .00        | .03  | .0  |
| 22            | 4018 | 4023         | 42                      | .85  | .00   | .00        | .18  | 1.1 |
| 23            | 4019 | 4020         | .08                     | .02  | .00   | .00        | .03  | . 0 |
| 24            | 4020 | 4021         | .03                     | .01  | .00   | .00        | .01  | . 0 |
| 25            | 4022 | 4023         | .43                     | .70  | .00   | .00        | .18  | 1.1 |
| 26            | 4022 | 4025         | 2.12                    | .03  | .00   | .00        | .07  | .0  |
| 27-FG         | 0    | 4022         | 7.78                    | .04  | .00   | .00        | .25  | .5  |
| 28            | 4024 | 4026         | -1.91                   | .51  | .00   | .00        | .39  | 3.2 |
| 29            | 4025 | 4026         | 1.96                    | .01  | .00   | .00        | .13  | .2  |
| 30            | 4025 | 4030         | .11                     | .00  | .00   | .00        | .01  | .0  |
| 31-XX         | 4030 | 4031         | •                       | .00  | . 0 0 |            |      | . • |
| 32            | 4031 | 4032         | 13                      | .08  | .00   | .00        | .05  | .1  |
| 33            | 4032 | 4035         | .21                     | .00  | .00   | .00        | .01  | .0  |
| 34            | 4035 | 4036         | 19                      | .00  | .00   | .00        | .01  | .0  |
| 35            | 4035 | 4037         | .00                     | .00  | .00   | .00        | .00  | . 0 |
| 36            | 4036 | 4037         | .00                     | .00  | .00   | .00        | .00  | .0  |
| 37-XXFG       |      | 4007         | .00                     | .00  | .00   | .00        | .00  | .0  |
| 37-AAFG<br>38 | 4018 | 4017         | .34                     | 0.0  | 0.0   | 0.0        | .05  | 0   |
| 30<br>39      | 4018 | 4019         | -3.66                   | .00  | .00   | .00<br>.00 | .03  | . 0 |
| 39<br>40      | 4007 |              | -3.66<br>-8. <b>1</b> 5 | .00  | .00   |            | .07  | .0  |
|               |      | 4013         |                         | .07  | .00   | .00        |      | . 4 |
| 41            | 4013 | 4017         | -10.38                  | .47  | .00   | .00        | .34  | .7  |
| 42            | 4017 | 4018         | -11.57                  | .11  | .00   | .00        | .38  | . 9 |
| 43-FG         | 0    | 4022         | 8.43                    | .04  | .00   | .00        | .27  | .5  |
| 44            | 4022 | 4023         | 13.45                   | .70  | .00   | .00        | .44  | 1.1 |
| 45            | 4023 | 4018         | 13.35                   | .85  | .00   | .00        | .43  | 1.1 |
| 46            | 4008 | 4009         | 3.35                    | .04  | .00   | .00        | .11  | . 0 |
| 47            | 4009 | 4010         | 2.65                    |      | .00   | .00        | .17  | . 3 |
| 48            | 4010 | 4012         | .49                     | .02  | .00   | .00        | .07  | . 0 |
| 49-XX         |      | 4024         |                         |      |       |            |      |     |
| 50-XX         | 4024 | 4026         | 2.5                     | 0.0  |       |            | 0.51 | -   |
| 51            | 4031 | 4032         | 36                      | .08  | .00   | .00        |      | .1  |
| 52            | 4006 | 4005         | 2.89                    | .07  | .00   | .00        |      | .3  |
| 53            | 4005 | 4004         | 1.91                    | . 03 | .00   | .00        |      | .1  |
| 54            | 4004 | 4003         | 1.06                    | .05  | .00   | .00        | . 14 | .3  |
| 55            | 4003 | 4002         | .58                     | .06  | .00   | .00        | .12  | . 3 |
| 56            | 4002 | 4001         | .17                     | .00  | .00   | .00        | .04  | . 0 |
| 57            | 4010 | 4011         | . 97                    | .18  | .00   | .00        | .13  | .3  |
| 58            | 4019 | 4020         | .22                     | .02  | .00   | .00        | .05  | . 0 |
| 59            | 4020 | 4021         | .10                     | .01  | .00   | .00        |      | . 0 |
| 60            | 4006 | 4007         | -2.14                   | .00  | .00   | .00        |      |     |
|               | 0    | 4029         | 3.47                    | .00  | .00   | .00        | .11  | . 1 |
| 62-XXFG       | 0    | 4029         |                         |      |       |            |      |     |
|               |      |              |                         |      |       |            |      |     |

| 63    | 4029 | 4028 | 2.14 | .01  | .00 | .00 | .07 | . 0 |
|-------|------|------|------|------|-----|-----|-----|-----|
| 64    | 4029 | 4033 | .88  | .00  | .00 | .00 | .03 | . 0 |
| 65    | 4028 | 4027 | 1.75 | .07  | .00 | .00 | .11 | .1  |
| 66    | 4033 | 4034 | .54  | .06  | .00 | .00 | .07 | . 1 |
| 67-XX | 4014 | 4028 |      |      |     |     |     |     |
| 68-XX | 4026 | 4027 |      |      |     |     |     |     |
| 69    | 4027 | 4032 | 1.59 | .12  | .00 | .00 | .10 | .1  |
| 70    | 4034 | 4036 | .20  | . 14 | .00 | .00 | .08 | .2  |
|       |      |      |      |      |     |     |     |     |

## JUNCTION NODE RESULTS

| JUNCTION<br>NUMBER   | JUNCTION<br>TITLE | EXTERNAL<br>DEMAND<br>(1/s)  | HYDRAULIC<br>GRADE<br>(m)  | JUNCTION<br>ELEVATION<br>(m)   | PRESSURE<br>HEAD<br>(m)  | JUNCTIO<br>PRESSUR<br>(kpa)  |
|--|-------------------|--|--|--|--|--|
| 4001<br>4002<br>4003<br>4004<br>4005<br>4006<br>4007<br>4008<br>4009<br>4010<br>4011<br>4012<br>4013<br>4014   |                   | .24<br>.55<br>.49<br>.78<br>1.05<br>1.00<br>1.38<br>1.09<br>1.40<br>1.65<br>1.18<br>.75<br>.67<br>2.09                                   | 519.67<br>519.67<br>519.74<br>519.79<br>519.82<br>519.89<br>519.89<br>519.85<br>519.75<br>519.75<br>519.75   | 497.00<br>497.00<br>482.00<br>472.00<br>496.00<br>495.00<br>502.00<br>501.00<br>480.00<br>494.00<br>485.00<br>507.00<br>507.00<br>465.00   | 22.67<br>22.67<br>37.74<br>47.79<br>23.82<br>24.89<br>17.89<br>18.89<br>39.85<br>25.75<br>34.57<br>12.73<br>12.97<br>54.94 | 222.33<br>222.36<br>370.08<br>468.65<br>233.55<br>244.08<br>175.47<br>185.30<br>390.84<br>252.52<br>339.04<br>124.82<br>127.17<br>538.82   |
| 4015<br>4016<br>4017<br>4018<br>4019<br>4020<br>4021<br>4022<br>4023<br>4024<br>4025<br>4026<br>4027<br>4028<br>4029<br>4030<br>4031<br>4032<br>4033<br>4034<br>4035 |                   | .31<br>.27<br>.18<br>.17<br>.10<br>.17<br>.13<br>.21<br>.10<br>.04<br>.05<br>.05<br>.16<br>.39<br>.45<br>.11<br>.48<br>.90<br>.34<br>.34 | 520.23<br>520.36<br>520.44<br>520.54<br>520.52<br>520.52<br>520.52<br>521.40<br>521.40<br>521.55<br>522.07<br>522.06<br>539.92<br>539.99<br>540.00<br>522.07<br>539.79<br>539.79<br>539.79 | 463.00<br>456.00<br>457.00<br>456.00<br>455.00<br>450.00<br>445.00<br>505.00<br>484.00<br>495.00<br>494.00<br>498.00<br>498.00<br>490.00<br>503.00<br>493.00<br>507.00<br>490.00<br>510.00 | 32.40<br>37.55<br>27.07<br>28.06<br>41.92<br>57.99<br>50.00<br>19.07<br>46.72<br>32.79                                     | 561.25<br>631.19<br>622.10<br>632.96<br>642.74<br>691.61<br>740.59<br>167.65<br>317.70<br>368.21<br>265.43<br>275.18<br>411.09<br>568.66<br>490.31<br>186.97<br>458.14<br>321.60<br>441.24<br>489.68<br>292.15 |

### DATE = 03-12-2002 PAGE NO. 10 JOB NAME = GKWSAP - JICA - Bangalawatta SR & Pihilladeniya SR

 4037
 .00
 539.79
 516.00
 23.79
 233.33

 4038
 .00
 539.79
 499.00
 40.79
 400.04

### SUMMARY OF INFLOWS AND OUTFLOWS

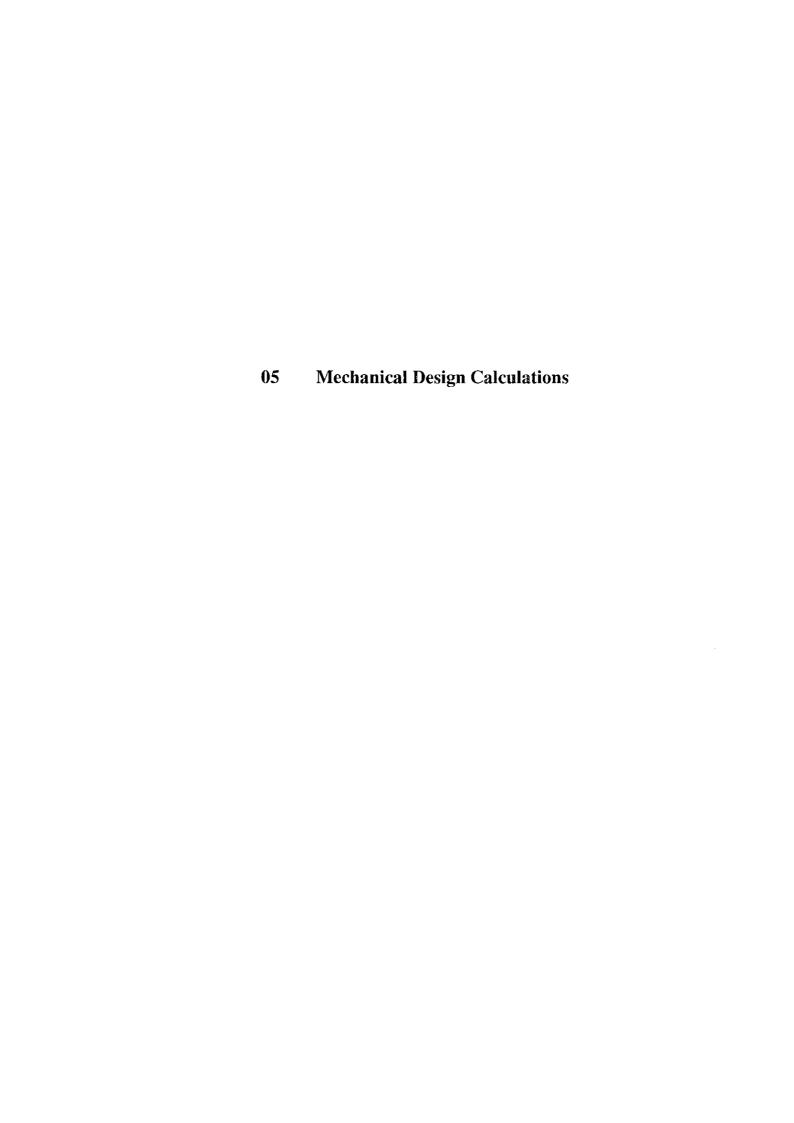
(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES

| ( | ( - ) | OUTFLOWS | FROM | $\mathtt{THE}$ | SYSTEM | INTO | FIXED | GRADE | NODES |
|---|-------|----------|------|----------------|--------|------|-------|-------|-------|
|   |       |          |      |                |        |      |       |       |       |

|     |                            | PIPE<br>NUMBER |   | FLOWRATE<br>(1/s)     |
|-----|----------------------------|----------------|---|-----------------------|
|     |                            | 27<br>43<br>61 |   | 7.78<br>8.43<br>3.47  |
| NET | SYSTEM<br>SYSTEM<br>SYSTEM | OUTFLOW        | ======================================= | 19.68<br>.00<br>19.68 |

\*\*\*\* KYPIPE SIMULATION COMPLETED \*\*\*\*

DATE: 3/12/2002 TIME: 8:47:44



## **Pump List**

| Location           | NO.  | Direction   | Phase          |          | Capacity   | Required<br>Head                                    | Total<br>Head                           |   | r of Units                  | Pump | A B B         |
|--------------------|--|---|----------------|----------|--|---|---|---|-----------------------------|------|---------------|
|                    | ļ  |   | (Year)         |          | (m3/min)   | (m)   | (m)                                     | Duty  | Standby                     |      | ļ             |
| Gohagoda Intake    |  | To WTP  | 2005           | 38,500   | 26.74  | 40.5  | 44,0                                    | " <u>1</u>  |                             |      | Ì             |
|                    |  |   | 2010           | 77,000   | 53.47  | 39.4  | 43.0                                    | 2   | 1                           | C    | A             |
|                    |  |   | 2015           | 115,500  | 80.21  | 40.6  | 44.0                                    | 3   | 1                           |      | A<br>B        |
| Katugastota W.T.P. |  | To Upland, Asgiriya SR  | 2005           | 17,600   | 12.22  | 130.5   | 134.0                                   | i   | T.                          |      | 1             |
|                    | A-I  |   | 2010           | 33,190   | 23.05  | 135.2   | 136.0                                   | 2   | 1                           | C    | В             |
|                    |  |   | 2015           | 51,110   | 35.49  | 135.6   | 137.0                                   | 3   | 1                           |      | }             |
|                    |  | To Gphagoda SR  | 2005           | 4,710    | 3.27   | 103.9   |   | 1   | 1                           |      |               |
|                    | A-2  | To Kondadeniya SR   | 2010           | 4,990    | 3.47   | 104.3   |   | 1   | 1                           | В    | В             |
|                    |  |   | 2015           | 5,870    | 4.08   | 101.7   | 104,0                                   | 1 2   |                             |      | B B B B B B B |
|                    |  | To Kahawatta SR &   | 2005           | 14,390   | the course of the stricts and appropriately  |   | 93.0                                    | i   | 14                          |      |               |
|                    | A-3  | other SRs   | 2010           | 29,160   |  |   | 1                                       |   | 1                           | С    | B B B B B B B |
|                    |  |   | 2015           | 44,240   |  | <del> </del>  | 102.0                                   | 3   | 1                           |      |               |
|                    |  |   | 2005           | 1,650    |  | t   | 1                                       | 1   | 1                           |      | Ì             |
| Heerasagala Low SR | В  | To Heerasagala Middle SR  |                | 2,350    |  | ***************************************             | *************************************** | 1   | 1                           | Α    | В             |
|                    |  | P. W. 1447. 1444. | 2015           | 2,740    | The state of the s | ******************                                  | 1                                       | 21  | 1                           |      |               |
| Heerasagala Middle |  |   | 2005           | 280      | 0.19   | 33-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-             | 600 000 1707 1700 0X                    | 1   | 1                           |      |               |
| SR                 | С  |   | 2010           | 550      | 0.38   |   |   | <u>-</u><br>1                                       | ı                           | A    | B             |
|                    |  |   | 2015           | 700      | 0.49   |   | 77.0                                    | **************                                      |                             | ••   |               |
| Ampitiya SR        | <del> </del>                                     | To Elhena SR  | 2005           | 400      | 0.28   |   | 6.312:9999244 <b>3</b>                  | 1   | 1                           |      |               |
| =                  | D-1  | TO EMONG SIX  | 2010           | 570      | 0.40   | †····   |   | 1   | 1                           | A    | R             |
| (chieding)         |  |   | 2015           | 1,200    | ***************************************  | MACHINES SERVICES                                   | 45.0                                    |   | 1                           | А    | В             |
|                    |  | To Mullepihilla SR  | 2005           | 580      | A PRODUCTION AND CHARGO  | 20.00, 21 75.77 19.40                               | AND CONTRACTOR                          | ı   | -200/00/2004-055 11:50/00/2 |      |               |
|                    | D-2  | To Munephina SK   | 2010           | <u> </u> | ***************************************  | †·····  | <del> </del>                            | 1   | 1                           | В    | D             |
|                    | D-2  |   | 130 sc 5 march | 810      | 0.56   | forest contract to the contract to                  | TO THE REPORT OF THE STATE OF           | SSEXT OF THE 22 PK                                  |                             | D    | В             |
|                    |  | T- Marian CD  | 2015           | 980      | 0.68   |   | 146.0                                   | 1 1   | 3.1                         |      |               |
|                    | D-3  | To Meekanuwa SR   | 2005           | 1250     | 0.87   |   |   | 1   | 1                           |      |               |
|                    | D-3  | ***************************************   | 2010           | 1770     | 1.23   |   |   | 1   | 1                           | A.   | В             |
| 77.1 CD            |  |   | 2015           | 2150     | 1.49   | DATE OF THE RESIDENCE                               |   | -W-6- H1 - H1 - A - A - A - A - A - A - A - A - A - | 21.3                        |      | ļ <u>.</u>    |
| Kahawatta SR       | _  | To Kurugoda SR and  | 2005           | 4,240    | ***************************************  |   |   |   | 1                           |      | _             |
|                    | E  | Telambugahawatta SR   | 2010           | 4,330    |  | 62.5  |   | 2   | 1                           | A    | В             |
|                    | ļ  |   | 2015           | 7,310    | 5.08   |   | <del></del>                             | 2   | 1                           |      |               |
| R2 SR              |  | To Hantana Place SR   | 2005           | 1,050    | ***************************************  |   | *************************************** | 1   | 1                           |      |               |
| (existing)         | F  | ***************************************   | 2010           | 1,490    | 777 93512997577259   | digerrania in the section                           |   | 1   | l<br>decode out             | Α    | В             |
|                    | <del>                                     </del> |   | 2015           | 1,960    | 4554.007-40.00.00.00.00  | 99.0  | 102.0                                   |   |                             |      |               |
| Asgiriya SR        |  | In-line pump to   | to 2005        | 1,970    |  | ***************************************             | *************************************** | 1   | 1                           |      | -             |
|                    | G  |   | 2010           | 2,150    | THE PERSON NAMED IN COLUMN   | كالكائمة والمراكبة فللمناهم والمتالة والمارك وأمارك | *************                           | 1   | 1                           | A    | В             |
|                    |  |   | 2015           | 2,280    | 1.58   | 3 87.2  | 0.86                                    | i   | 1                           |      | ļ             |
| Kondadeniya        |  | To Kulugamana SR  | 2005           | 1,050    | 0.73   | 67.2  |   | 1   | 1                           |      |               |
| (existing)         | Н  |   | 2010           | 1,100    | 0.76   | 68.1  |   | I   | 1 1                         | A    | В             |
|                    |  |   | 2015           | 1,600    | 1.11   | 59.9  | 64.0                                    | 1.  | lai.                        |      | 1             |

Pump Type: A End Suction Volute Pump

B Multi-Stage Volute Pump C Double Suction Volute Pump

Control Type: A Pump Speed Control Operation with Flowmeter/Pressure Sensor B Pump On-Off Operation with Flowmeter

#### 1-1. Intake (Stage 1)

**Total Capacity**  $38,500 \text{ m}^3/\text{day} =$ 26.74 m<sup>3</sup>/min 1 sets + 1 set for stand-by Quantity of pump 38,500 m<sup>3</sup>/day Pump Capacity

26.74 m<sup>3</sup>/min  $1,604.2 \text{ m}^3/\text{hr}$ Q=

 $0.446 \text{ m}^3/\text{sec}$  $\mathbf{q}=$ 

Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter

616 mm to 436 mm 400 x 300 mm 3

1.5 where, v= to

Total Head Total Head  $H = h_1 + h_2 + h_3 =$ 42.5

44.0 m

actual head:

 $h_1 = hd - hs =$ 38.33 m

suction level hs = 436.67 m delivery level hd = 475.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \ x \ c^{(\text{--}1.85)} \ x \ D^{(\text{--4.87})} \ x \ q^{(\text{1.85})} \ x \ L =$ 2.13 m

110 where, c= D== 800 mm dia /1000 L= 1.800 m

(v= 0.886 m/sec)

friction loss: fittings around pump

$$h_3 = f_1 x (v_1^2 / 2g) + f_2 x (v_2^2 / 2g)$$

0.05 m + 1.98 m 2.03 m

500 mm dia /1000 where, D=

 $(v_1 =$ 2.269 m/sec)

| <u></u>      | <u>Q'ty</u> | <u>t/pc</u>          | <u>_t</u> _ |
|--------------|-------------|----------------------|-------------|
| bell mouth   | 1           | 0.06                 | 0.06        |
| sluice valve | 1           | 0.10                 | 0.10        |
| deducer      | 1           | 0.04                 | 0.04        |
|              |             | f <sub>1</sub> total | 0.20        |

where, D= 400 mm dia/1000

 $(v_2 =$ 3.546 m/sec)

f2 Q'ty f/pc f check valve 1 1.50 1.50 sluice valve 1 0.10 0.10 increase 1 0.15 0.15 90deg 1 0.18 0.18 tee 1 1.15 1.15 f2 total 3.08

Motor Output Motor Output =  $(0.163 \times r \times Q \times H / e) \times (1 + a)$ 

265.7 280.0 kW 1.00 where, r= 0.83 e =

> 0.15 a =

Specification

Type Vertical Double-Suction Centrifugal Pump

Diameter 400 x 300 mm Capacity 26.74 m<sup>3</sup>/min Head 44.0 m Motor Outpr 280 kW

#### 1-2. Intake (Stage 2)

 $77,000 \text{ m}^3/\text{day} =$ **Total Capacity** 53.47 m<sup>3</sup>/min 2 sets + 1 set for stand-by Quantity of pump

38,500 m<sup>3</sup>/day **Pump Capacity** 

> 26.74 m<sup>3</sup>/min  $1,604.2 \text{ m}^3/\text{hr}$ 0.446 m<sup>3</sup>/sec q=

Diameter =  $146 \times (Q / v)^{(1/2)}$ Diameter

616 mm to 436 mm 400 x 300 mm 3

where, v= 1.5

Total Head Total Head  $H = h_1 + h_2 + h_3 =$ 41.4 44.0 m

actual head:  $h_1 = hd - hs =$ 38.33 m

> suction level hs = 436.67 m delivery level hd = 475.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \text{ x e}^{(-1.85)} \text{ x D}^{(-4.87)} \text{ x q}^{(1.85)} \text{ x L} =$ 1.05 m

where, c= D=1,204 mm dia /1000 L= 1,800 m (v= 0.783 m/sec)

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

0.05 m + 1.98 m 2.03 m where, D= 500 mm dia /1000

 $(v_1 =$ 2.269 m/sec)

Q'ty f/pc bell mouth 1 0.06 0.06 sluice valve 1 0.10 0.10 deducer 1 0.04 0.04 f<sub>i</sub> total 0.20

where, D= 400 mm dia /1000

 $(v_2 =$ 3.546 m/sec)

Q'ty f/pc check valve 1 1.50 1.50 sluice valve 1 0.100.10 increase 0.15 0.15 90deg 1 0.18 0.18 tee 1.15 1.15 3.08 f2 total

Motor Output Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1 + a)$ 

> 265.7 280.0 kW where, r= 1.00 e= 0.83 0.15 a =

Specification

Type Vertical Double-Suction Centrifugal Pump

Diameter 400 x 300 mm Capacity 26.74 m<sup>3</sup>/min Head 44.0 m Motor Outpr 280 kW

#### 1-3. Intake (Stage 3)

**Total Capacity**  $115,500 \text{ m}^3/\text{day} =$ 80.21 m<sup>3</sup>/min 3 sets + 1 set for stand-by Quantity of pump

38,500 m<sup>3</sup>/day Pump Capacity

> 26.74 m<sup>3</sup>/min  $1,604.2 \text{ m}^3/\text{hr}$  $0.446 \text{ m}^3/\text{sec}$ q=

Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter

616 mm to 436 mm 400 x 300 mm where, v= tο 3

1.5

Total Head Total Head  $H = h_1 + h_2 + h_3 =$ 42.6

44.0 m

actual head:

 $h_1 = hd - hs =$ 38.33 m

suction level hs = 436.67 m delivery level hd = 475.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \times e^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L =$ 2.22 m

where, c= 110 D≕ 1,204 mm dia /1000 L= 1,800 m (v= 1.174 m/sec)

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

f1

deducer

0.05m + 1.98 m 2.03 m

where, D= 500 mm dia /1000  $(v_1 =$ 2.269 m/sec)

Q'ty f/pc bell mouth 1 0.06 0.06 sluice valve 1 0.10 0.10 1

3.546 m/sec)

0.04 0.04 f<sub>1</sub> total 0.20

f2 total

3.08

where, D= 400 mm dia /1000

f2 Q'ty f/pc f check valve 1 1.50 1.50 sluice valve 1 0.10 0.10 increase 1 0.15 0.15 90deg 1 0.180.18 tee 1 1.15 1.15

Motor Output = (0.163 x r x Q x H/e) x (1+a)Motor Output

 $(\mathbf{v}_2 =$ 

265.7 280.0 kW 1.00 where, r =0.83 e = 0.15a =

Specification

Type Vertical Double-Suction Centrifugal Pump

Diameter 400 x 300 mm 26.74 m<sup>3</sup>/min Capacity Head 44.0 m Motor Outpt 280 kW

#### 2-1. Clear Water Pump (A-1) - Phase 1

**Total Capacity**  $20,360 \text{ m}^3/\text{day} =$ 14.14 m<sup>3</sup>/min 1 sets + 1 set for stand-by Quantity of pump **Pump Capacity**  $20,360 \text{ m}^3/\text{day}$ 14.14 m<sup>3</sup>/min 848.3 m<sup>3</sup>/hr Q= 0.236 m<sup>3</sup>/sec q= Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter 448 mm to 317 mm 300 x 200 mm where, v= 1.5 3 to Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 132.0 134.0 m actual head: Asgiriya  $h_1 = hd - hs =$ 124.39 m suction header pipe hs = 442.61 m delivery level hd = 567.00 m friction loss: pipeline (Hazen Williams)  $h_2 = 10.666 \times c^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L =$ 0.91 m friction loss: fittings around pump  $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 0.02 m +1.71 m 1.73 m where, D= 400 mm dia /1000  $(v_1 =$ 1.875 m/sec) fl Q'ty f/pc sluice valve 0.10 0.101 reducer 1 0.03 0.03 f<sub>1</sub> total 0.13 where, D= 300 mm dia /1000 3.334 m/sec)  $(\mathbf{v}_2 =$ f2 Q'ty f/pc f increase 1 0.48 0.48 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 1 0.18 0.18

friction loss: float type butterfly valve

 $h_4 =$ 5.00 m

**Motor Output** Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1+a)$ 

tee

433.1 kW 450.0 kW

1

1.15

f<sub>2</sub> total

1.15

3.01

1.00 where, r=

0.82 e = 0.15 a =

Specification

Type Horizontal Double-Suction Centrifugal Pump

300 x 200 mm Diameter Capacity 14.14 m<sup>3</sup>/min Head 134.0 m Motor Outpr 450 kW

#### 2-2. Clear Water Pump (A-1) - Phase 2

 $36,040 \text{ m}^3/\text{day} =$ 25.03 m<sup>3</sup>/min **Total Capacity** 2 sets + 1 set for stand-by Quantity of pump

18.020 m<sup>3</sup>/day **Pump Capacity** 

> 12.51 m<sup>3</sup>/min 750.8 m<sup>3</sup>/hr

 $0.209 \text{ m}^3/\text{sec}$ q=

Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter

422 mm to 298 mm 300 x 200 mm

where, v= 1.5 to

Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 134.1

136.0 m

actual head: Asgiriya

 $h_t = hd - hs =$ 124.39 m

> suction header pipe hs = 442.61 m delivery level hd = 567.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \times e^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L =$ 3.31 m

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

fl

m + 1.34 m 1.36 m

where, D= 400 mm dia /1000  $(\mathbf{v}_1 =$ 1.660 m/sec)

Q'ty f/pc f sluice valve 0.10 0.10 1 reducer 0.03 0.03

f<sub>1</sub> total 0.13

where, D= 300 mm dia /1000

2.951 m/sec)  $(v_2 =$ 

ť2 Q'ty f/pc increase 0.48 0.48 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 0.18 0.18 tee 1.15 1.15 f<sub>2</sub> total 3.01

friction loss: float type butterfly valve

 $h_4 =$ 

Motor Output = (0.163 x r x Q x H / e) x (1 + a)Motor Output

389 kW =

400.0 kW

where, r = 1.00 0.82e ==

0.15

Specification

Horizontal Double-Suction Centrifugal Pump Type

Diameter 300 x 200 mm 12.51 m<sup>3</sup>/min Capacity Head 136.0 m Motor Outpt 400 kW

#### 2-3 Clear Water Pump (A-1) - Phase 3

Total Capacity  $54,160 \text{ m}^3/\text{day} = 37.61 \text{ m}^3/\text{min}$ Quantity of pump 3 sets + 1 set for stand-by

Pump Capacity 18,053 m<sup>3</sup>/day

Q=  $12.54 \text{ m}^3/\text{min}$   $752.2 \text{ m}^3/\text{hr}$ 

 $q= 0.209 \text{ m}^3/\text{sec}$ 

Diameter =  $146 \times (Q/v)^{(1/2)}$ 

= 422 mm to 298 mm = 300 x 200 mm

where, v= 1.5 to 3

Total Head H =  $h_1 + h_2 + h_3 + h_4 = 135.2$ 

= 137.0 m

actual head: Asgiriya

 $h_1 = hd - hs =$  124.39 m

suction header pipe hs = 442.61 m delivery level hd = 567.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \times c^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L =$  4.41 m

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

= 0.02 m + 1.34 m = 1.36 m

where, D= 400 mm dia/1000(v<sub>1</sub> = 1.663 m/sec)

where, D= 300 mm dia /1000

 $(v_2 = 2.956 \text{ m/sec})$ 

f2 Q'ty f/pc increase 0.48 1 0.48 check valve 1.00 1 1.00 butterfly valve 1 0.20 0.20 90 deg0.180.18 1 tee 1 1.15 1.15 f<sub>2</sub> total 3.01

friction loss: float type butterfly valve

 $h_4 = 5.00 \text{ m}$ 

Motor Output =  $(0.163 \times x \times Q \times H/e) \times (1+a)$ 

= 392.6 kW = 400.0 kW where, r = 1.00

e = 0.82 a = 0.15

Specification

Type Horizontal Double-Suction Centrifugal Pump

Diameter  $300 \times 200 \text{ mm}$ Capacity  $12.54 \text{ m}^3/\text{min}$ Head 137.0 mMotor Outpt 400 kW

#### 3-1. Clear Water Pump (A-2) - Phase 3

**Total Capacity**  $2,820 \text{ m}^3/\text{day} =$ 1.96 m<sup>3</sup>/min Quantity of pump 1 sets + 1 set for stand-by **Pump Capacity**  $2,820 \text{ m}^3/\text{day}$ 1.96 m<sup>3</sup>/min  $117.5 \text{ m}^3/\text{hr}$  $0.033 \text{ m}^3/\text{sec}$ q=

Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter

> 167 mm to 118 mm 125 x 125 mm 1.5 where, v= 3

Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 102.4 m 104.0 m

actual head:

Asgiriya  $h_1 = hd - hs =$ 

87.40 m

suction header pipe hs = 442.60 m delivery level hd = 530.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \text{ x } e^{(-1.85)} \text{ x } D^{(-4.87)} \text{ x } q^{(1.85)} \text{ x } L =$ 9.30 m

friction loss: fittings around pump  $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

> 0.22 0.52 mm + 0.74 m

where, D= 150 mm dia /1000

1.847 m/sec)  $(\mathbf{v}_1 =$ fl Q'ty f/pc sluice valve 0.10 0.10 1 1.15 tee 1.15 1 reducer 0.03 1 0.03

f<sub>1</sub> total 1.28 where, D= 150 mm dia /1000

1.847 m/sec)  $(v_2 =$ 

f2 Q'ty f/pc increase 1 0.48 0.48 check valve 1.00 1.00 1 butterfly valve 0.20 0.20 1 90deg 0.18 0.18 1 tee 1 1.15 1.15 f2 total 3.01

friction loss: float type butterfly valve

5.00 m  $h_4 =$ 

**Motor Output** Motor Output = (0.163 x r x Q x H/e) x (1 + a)

> 54.5 kW 55.0 kW where, r = 1.00 0.70 e =0.15 a =

Specification

Horizontal Multi-turbine Pump Type Diameter 125 x 125 mm 1.96 m<sup>3</sup>/min Capacity Head 104.0 m Motor Outpt 55 kW

Quantity 2 (1) sets including 1 set for stand-by

#### 4-1. Clear Water Pump (A-3) - Phase 1

 $14,390 \text{ m}^3/\text{day} =$ **Total Capacity** 9.99 m<sup>3</sup>/min Quantity of pump 1 sets + 1 set for stand-by

 $14,390 \text{ m}^3/\text{day}$ Pump Capacity

> 9.99 m<sup>3</sup>/min Q= 599.6 m<sup>3</sup>/hr

 $0.167 \text{ m}^3/\text{sec}$ q=

Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter

377 mm to 266 mm 300 x 200 mm 3

1.5 where, v= to

Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 91.7

93.0 m

actual head: Asgiriya

 $h_1 = hd - hs =$ 78.67 m

> suction header pipe hs = 442.61 m delivery level hd = 521.28 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \text{ x c}^{(-1.85)} \text{ x D}^{(-4.87)} \text{ x q}^{(1.85)} \text{ x L} =$ 7.13 m

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

0.01 0.85 m 0.86 m where, D= 400 mm dia /1000  $(\mathbf{v}_1 =$ 1.325 m/sec)

fl Q'ty f/pc 0.10 sluice valve 0.10 1 reducer 1 0.03 0.03  $f_1$  total 0.13

where, D= 300 mm dia/1000

 $(v_2 =$ 2.356 m/sec)

f2 Q'ty \_f/pc 0.48 increase 1 0.48check valve 1 1.00 1.00 0.20 butterfly valve 0.20 90deg 0.18 0.18 tee 1.15 1.15 f2 total 3.01

friction loss: float type butterfly valve

 $5.00\ \mathbf{m}$  $h_4 =$ 

Motor Output Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1+a)$ 

212.4 kW 250.0 kW where, r= 1.00 0.82 e = 0.15 a =

Specification

Type Horizontal Double-Suction Centrifugal Pump

Diameter 300 x 200 mm Capacity 9.99 m<sup>3</sup>/min Head 93.0 m Motor Outpu 250 kW

#### 4-2. Clear Water Pump (A-3) - Phase 2

 $29,160 \text{ m}^3/\text{day} =$ **Total Capacity**  $20.25 \text{ m}^3/\text{min}$ 2 sets + 1 set for stand-by Quantity of pump

**Pump Capacity**  $14,580 \text{ m}^3/\text{day}$ 

> 10.13 m<sup>3</sup>/min 607.5 m<sup>3</sup>/hr Q=

 $0.169 \text{ m}^3/\text{sec}$ 

Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter

> 379 mm to 268 mm

300 x 200 mm 1.5

Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 97.2

99.0 m

3

actual head: Asgiriya

 $h_1 = hd - hs =$ 78.67 m

> suction header pipe hs = 442.61 m delivery level hd = 521.28 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \text{ x c}^{(-1.85)} \text{ x } D^{(-4.87)} \text{ x } q^{(1.85)} \text{ x } L =$ 12.63 m

friction loss: fittings around pump

 $h_3 = f_1 x (v_1^2 / 2g) + f_2 x (v_2^2 / 2g)$ 

0.88 m 0.89 m

where, D=

400 mm dia /1000 1.343 m/sec)  $(\mathbf{v}_1 =$ 

Q'ty f/pc sluice valve 1 0.10 0.10 reducer 1 0.03 0.03 0.13

 $f_1$  total where, D= 300 mm dia /1000

> $(v_2 =$ 2.387 m/sec)

f2 Q'ty f/pc increase 1 0.48 0.48 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 1 0.18 0.18 tee 1 1.15 1.15 f<sub>2</sub> total 3.01

friction loss: float type butterfly valve

h4=

**Motor Output** Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1 + a)$ 

> 229.1 kW 250.0 kW

1.00 where, r= 0.82e =

> a = 0.15

Specification

Type Horizontal Double-Suction Centrifugal Pump

Diameter 300 x 200 mm Capacity  $10.13 \text{ m}^3/\text{min}$ 99.0 m Head 250 kW Motor Outpu

#### 4-3. Clear Water Pump (A-3) - Phase 3

Total Capacity  $44,240 \text{ m}^3/\text{day} = 30.72 \text{ m}^3/\text{min}$  Quantity of pump 3 sets + 1 set for stand-by Pump Capacity  $14,747 \text{ m}^3/\text{day}$  Q=  $10.24 \text{ m}^3/\text{min} \qquad 614.4 \text{ m}^3/\text{hr}$  q=  $0.171 \text{ m}^3/\text{sec}$ 

Diameter Diameter =  $146 \times (Q/v)^{(1/2)}$ 

= 381 mm to 270 mm = 300 x 200 mm where, v= 1.5 to 3

Total Head H =  $h_1 + h_2 + h_3 + h_4 = 100.2$ 

= 102.0 m

actual head: Asgiriya

 $h_1 = hd - hs = 78.67 \text{ m}$ 

suction header pipe hs = 442.61 m delivery level hd = 521.28 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \times c^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L = 15.63 \text{ m}$ 

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

= 0.01 m + 0.9 m = 0.91 m where, D= 400 mm dia /1000 (v<sub>1</sub> = 1.358 m/sec)

 $f_1$  total 0.13

where, D= 300 mm dia /1000

 $(v_2 = 2.415 \text{ m/sec})$ 

**f**2 Q'ty f/pc f increase 0.48 0.48 1 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 1 0.180.18 tee 1 1.15 1.15 f2 total 3.01

friction loss: float type butterfly valve

 $h_4 = 5.00 \text{ m}$ 

Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1+a)$ 

= 238.8 kW = 250.0 kW where, r = 1.00 e = 0.82 a = 0.15

Specification

Type Horizontal Double-Suction Centrifugal Pump

 $\begin{array}{lll} \text{Diameter} & 300 \text{ x } 200 \text{ mm} \\ \text{Capacity} & 10.24 \text{ m}^3/\text{min} \\ \text{Head} & 102.0 \text{ m} \\ \text{Motor Outpt} & 250 \text{ kW} \end{array}$ 

#### 5-1. Ampitiya Booster Pump (D-1) - Phase 3

Total Capacity  $1,200 \text{ m}^3/\text{day} = 0.83 \text{ m}^3/\text{min}$  Quantity of pump 1 sets + 1 set for stand-by Pump Capacity  $1,200 \text{ m}^3/\text{day}$  Q=  $0.83 \text{ m}^3/\text{min} \qquad 50.0 \text{ m}^3/\text{hr}$ 

 $q = 0.014 \text{ m}^3/\text{sec}$ 

Diameter =  $146 \times (Q/v)^{(1/2)}$ 

= 109 mm to 77 mm = 80 x 65 mm where, v= 1.5 to 3

Total Head H =  $h_1 + h_2 + h_3 + h_4 =$  43.6 m

= 45.0 m

actual head: Elhena

 $h_1 = hd - hs =$  32.50 m

suction level hs = 582.50 m delivery level hd = 615.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \times c^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L =$  4.60 m

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

= 0.12 m + 1.37 m = 1.49 m

where, D= 80 mm dia /1000(v<sub>1</sub> = 2.763 m/sec)

fl Q'ty \_f/pc bell mouth 1 0.20 0.20 sluice valve 1 0.10 0.10 reducer 0.02 0.02 f, total 0.32

where, D= 80 mm dia /1000

 $(v_2 = 2.763 \text{ m/sec})$ 

| <u>f2</u>       | <u>Q'ty</u> | _f/pc_      | <u>f</u> |
|-----------------|-------------|-------------|----------|
| increase        | 2           | 0.20        | 0.40     |
| check valve     | 1           | 1.00        | 1.00     |
| butterfly valve | 1           | 0.20        | 0.20     |
| 90deg           | 1           | 0.18        | 0.18     |
| tee             | 1           | 1.50        | 1.50     |
| sluice valve    | 2           | 0.10        | 0.20     |
| reducer         | 1           | 0.03        | 0.03     |
|                 |             | $f_2$ total | 3.51     |

friction loss: float type butterfly valve

 $h_4 = 5.00 \text{ m}$ 

Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1 + a)$ 

= 10.3 kW = 11.0 kW where, r = 1.00 e = 0.68 a = 0.15

Specification

Type Horizontal End-Suction Centrifugal Pump

 $\begin{array}{lll} \text{Diameter} & 80 \text{ x } 65 \text{ mm} \\ \text{Capacity} & 0.83 \text{ m}^3 \text{/min} \\ \text{Head} & 45.0 \text{ m} \\ \text{Motor Outpt} & 11 \text{ kW} \end{array}$ 

```
5-2. Ampitiya Booster Pump (D-2) - Phase 3
```

Total Capacity

Quantity of pump

Pump Capacity Q=

Diameter =  $146 \times (Q / v)^{(1/2)}$ 

= 98 mm to 70 mm = 65 x 50 mm where, v= 1.5 to 3

Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 = 144.7 \text{ m}$ 

= 146.0 m

actual head: Mullepihilla

 $h_1 = hd - hs =$  130.50 m

suction level hs = 582.50 m delivery level hd = 713.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \times c^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L = 8.20 \text{ m}$ 

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

= 0.08 m + 0.91 m = 0.99 m where, D= 80 mm dia /1000 (v<sub>1</sub> = 2.257 m/sec)

| <u>fl</u>    | <u>Q'ty</u> | _f/pc    | <u>f</u> |
|--------------|-------------|----------|----------|
| bell mouth   | 1           | 0.20     | 0.20     |
| sluice valve | 1           | 0.10     | 0.10     |
| reducer      | 1           | 0.02     | 0.02     |
|              |             | f. total | 0.32     |

where, D= 80 mm dia /1000  $(v_2 = 2.257 \text{ m/sec})$ 

f2 Q'ty f/pc increase 0.20 0.40 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 0.18 0.18 tee 1.50 1.50 sluice valve 2 0.10 0.20 reducer 0.03 0.03 f<sub>2</sub> total 3.51

friction loss: float type butterfly valve

 $h_4 = 5.00 \text{ m}$ 

Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1+a)$ 

= 28.7 kW = 30.0 kW where, r = 1.00 e = 0.65 a = 0.15

Specification

Type Horizontal Multi-stage Pump
Diameter 65 x 50 mm
Capacity 0.68 m³/min
Head 146.0 m
Motor Outpr 30 kW

```
5-3. Ampitiya Booster Pump (D-3) - Phase 3
```

 $2,150 \text{ m}^3/\text{day} =$ **Total Capacity** 1.49 m<sup>3</sup>/min Quantity of pump 1 sets + 1 set for stand-by Pump Capacity  $2,150 \text{ m}^3/\text{day}$  $1.49 \text{ m}^3/\text{min}$ Q=  $89.6 \text{ m}^3/\text{hr}$  $0.025 \text{ m}^3/\text{sec}$ Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter 146 mm to 103 mm

100 x 80 mm 1.5 where, v= to 3

Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 72.0 m

73.0 m

actual head: Meekanuwa

 $h_1 = hd - hs =$ 52.50 m

> suction level hs = 582.50 m delivery level hd = 635.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \text{ x c}^{(-1.85)} \text{ x D}^{(-4.87)} \text{ x q}^{(1.85)} \text{ x L} =$ 12.50 m

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

0.16 1.8 m 1.96 m where, D= 100 mm dia /1000

3.168 m/sec)

fl Q'ty f/pc bell mouth 0.20 0.20 1 sluice valve 0.10 0.10 1 reducer 0.02 0.02

f<sub>1</sub> total where, D= 100 mm dia/1000

> 3.168 m/sec)  $(\mathbf{v_2} =$

Q'ty \_f/pc increase 2 0.20 0.40 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 1 0.18 0.18 tee 1.50 1.50 1 sluice valve 2 0.10 0.20 reducer 0.030.03 f2 total 3.51

friction loss: float type butterfly valve

5.00 m  $h_4 =$ 

Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1 + a)$ Motor Output

> 28 kW 30.0 kW where, r= 1.00 e = 0.73 a =0.15

Specification

Type Horizontal End-Suction Centrifugal Pump

Diameter 100 x 80 mm Capacity 1.49 m<sup>3</sup>/min Head 73.0 m 30 kW Motor Outpu

#### 6-1. Kahawatta Booster Pump (E) - Phase 1

 $4,240 \text{ m}^3/\text{day} =$ **Total Capacity**  $2.94 \text{ m}^3/\text{min}$ Quantity of pump 1 sets + 1 set for stand-by  $4,240 \text{ m}^3/\text{day}$ Pump Capacity 2.94 m<sup>3</sup>/min 176.7 m<sup>3</sup>/hr Q=  $0.049 \text{ m}^3/\text{sec}$ q= Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter 205 mm to 145 mm 150 x 125 mm 1.5 where, v= 3 Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 63.9 m 68.0 m actual head: Kurugoda  $h_1 = hd - hs =$ 57.00 m suction level hs = 516.00 m delivery level hd = 573.00 m friction loss: pipeline (Hazen Williams)  $h_2 = 10.666 \times e^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L =$ 0.40 m friction loss: fittings around pump  $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 1.38 m 1.51 m where, D= 150 mm dia /1000 2.777 m/sec)  $(v_1 =$ Q'ty f/pc bell mouth 1 0.20 0.20 sluice valve 1 0.10 0.10 reducer 0.02 0.02  $f_1$  total 0.32 where, D= 150 mm dia /1000 2.777 m/sec)  $(v_2 =$ Q'ty f/pc 0.20 0.40 increase 2 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 0.18 0.18 tee 1.50 1.50 sluice valve 2 0.10 0.20 reducer 0.03 0.03

friction loss: float type butterfly valve

 $h_4 =$ 

f2 total

3.51

Motor Output = (0.163 x r x Q x H/e) x (1 + a)Motor Output

> 49.4 kW 55.0 kW where, r =1.00 0.76 e = a = 0.15

Specification

Horizontal End-Suction Centrifugal Pump Type

Diameter 150 x 125 mm  $2.94 \text{ m}^3/\text{min}$ Capacity Head 68.0 m 55 kW Motor Outpu

#### 6-2. Kahawatta Booster Pump (E) - Phase 3

Total Capacity 7,310 m $^3$ /day = 5.08 m $^3$ /min Quantity of pump 2 sets + 1 set for stand-by Pump Capacity 3,655 m $^3$ /day Q= 2.54 m $^3$ /min 152.3 m $^3$ /hr

Q=  $2.54 \text{ m}^3/\text{min}$  152.3 m<sup>3</sup>/h q=  $0.042 \text{ m}^3/\text{sec}$ 

Diameter =  $146 \times (Q/v)^{(1/2)}$ 

= 190 mm to 134 mm = 150 x 125 mm where, v= 1.5 to 3

Total Head  $H = h_1 + h_2 + h_3 + h_4 =$  71.1 m

= 72.0 m

actual head: Kurugoda

 $h_1 = hd - hs = 57.00 \text{ m}$ 

suction level hs = 516.00 mdelivery level hd = 573.00 m

friction loss: pipeline (Hazen Williams)

 $h_2 = 10.666 \times e^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L = 8.00 \text{ m}$ 

friction loss: fittings around pump

 $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 

reducer

= 0.09 m + 1.03 m = 1.12 m where, D= 150 mm dia/1000

 $\begin{array}{ccc}
1 & \underline{0.02} & \underline{0.02} \\
f_1 \text{ total} & 0.32
\end{array}$ 

where, D= 150 mm dia /1000

 $(v_2 = 2.394 \text{ m/sec})$ 

| <u>f2</u>       | <u>Q'ty</u> | _f/pc_               | <u>f</u> |
|-----------------|-------------|----------------------|----------|
| increase        | 2           | 0.20                 | 0.40     |
| check valve     | 1           | 1.00                 | 1.00     |
| butterfly valve | 1           | 0.20                 | 0.20     |
| 90deg           | 1           | 0.18                 | 0.18     |
| tee             | 1           | 1.50                 | 1.50     |
| sluice valve    | 2           | 0.10                 | 0.20     |
| reducer         | 1           | 0.03                 | 0.03     |
|                 |             | f <sub>2</sub> total | 3.51     |

friction loss: float type butterfly valve

 $h_4 = 5.00 \text{ m}$ 

Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1+a)$ 

= 45.1 kW = 55.0 kW where, r = 1.00 e = 0.76 a = 0.15

Specification

Type Horizontal End-Suction Centrifugal Pump

 $\begin{array}{lll} \text{Diameter} & 150 \text{ x } 125 \text{ mm} \\ \text{Capacity} & 2.54 \text{ m}^3/\text{min} \\ \text{Head} & 72.0 \text{ m} \\ \text{Motor Outpt} & 55 \text{ kW} \end{array}$ 

7-1. R2 Booster Pump (F) - Phase 3 **Total Capacity**  $1,960 \text{ m}^3/\text{day} =$  $1.36 \text{ m}^3/\text{min}$ Quantity of pump 1 sets + 1 set for stand-by **Pump Capacity**  $1,960 \text{ m}^3/\text{day}$ 1.36 m<sup>3</sup>/min  $81.7 \text{ m}^3/\text{hr}$ O=  $0.023 \text{ m}^3/\text{sec}$ q≔ Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter 139 mm to mm 100 x 80 mm where, v= 1.5 3 Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 100.6 m 102.0 m actual head: Hantana Place  $h_1 = hd - hs =$ 91.51 m suction level hs = 549.49 m delivery level hd = 641.00 m friction loss: pipeline (Hazen Williams)  $h_2 = 10.666 \text{ x c}^{(-1.85)} \text{ x D}^{(-4.87)} \text{ x q}^{(1.85)} \text{ x L} =$ 2.49 m friction loss: fittings around pump  $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ 0.14 1.49 m m + 1.63 m where, D= 100 mm dia /1000  $(v_1 =$ 2.888 m/sec) Q'ty f/pc bell mouth 0.20 1 0.20 sluice valve 1 0.10 0.10 reducer 1 0.020.02  $f_1$  total 0.32 where, D= 100 mm dia /1000 2.888 m/sec)  $(v_2 =$ Q'ty f/pc increase 2 0.20 0.40 check valve 1 1.00 1.00 butterfly valve 1 0.20 0.20 90deg 0.18 0.18 1.50 1.50 tee 1 sluice valve 2 0.10 0.20 reducer 0.03 0.03 f<sub>2</sub> total 3.51 friction loss: float type butterfly valve  $h_4 =$ 5.00 m Motor Output Motor Output =  $(0.163 \times r \times Q \times H/e) \times (1+a)$ 36.7 kW 37.0 kW where, r= 1.00 0.71

Specification

Horizontal End-Suction Centrifugal Pump Type

a =

Diameter 100 x 80 mm  $1.36 \text{ m}^3/\text{min}$ Capacity Head 102.0 m Motor Outpt 37 kW

Quantity 2 (1) sets including 1 set for future

0.15

```
8-1. Asgiriya In-Line Booster Pump (G) - Phase 3
```

 $2,280 \text{ m}^3/\text{day} =$ 1.58 m<sup>3</sup>/min **Total Capacity** Quantity of pump 1 sets + 1 set for stand-by Pump Capacity  $2,280 \text{ m}^3/\text{day}$ 1.58 m<sup>3</sup>/min  $95.0 \text{ m}^3/\text{hr}$ Q=  $0.026 \text{ m}^3/\text{sec}$ Diameter =  $146 \times (Q/v)^{(1/2)}$ Diameter 150 mm to 106 mm 100 x 80 mm where, v= 1.5 to 3 Total Head Total Head  $H = h_1 + h_2 + h_3 + h_4 =$ 66.7 m68.0 m actual head: Bahirawakanda  $h_1 = hd - hs =$ 56.3 m floor level hf = 532.50 m suction pressure hs = 40.25 m delivery level hd = 629.00 m friction loss: pipeline (Hazen Williams)  $h_2 = 10.666 \times e^{(-1.85)} \times D^{(-4.87)} \times q^{(1.85)} \times L =$ 3.22 m friction loss: fittings around pump  $h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)$ = 0.18 2.02 m m += 2.2 m where, D= 100 mm dia /1000  $(v_1 =$ 3.360 m/sec) fl Q'ty f/pc 0.20 bell mouth 0.20 1 0.10 sluice valve 1 0.10 reducer 0.02 0.02 1 f<sub>1</sub> total 0.32 100 mm dia /1000 where, D=  $(v_2 =$ 3.360 m/sec) f/pc f2Q'ty 0.20 0.40 increase 2 check valve 1 1.00 1.00 0.20 0.20 butterfly valve 1 0.18 90deg 1 0.18 1.50 1 1.50 tee sluice valve 2 0.10 0.20reducer 1 0.03 0.03 f2 total 3.51 friction loss: float type butterfly valve

 $h_4 =$ 5.00 m

Motor Output =  $(0.163 \times r \times Q \times H / e) \times (1 + a)$ Motor Output

28 kW 30.0 kW 1.00 where, r= 0.72 e = 0.15

Specification

Horizontal End-Suction Centrifugal Pump Type

Diameter 100 x 80 mm Capacity  $1.58 \text{ m}^3/\text{min}$ Head 68.0 m Motor Outpt 30 kW

```
9-1. Kondadeniya Booster Pump (H) - Phase 3
   Total Capacity
                                                            1,600 \text{ m}^3/\text{day} =
                                                                                       1.11 m<sup>3</sup>/min
                                                                 1 sets + 1 set for stand-by
   Quantity of pump
   Pump Capacity
                                                            1,600 \text{ m}^3/\text{day}
                                                             1.11 m<sup>3</sup>/min
                                          Q=
                                                                                        66.7 m<sup>3</sup>/hr
                                                            0.019 \text{ m}^3/\text{sec}
                                          q=
                       Diameter = 146 \times (Q/v)^{(1/2)}
   Diameter
                                                              126 mm to
                                                                                              mm
                                                          80 x 65 mm
                                                               1.5
                                  where, v=
                                                                                 3
   Total Head
                       Total Head H = h_1 + h_2 + h_3 + h_4 =
                                                                           62.6 m
                                                                                        64.0 m
                       actual head:
                                              Kulugammana
                       h_1 = hd - hs =
                                                                                       52.00 m
                                               suction level hs =
                                                                        531.25 m
                                            delivery level hd =
                                                                        583.25 m
                       friction loss: pipeline (Hazen Williams)
                       h_2 = 10.666 \text{ x c}^{(-1.85)} \text{ x D}^{(-4.87)} \text{ x q}^{(1.85)} \text{ x L} =
                                                                                        2.90 m
                       friction loss: fittings around pump
                       h_3 = f_1 \times (v_1^2 / 2g) + f_2 \times (v_2^2 / 2g)
                                                             0.22
                                                                                        2.43 m
                                                                      m +
                                                             2.65 m
                                                               80 mm dia /1000
                                  where, D=
                                                           3.684 m/sec)
                                        (\mathbf{v_1} =
                                 fl
                                                             Q'ty
                                                                         f/pc
                            bell mouth
                                                                 1
                                                                          0.20
                                                                                        0.20
                            sluice valve
                                                                 1
                                                                          0.10
                                                                                        0.10
                              reducer
                                                                          0.02
                                                                                        0.02
                                                                                        0.32
                                                                         f<sub>1</sub> total
                                  where, D=
                                                               80 mm dia /1000
                                        (\mathbf{v}_2 =
                                                           3.684 m/sec)
                                                                          f/pc
                                                             Q'ty
                              increase
                                                                          0.20
                                                                 2
                            check valve
                                                                          1.00
                                                                                        1.00
                          butterfly valve
                                                                          0.20
                                                                                        0.20
                                                                 1
                               90deg
                                                                          0.18
                                                                                        0.18
                                                                          1.50
                                                                                        1.50
                                 tee
                            sluice valve
                                                                          0.10
                                                                                        0.20
                              reducer
                                                                          0.03
                                                                                        0.03
                                                                         f<sub>2</sub> total
                                                                                        3.51
                       friction loss: float type butterfly valve
                                                             5.00 m
                                         h_4 =
   Motor Output
                       Motor Output = (0.163 \times r \times Q \times H/e) \times (1 + a)
                                                               19 kW
                                                             30.0 kW
                                                             1.00
                                where, r=
                                                             0.70
                                          e =
                                                             0.15
                                          a =
   Specification
        Type
                       Horizontal End-Suction Centrifugal Pump
```

80 x 65 mm

64.0 m 30 kW

 $1.11 \, \text{m}^3/\text{min}$ 

2 (1) sets including 1 set for future

Diameter

Capacity

Motor Outpt Quantity

Head

Sri Lanka - Greater Kandy Water Supply Augumentation Project
Chemical Facility Capacity Calculation for Katugastota Treatment Plant Q=110,000 cu m/day

| Item                             | Total System   | First Stage   |
|----------------------------------|--|---|
| Plant Capacity                   | Q= 110,000 cu m/day  | Q= 36,670 cu m/day  |
| (Daily Max)                      | r 10,000 cu maay   | 50,070 cd ii)day  |
| Planned Flow                     | Q= 115,500 cu m/day  | Q= 38,500 cu m/day  |
| I IAIMCG I IOW                   | = 4,813 cu m/hour  | = 1,604 cu m/hour   |
|                                  | = 80.2 cu m/min  | = 26.7 cu m/min   |
|                                  | = 1.337 cu m/sec   | = 0.446 cu m/sec  |
| (1) Alum Dissolving Tax          |  | = 0.446 Cu m/sec  |
|                                  |  | G.114 A1 : G.1 1 (A12/GO4)2)  |
| Coagulant                        | Solid Aluminum Sulphate (Al2(SO4)3)  | Solid Aluminum Sulphate (Al2(SO4)3)   |
|                                  | containing 15 % Al2-O3   | containing 15 % Al2-O3  |
| Criteria                         | D B 10.60 17.1 1   | D D 10.00 111.1 #   |
| Cntena                           | Dosage Rate: 10-60 mg-solid alum/l   | Dosage Rate: 10-60 mg-solid alum/i  |
|                                  | - Maximum 60 mg/l  | - Maximum 60 mg/l   |
|                                  | - Average 30 mg/l  | - Average 30 mg/l   |
|                                  | - Minimum 10 mg/l  | - Minimum 10 mg/l   |
|                                  |  | Coagulant Solution: 10 % sg = 1.0525  |
|                                  | Retention Time 24 hours  | Retention Time 24 hours   |
|                                  | Dissolving Time 2 hours  | Dissolving Time 2 hours   |
|                                  |  |   |
| Dosage Amount                    | Wt = 3,465 kg-Alum/day (Ave dosage)  | Wt = 1,155 kg-Alum/day (Ave dosage)   |
| Coagulant Solution               | Vmax = 32.9 cu m/day (Max dosage)  | Vmax = 11.0 cu m/day (Max dosage)   |
|                                  | Vave = 16.5 cu m/day (Ave dosage)  | Vave = 5.5 cu m/day (Ave dosage)  |
|                                  |  |   |
| Solution Tank                    | Square 4 units   | Square 2 units  |
| Dimension                        | Lm x W mx Dm x units   | Lm x W mx Dm x units  |
|                                  | 2.0 2.0 2.5 4  | 2.0 2.0 2.5 2   |
|                                  |  |   |
| Total Volume                     | V = 40.0 cu m  | V = 20.0 cu m   |
| Retention Time                   | T = 29.2 hours for maximum dosing  | T = 43.7 hours for maximum dosing   |
|                                  |  |   |
| Alum Pump                        | 2 units each (excl. 1 unit stand-by)   | 1 units (excl. 1 unit stand-by)   |
| Capacity                         | Qmax = 11.4 liter/min 0.69 cu m/hr   | Qmax = 7.6 liter/min 0.46 cu m/hr   |
|                                  | Qmin = 1.9 liter/min 0.11 cu m/hr  | Omin = 1.13 liter/min 0.08 cu m/hr  |
|                                  | , The state of the |   |
| Storage                          | Period 30 days   | Period 30 days  |
|                                  | Bulk s. g. 0.60  | Bulk s. g. 0.60   |
| Storage Area                     | A = 87 m2 at 2.0 m height  | A = 29 m2 at 2.0 m height   |
| (2) Lime Dissolving Tar          | 1  | 25 m u. 210 m nu.gut  |
| , , <u> </u>                     | Hydrated Lime (Ca(OH)2)  | Hydrated Lime (Ca(OH)2)   |
| F                                | containing 72 % CaO  | containing 72 % CaO   |
|                                  | , , , , , , , , , , , , , , , , , , ,  |   |
| Criteria                         | Dosage Rate: 5-30 mg-solid Lime/I  | Dosage Rate: 5-30 mg-solid Lime/l   |
| Requirement                      |  | - Maximum 20.8 mg/l   |
| by Alum Dosage                   |  | - Average 10.4 mg/l   |
| oj man bosage                    | - Minimum 3.5 mg/l   | - Minimum 3.5 mg/l  |
|                                  |  | Lime Solution 10 % sg = 1.0607  |
|                                  | Retention Time 24 hours  | Retention Time 24 hours   |
|                                  | Dissolving Time 2 hours  | Dissolving Time 24 hours  |
|                                  | Dissolving Time 2 hours  | Dissolving Time 2 hours   |
| Dosage Amount                    | Wt max : 2,401 kg-Lime/day (for Max Alum dosage)   | Wt max = 800 kg-Lime/day (for Max Alum dosage)  |
| Dosage Amount<br>Alkali Solution | V max = 22.6 cu m/day (for Max Alum dosage)  | Wt max · 800 kg-Lime/day (for Max Alum dosage) V max = 7.5 cu m/day (for Max Alum dosage) |
| Alkali Solution                  | v max = 22.0 cu m/day (101 Max Alum dosage)  | V max = 7.5 cu m/day (101 wax Alum dosage)  |
| Solution Tank                    | Square 4 units   | Square 2 units  |
| Dimension                        | L m x W mx D m x units   | Square 2 units Lm x W mx Dm x units   |
| Dimension                        | 2.0 2.0 2.5 4  | 2.0 2.0 2.5 2   |
| ]                                | 2.0 2.0 4  | 2.0 2.0 2.3 2   |
| Total Volume                     | V = 40.0 cu m  | 30.0  |
|                                  |  | V = 20.0 cu m   |
| Retention Time                   | T = 42.4 hours (for Max Alum dosage)   | T = 63.6 hours (for Max Alum dosage)  |
| ,                                | Marin 1  |   |
| Dosage Rate                      | l.   | Maximum Average Minimum   |
| Ī                                | Pre (5-30 mg/l) 30 15 5  | Pre (5-30 mg/l) 30 15 5   |
|                                  | Post (5-20 mg/l) 20 5 5  | Post (5-20 mg/l) 20 5 5   |
|                                  |  | <u>.</u>  |
| Pump Capacity                    | Pre- 2 units each (excl. 1 unit stand-by)  | Pre- 1 units each (excl. I unit stand-by)   |
|                                  | Qmax = 113 liter/min 0.68 cu m/hr  | $Q_{\text{max}} = \frac{7.6 \text{ liter/min}}{0.45 \text{ cu m/hr}}$                     |
|                                  | Qmin = 1.9 liter/min 0.11 cu m/hr  | Qmin = Q 13 liter/min 0.08 cu m/hr  |
|                                  | Post- 2 units each (excl. 1 unit stand-by)   | Post- 1 units each (excl. 1 unit stand-by)  |
|                                  | Qmax = 7.6 liter/min 0.45 cu m/hr  | Qmax = 5.0 liter/min 0.30 cu m/hr   |
|                                  | Qmin = 1.9 liter/min 0.11 cu m/hr  | Qmin = 1/3 liter/min 0.08 cu m/hr   |
|                                  |  | -800,794-79 (494600)A0007-2-  |
| Storage                          | Period 30 days   | Period 30 days  |
| 5.0.050                          |  | <u> </u>  |
|                                  | (Bulk s. g   | Bulk's g   1140   |
| Storage Area                     | Bulk s. g. 0.40<br>A = 87 m2 at 2.0 m height   | Bulk s. g. 0.40<br>A = 29 m2 at 2.0 m height  |

| (3) Chlorination Equipm | nent                          |               |                           |                               |              | ]                  |                 |   |                               |             |  |  |
|-------------------------|-------------------------------|---------------|---------------------------|-------------------------------|--------------|--------------------|-----------------|---|-------------------------------|-------------|--|--|
| Injection Point         | Pre-Chlorine<br>Post-Chlorine |               | he Inlet o<br>l outlet of | f Distribution (<br>Filter    | Chamber      | Pre-Chl<br>Post-Ch |                 | at the Inlet of Distribution Chamber and outlet of Filter |                               |             |  |  |
| Туре                    | Liquid Chlor                  | ine (900 kg-c | ylinder)                  |                               |              | Liquid (           | Chlorine (900 k | lorine (900 kg-cylinder)                                  |                               |             |  |  |
| Dosage Rate             | ,                             | M             | laximum                   | Average                       | Minimum      |                    |                 | Maximum   | Average                       | Minimum     |  |  |
|                         | Pre (1.                       | 0-5.0 mg/.    | 5.0                       | 2.0                           | 1.0          | Pre                | (1.0-5.0 mg/.   | 5.0   | 2.0                           | 1.0         |  |  |
|                         | Post (0.                      | 5-1.0 mg/     | 2.0                       | 1.0                           | 0.5          | Post               | (0.5-1.0 mg/    | 2.0   | 1.0                           | 0.5         |  |  |
| Dosage Amount           | Wt =                          |               |                           | ay (Average)<br>our (Average) |              | Wt=                |                 | kg- Cl gas/da<br>kg- Cl gas/ho                            | iy (Average)<br>our (Average) |             |  |  |
| Chlorinator             | Vacuum Typ                    | e             |                           |                               |              | Vacuum             | ı Tvpe          |   |                               |             |  |  |
| Capacity                | Pre-                          |               | ts each                   | (excl. 1 unit s               | tand-by)     | Pre-               |                 | units each  | ch (excl. 1 unit stand-by)    |             |  |  |
| - *                     | Qmax =                        | 12.0 kg/      | hr                        | 288.75                        | kg/day       | Qmax =             | 8.0             | kg/hr   | •                             | kg/day      |  |  |
|                         | Qmin =                        | 2.4 kg/       | 'hr                       | 57.75                         | kg/day       | Qmin ==            | 1.6             | kg/hr   | 38.50                         | kg/day      |  |  |
|                         | Post-                         | 2 uni         | ts each                   | (excl. 1 unit s               | tand-by)     | Post-              | 1               | units each  | (excl. 1 unit                 | stand-by)   |  |  |
|                         | Qmax =                        | 4.8 kg/       | br                        | 115.50                        | kg/day       | Qmax =             | 3.2             | kg/hr   | 77.00                         | kg/day      |  |  |
|                         | Qmin =                        | 1.2 kg/       | hr                        | 28.88                         | kg/day       | Qmin =             | - 0.8           | kg/hr   | 19.25                         | kg/day      |  |  |
| Storage                 | Period                        |               | 30                        | ) days                        |              | Period             |                 | 30  | days                          |             |  |  |
| No. of Container        |                               | 14 uni        |                           | •                             |              |                    | 6               | units   | •                             |             |  |  |
| Storage Area            | A =                           | 28 m2         | as                        | 2.0                           | m2/container | A =                | 12              | m2 as   | 2.0                           | m2/containe |  |  |

| Alum - Spec | eific Gravity | Lime - Specific | Gravity |
|-------------|---------------|-----------------|---------|
| (% as Al2(S | O4)3-18H2O)   | (% as Ca (OH)2) | )       |
| 5           | 1.0254        | 5               | 1.0308  |
| 10          | 1.0525        | 10              | 1.0607  |
| 15          | 1.0804        | 15              | 1.0923  |

Sri Lanka - Greater Kandy Water Supply Augumentation Project Chemical Facility Capacity Calculation for Kahawwatta Reservoir Q=7,310 cu m/day

| Item                    |                  | Total Syste         | m                |              |                 | First              | Stage             |              |
|-------------------------|------------------|---------------------|------------------|--------------|-----------------|--------------------|-------------------|--------------|
| Plant Capacity          | Q=               | 7,310 cu m/day      |                  |              | Q=              | 4.240 eu m/day     |                   |              |
| (Daily Max)             |                  |                     |                  |              | •               | •                  |                   |              |
| Planned Flow            | Q=               | 7,310 cu m/day      |                  |              | Q=              | 4.240 cu m/day     |                   |              |
|                         | =                | 305 cu m/hour       |                  |              | =               | 177 cu m/hour      |                   |              |
|                         | =                | 5.1 cu n√min        |                  |              | =               | 2.9 cu m/min       |                   |              |
|                         | ==               | 0.085 cu m/sec      |                  |              | =               | 0.049 cu m/sec     |                   |              |
| Chlorine Dissolving Tan | k                |                     |                  |              | ·               |                    |                   |              |
| Chlorine                | Calcium Hypochlo | orite (Ca(Ocl)2•4H2 | O)               |              | Calcium Hypocl  | hlorite (Ca(OcI)2° | 4H2O)             |              |
|                         | containi         | ng 60               | % cl2            |              | contair         | ning               | 60 % e12          |              |
|                         |                  |                     |                  |              |                 |                    |                   |              |
| Criteria                | Dosage Rate:     | 0.5 - 2             | nıg-solid alum   | /t           | Dosage Rate :   | 0.5                | - 2 mg-solid alur | n/i          |
|                         | - Maximum        | 2                   | mg/l             |              | - Maximum       |                    | 2 mg/l            |              |
|                         | - Average        | 1                   | mg/l             |              | - Average       |                    | l mg/l            |              |
|                         | - Minimum        | 0.5                 | mg/l             |              | - Minimum       | (                  | ).5 mg/l          |              |
|                         | Solution:        | 5                   | % sg =           | 1.0247       | Solution:       |                    | 5 % sg =          | 1.0247       |
|                         | Retention Time   | 24                  | hours            |              | Retention Time  |                    | 24 hours          |              |
|                         | Dissolving Time  | 2                   | hours            |              | Dissolving Time | •                  | 2 hours           |              |
| Dosage Amount           | Wt =             | 12.18 kg-chlorine/d | laγ              | (Ave dosage) | <br>Wt =        | 7.07 kg-Alum/d     | av (Ave dosage)   |              |
| Chlorine Solution       | Vmax =           | 0.48 cu m/day       | (Max dosage)     |              | Vmax =          | 0.28 cu m/day      | (Max dosage)      | )            |
|                         | Vave =           | 0.24 cu m/day       | (Ave dosage)     |              | Vave =          | 0.14 cu m/day      | (Ave dosage)      |              |
| Solution Tank           | Square           | 1 units             |                  |              | Square          | 1 units            |                   |              |
| Dimension               | L'm x W          | mx Dm               | x units          |              | Lm x W          | mx Dm              | x units           |              |
|                         | 0.9              | 0.9 0.9             | 1                |              | 0.9             |                    | ).9 1             |              |
| Total Volume            | \ <b>V</b> =     | 0.7 cu m            |                  |              | V =             | 0.7 cu m           |                   |              |
| Retention Time          | T =              | 36.8 hours for max  | timum dosing     |              | T =             | 63.4 hours for n   | naximum dosing    |              |
| Chlorination Pump       |                  | 1 units each        | (excl. I unit st | and-by)      |                 | l units            | (excl. 1 unit s   | tand-hvì     |
| * 1                     | Qmax =           | 0.33 liter/min      | •                | -,           | Qmax =          | 0.19 liter/min     | •                 | cu m/hr      |
| Cupacity                | Qmia =           | 0.08 liter/min      |                  | cum/hr       | Qmin =          | 0.05 liter/min     | <b>-</b>          | cu n/hr      |
| Storage                 | Period           | 30                  | davs             |              | Period          |                    | 30 days           |              |
| No. of Container        |                  | 3 units             | uu yo            |              | LONG            | 3 units            | Jo days           |              |
|                         | A =              | 0.375 m2 as         | 0.00             | m2/container |                 | 0.375 m2 as        | 0.445             | m2/container |

Hypo-chlorite (% as Ca(Ocl)2\*4H2O) 5 1.0247 SURGE ANALYSIS ウォーターハンマ計算条件

Calculation No.

計算番号 C2-1010IN

PAGE

Sample

Intake Pump

Standard Level 基準レベル Calculation Time Unit 計算時間単位

436.940 m .06140 sec

【 管路仕様 】 Pipeline Specifications

Valve No.

| No,           | Length           | Material   | Diame<br>s      | ter<br>Thickness | Modulus of Elasticity | - F   | Pump No.           | Surge Tank<br>No.      |       | Flow<br>Pipeline End           | Pipe Loss         | Valve Loss        | Reciprocation Time          | TO I           | Division |
|---------------|------------------|------------|-----------------|------------------|-----------------------|-------|--------------------|------------------------|-------|--------------------------------|-------------------|-------------------|-----------------------------|----------------|----------|
| 管路<br>名称<br>1 | 管長<br>m<br>420.0 | 管種<br>SS 1 | 管径<br>mm<br>800 | 管厚<br>mm<br>7.0  | ヤング<br>率<br>2.100     | 上流の管路 | ポンプ<br>番号<br>1 0 0 | サージ・<br>タンク<br>番号<br>0 | 弁番号 0 | 終点 管路流量<br>条件 m3/m<br>1 80.210 | 配管<br>損失<br>4.400 | 弁絞<br>損失<br>1,000 | 圧力波<br>往復時間<br>sec<br>.8596 | 管路定数<br>1.6539 | 分割<br>14 |

## 【 ポンプ仕様 】 Pump Specifications

Initial Condition

| Pu  | mp N | o, Vai   | ve Close  |            |          | Motor  |       |                 |           |       | Inertial Efi | fect         |              |         |       |
|-----|------|----------|-----------|------------|----------|--------|-------|-----------------|-----------|-------|--------------|--------------|--------------|---------|-------|
| No. |      | Type     | Valve No. | Total Head | Capacity | Output | Pole  | Type Pump/Motor | Churchaal | , I   | Efficiency   | Head         | Capacity     | Speed T | orque |
|     |      |          | 弁 弁       |            | 1 ,      | 1      | 1 010 | Type Tumpanotor | Flywheen  | Speed | 効 減衰         |              | 소            | ek.     |       |
| 番   | 台    | 形        | 閉番        | 全揚程        | 吐出量      | 出力     | 極     | 型 ポンプ・モータ       | フライホイール   | 回転数   | 率 定数         | 揚程           | - 初期状<br>吐出量 |         | トルク   |
| 号   | 数    | <b>注</b> | 鎖号        | m          | m3/m     | kw     | 数     | 式 kg-m2         | kg-m2     | min-1 | - γ ~ × k    | 1901±<br>[7] | m3/m         | 四 私 致   | טעיו  |
| ļ   | 3    | I        | i U       | 44.000     | 26.740   | 250.0  | 4     | 1 30.000        | . 000     | 1480  | 87 1. 2263   | 44.000       | 26. 740      | 1.000   | 1.000 |

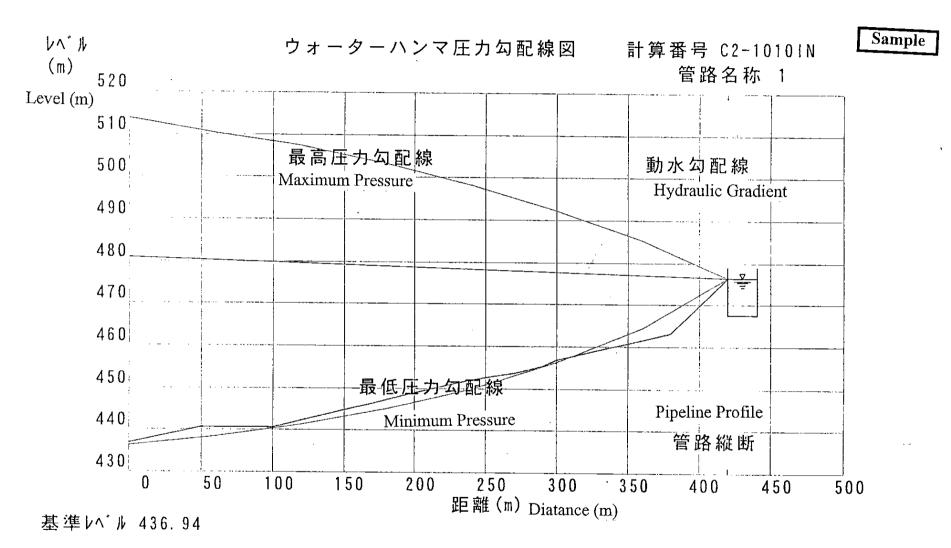
## 【 圧力線図仕様 】 Pressure Gradients

Pipeline No.

管路名称 1

# 【 縦断仕様 】 Pipeline Profile

| Pipeline No | Cumulative<br>Distance (m) | Level (m) | Cumulative<br>Distance (m) | Level (m) | Cumulative<br>Distance (m) | Level (m) | Cumulative<br>Distance (m) | Level (m) |
|-------------|----------------------------|-----------|----------------------------|-----------|----------------------------|-----------|----------------------------|-----------|
| 管路          | 追加距離                       | レベル       | 追加距離                       | レベル       | 追加距離                       | レベル       | 追加距離                       | レベル       |
| 名称          | m                          | m         | , <b>m</b>                 | m         | m                          | m         | m                          | m         |
| 1           | . 0                        | 436.94    | 50.0                       | 440.83    | 100.0                      | 440.83    | 120.0                      | 442.43    |
|             | 150.0                      | 444.83    | 170.0                      | 446.43    | 200, 0                     | 448, 83   | 240.0                      | 452.03    |
|             | 270.0                      | 453.63    | 290.0                      | 455, 23   | 300.0                      | 456, 83   | 340.0                      | 460.03    |
|             | 360.0                      | 461, 63   | 380.0                      | 463.23    | 410.0                      | 472.83    | 420.0                      | 476.54    |



INTAKE PUMP

ウォーターハンマ計算条件

計算番号 C2-10101N

PAGE 1

Intake Pump

基準レベル 計算時間単位 436.940 m .06140 sec

【 管路仕様 】

| 色加工水     | <b>4</b> |      |     |     |        |       |       | 4-2.* | 4> |    |        | #3 <b>6</b> 5 | + %      | 压力油         |        |    |
|----------|----------|------|-----|-----|--------|-------|-------|-------|----|----|--------|---------------|----------|-------------|--------|----|
| 管路<br>名称 | 管長       | 管種   | 管径  | 管厚  | ヤング    | 上流の管路 | ポンプ   | タンク   | 番  | 終点 | 管路流量   | 能官<br>損失      | 升权<br>損失 | 圧刀液<br>往復時間 | 管路定数   | 分割 |
| 名称       | m        |      |     |     |        |       |       |       |    |    |        |               |          |             |        |    |
| 1        | 420.0    | SS 1 | 800 | 7.0 | 2. 100 |       | 1 0 0 | 0     | 0  | 1  | 80.210 | 4.400         | . 000    | . 8596      | 1.6539 | 14 |

【 ポンプ仕様 】

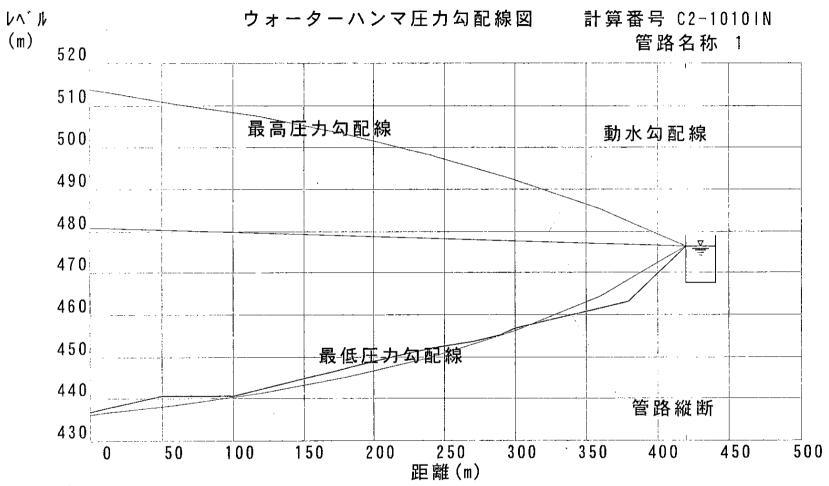
|   |   |   | 弁      | 弁 |        |        |       |   |    |         |         | 効       | 減衰     |        | 7// 共の 1人 : | 態     |        |
|---|---|---|--------|---|--------|--------|-------|---|----|---------|---------|---------|--------|--------|-------------|-------|--------|
| 番 | 台 | 形 | 閉      | 番 | 全揚程    | 吐出量    | 出力    | 極 | 型: | ポンプ・モ−タ | フライホイール | 回転数 率   | 定数     | 揚程     | 吐出量         | 回転数   | トルク    |
| 亭 | 数 | 土 | 閉<br>鎖 | 号 | m      | m3/m   | kw    | 数 | 茳  | kg-m2   | kg−m2   | min−1 % | k      | m      | m3/m        |       |        |
| 1 | 3 | 1 | 1      | 0 | 44.000 | 26.740 | 250.0 | 4 | 1  | 30.000  | . 000   | 1480 87 | 1.2263 | 44.000 | 26.740      | 1.000 | 1. 000 |

【 圧力線図仕様 】

管路名称 1

【 縦断仕様 】

| 縦断仕 | 禄】    |         |       |         |       |        |       |         |
|-----|-------|---------|-------|---------|-------|--------|-------|---------|
| 管路  | 追加距離  | レベル     | 追加距離  | レベル     | 追加距離  | レベル    | 追加距離  | レベル     |
| 名称  | m     | m       | m     | m       | m     | m      | m     | m       |
| 1   | . 0   | 436.94  | 50.0  | 440.83  | 100.0 | 440.83 | 120.0 | 442, 43 |
|     | 150.0 | 444.83  | 170.0 | 446.43  | 200.0 | 448.83 | 240.0 | 452.03  |
|     | 270.0 | 453, 63 | 290,0 | 455. 23 | 300.0 | 456.83 | 340.0 | 460.03  |
|     | 360 0 | 461 63  | 380 0 | 463 23  | 41N N | 472 83 | 420 0 | 476 54  |



基準レベル 436.94

INTAKE PUMP

ウォーターハンマ計算条件

計算番号 C2-1010-A1

PAGE 1

Clear Water Pump (A1)

基準レベル 計算時間単位

442.610 m .01023 sec

|  | 管 | 路 | 仕 | 様 | ] |
|--|---|---|---|---|---|
|--|---|---|---|---|---|

| Ē | 写的江惊     | . 1     |      |     |      |            |          |   |    |            | サージ | 弁  |    |         | 配管       | 弁絞    | 圧力波     |          |     |
|---|----------|---------|------|-----|------|------------|----------|---|----|------------|-----|----|----|---------|----------|-------|---------|----------|-----|
|   | 管路<br>名称 | 管長      | 管種   | 管径  | 管厚   | ヤング        | 上流の管路    |   | ンフ | <b>o</b> ° | タンク | 番号 | 終点 | 管路流量    | 配管<br>損失 | 損失    | 往復時間    | 管路定数     | 分割  |
|   | 名称       | m       |      | mm  | mm   | <u> 34</u> |          | 翟 | 号  |            | 番号  | 号  | 条件 | m3/m    | m        | tn    | sec     |          |     |
|   | - i      | 10.0    | SS 1 | 800 | 7. 0 | 2.100      |          | 1 | 0  | 0          | 0   | 0  | 0  | 12. 215 | . 100    | . 000 | . 0205  | 1. 6539  | 2   |
|   | ż        | 1384. 0 | FCD3 | 700 | 10.0 | 1.600      | 1        | 0 | 0  | 0          | 0   | 0  | 0  | 12. 215 | . 800    | . 000 | 2.6815  | 2. 2820  | 264 |
|   | 3        | 2059. 0 | FCD3 | 400 | 7. 0 | 1.600      | ż        | Õ | ñ  | Ō          | Ō   | Ó  | 1  | 3.044   | 1.300    | . 000 | 3.8112  | 7. 3153  | 372 |
|   | A        | 1308. 0 | FCD3 | 700 | 10.0 | 1.600      | 2        | ñ | ñ  | ň          | Ŏ   | ň  | Ó  | 9, 171  | . 500    | . 000 | 2. 5342 | 2. 2820  | 248 |
|   | 5        | 237. 0  | FCD3 | 500 | 8. 0 | 1. 600     | 1        | ñ | ñ  | ñ          | ň   | ก  | ī  | 7. 803  | . 300    | . 000 | . 4473  | 4.5912   | 44  |
|   | 6        | 100.0   | FCD3 | 200 | 6. 0 | 1. 600     | 1        | ñ | ň  | ň          | ň   | ň  | ń  | 1. 368  | . 100    | 000   | . 1679  | 32, 2567 | 16  |
|   | 0        |         |      |     |      |            | <b>4</b> | 0 | 0  | ۸          | 0   | ň  | 1  | 1. 368  | 10.000   | . 000 | 3.6906  | 32. 2567 | 360 |
|   | 1        | 2198.0  | FCD3 | 200 | 6.0  | 1.600      | ь        | 2 | U  | U          | U   | U  | I  | 1. 300  | 10.000   | . 000 | 3. 0300 | JZ. 2301 | 300 |

# 【ポンプ仕様】

| 小ノノ | / 11 fs | <b>F</b> | 台  | 华         |         |       |        |   |         |         | 効       | 減衰      |         | - 初期状   | 態      |        |
|-----|---------|----------|----|-----------|---------|-------|--------|---|---------|---------|---------|---------|---------|---------|--------|--------|
| 番   | 台       | 形        | 혦  | 番 全揚程     | 吐出量     | 出力    | 極      | 型 | ポンプ・モータ | フライホイール | 回転数 率   | 定数      | 揚程      | 吐出量     |        | トルク    |
| 番号  | 数       | ÷Ψ       | 鎖  | 异         | m3/m    | kw    | 極<br>数 | 定 | kg-m2   | kg-m2   | min-1 % | k       | m       | m3/m    |        |        |
| Í   | î       | ĩ        | ~î | 0 130 300 | 12, 215 | 450.0 | 4      | 1 | 63.000  | 100.000 | 1475 80 | . 3343  | 130.300 | 12, 215 | 1.000  | 1.000  |
| ż   | i       | i        | i  | 0 60.000  | 1.368   | 30.0  | 4      | 1 | 1.960   | . 000   | 1470 77 | 1. 4996 | 60.000  | 1.368   | 1. 000 | 1. 000 |

## 【 圧力線図仕様 】

管路名称 1 2 4 6 7

## 【 縦断什梯 】

| を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を<br>を | では<br>追加距離 | レベル     | 追加距離   | レベル    | 追加距離   | レベル     | 追加距離          | レベル・    |
|---|------------|---------|--------|--------|--------|---------|---------------|---------|
| 名称  | m          | m       | m      | m      | m      | m       | m             | m       |
| 1   | . 0        | 440.86  | 10.0   | 440.86 |        |         |               |         |
| 2   | 10.0       | 440.86  | 300.0  | 445.00 | 450.0  | 441.59  | <b>500.</b> 0 | 442.50  |
|   | 510.0      | 445.00  | 640.0  | 445.00 | 650.0  | 441.25  | 970.0         | 440.90  |
|   | 1270.0     | 454.00  | 1384.0 | 451.63 |        |         |               |         |
| 3   | 1384.0     | 451, 63 | 1391.0 | 448.09 | 1418.0 | 445. 29 | 1464.0        | 447. 75 |
| _   | 1486.0     | 451.70  | 2035.0 | 494.90 | 2114.0 | 494, 90 | 2433.0        | 506.80  |
|   | 2691.0     | 494.01  | 3129.0 | 526.80 | 3262.0 | 547. 92 | 3393.0        | 557.92  |
|   | 3443.0     | 558.50  |        |        |        |         |               |         |

ウォーターハンマ計算条件

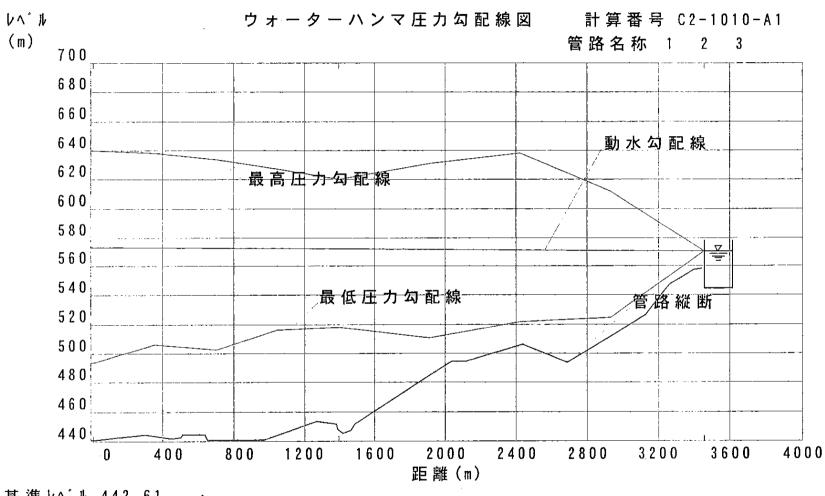
計算番号 C2-1010-A1

PAGE 2

| 1 | 世管名 4 5 6 7 6 7 | 追加距離<br>1384.0<br>2316.0<br>2692.0<br>2879.0<br>2692.0 | レベル<br>#<br>451. 63<br>524. 62<br>524. 40<br>562. 98<br>524. 40<br>524. 40 | 追加距離<br>1444.0<br>2586.0<br>2716.0<br>2929.0<br>2702.0<br>2711.0 | レベル<br>m<br>450.70<br>524.30<br>527.03<br>563.00<br>524.40<br>524.79 | 追加距離<br>1958.0<br>2692.0<br>2783.0 | レベル<br>483. 25<br>524. 40<br>524. 38 | 追加距離<br>2039.0<br>2833.0<br>3480.0 | レベル<br>m<br>481.70<br>535.58<br>553.58 |  |
|---|-----------------|--|--|--|--|------------------------------------|--------------------------------------|------------------------------------|--|--|
|   | 7               | 2702. 0<br>3580. 0<br>4665. 0<br>4990. 0               | 524. 40<br>548. 90<br>552. 25<br>604. 00                                   | 2711.0<br>3697.0<br>4693.0                                       | 524. 79<br>554. 22<br>553. 24  | 2793. 0<br>3822. 0<br>4809. 0      | 519.34<br>551.25<br>562.07           | 3480. U<br>4172. 0<br>4940. 0      | 553, 58<br>570, 03<br>590, 27          |  |

æ

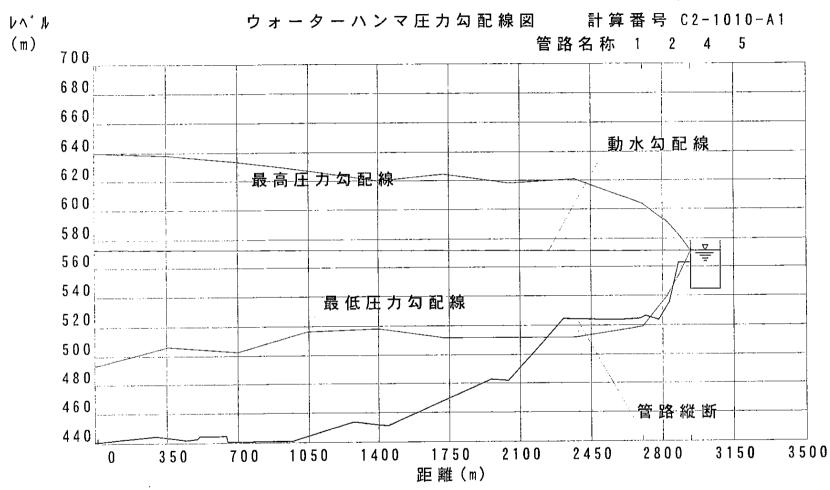
.



基準 レペル 442.61

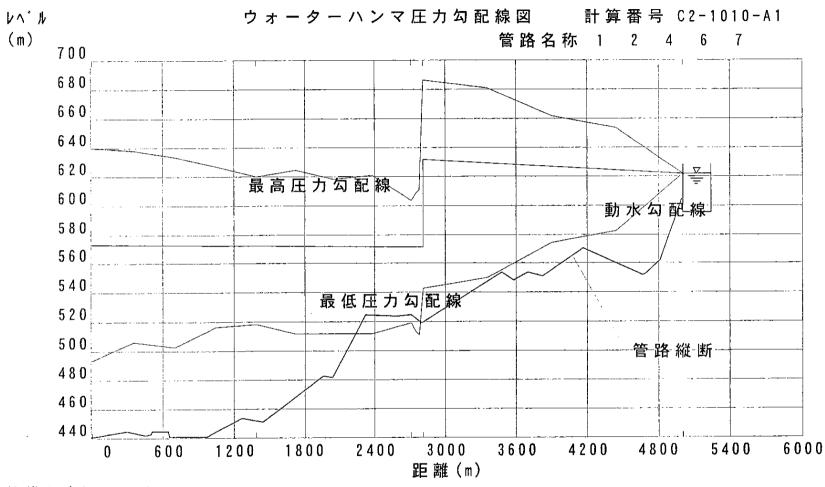
Al Purp

\* To upland Reservoir



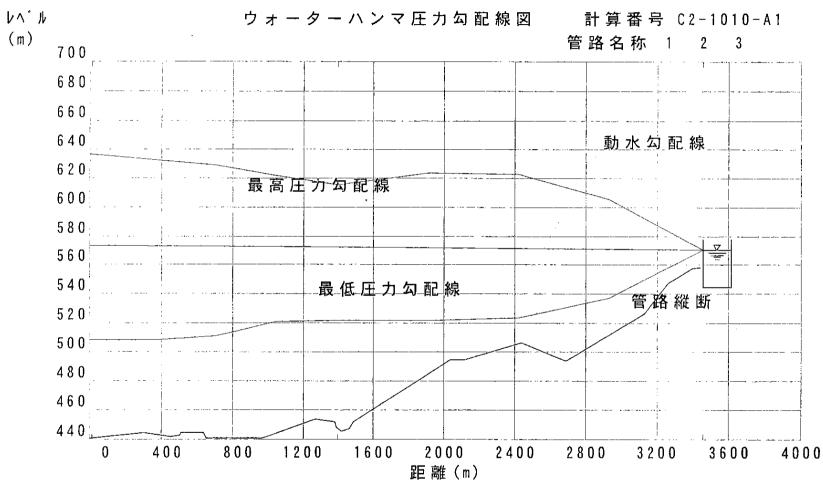
基準 レペル 442.61

Al Rompi To Asgirija ResorvaiR



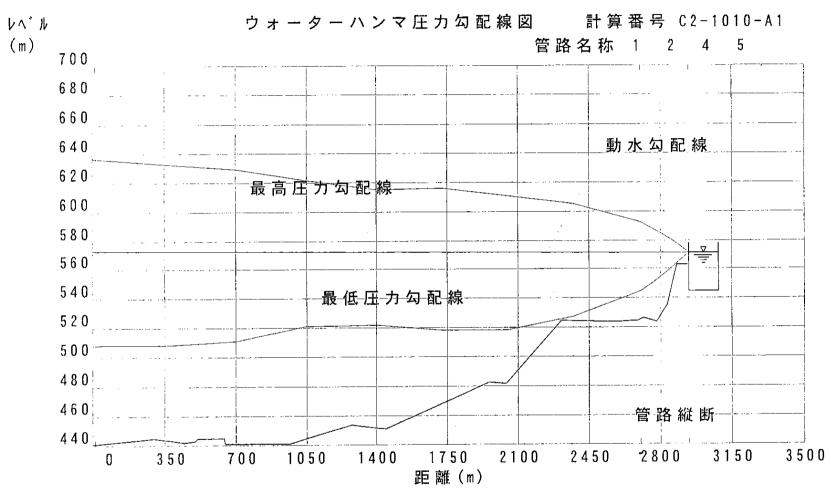
基準 V^\* N 442.61 A/ PM/>

艺科 To Bahira wakada Reservoir



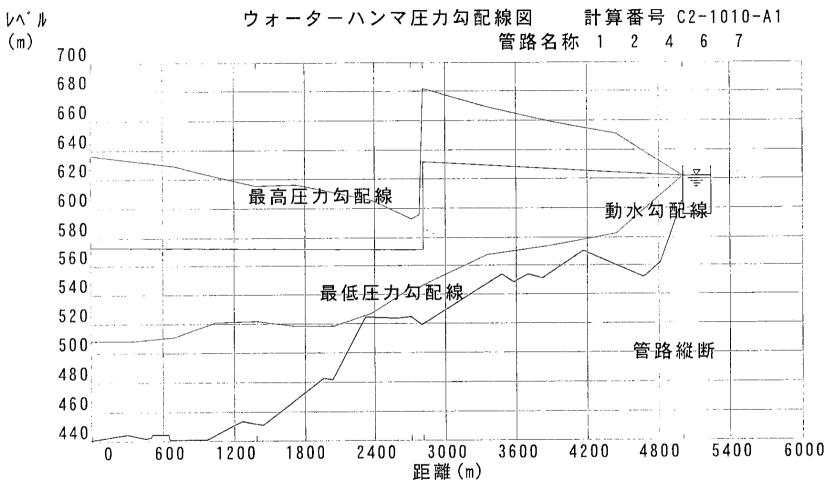
基準 レベル 442.61

with Flyshal rosofti To upland Reservoir



基準 レベル 442.61

with Flywheel 10019 m² to Asfirita Reservoir



基準レベル 442.61

with Elywhal coogs and

To Bahivawakada Reservoja

計算番号 C2-1010-A1

PAGE 1

Clear Water Pump (A1)

基準レベル 計算時間単位

442.610 m .01023 sec

| • | <b>(1)</b> | ᇡ  | 21 | 134 | , |
|---|------------|----|----|-----|---|
| L | 管          | ĽΩ | 1  | 1按  |   |

| 管路<br>名称 | 管長     | 管種   | 管径<br>mm | 管厚   | ヤング<br>率 | 上流の管路 |   | 、<br>番号 |   | ァーソ<br>タンク<br>番号 | 开番号 | 終点<br>条件 | 管路流量<br>m3/m | 配官<br>損失<br>m | 开段<br>損失 | 上刀波<br>往復時間<br>sec | 管路定数     | 分割  |
|----------|--------|------|----------|------|----------|-------|---|---------|---|------------------|-----|----------|--------------|---------------|----------|--------------------|----------|-----|
| 1        | 10.0   | SS 1 | 800      | 7.0  | 2. 100   |       | 1 | 0       | 0 | 0                | 0   | 0        | 12. 215      | . 100         | . 000    | . 0205             | 1.6539   | 2   |
| 2        | 1384.0 | FCD3 | 700      | 10.0 | 1.600    | 1 .   | 0 | 0       | 0 | 0                | 0   | 0        | 12. 215      | . 800         | . 000    | 2.6815             | 2. 2820  | 264 |
| 3        | 2059.0 | FCD3 | 400      | 7.0  | 1.600    | 2     | 0 | 0       | 0 | 0                | 0   | 1        | 3. 044       | 1.300         | . 000    | 3.8112             | 7. 3153  | 372 |
| 4        | 1308.0 | FCD3 | 700      | 10.0 | 1.600    | 2     | 0 | 0       | 0 | 0                | 0   | 0        | 9. 171       | . 500         | . 000    | 2.5342             | 2. 2820  | 248 |
| 5        | 237.0  | FCD3 | 500      | 8. 0 | 1.600    | 4     | 0 | 0       | 0 | 0                | 0   | 1        | 7.803        | . 300         | . 000    | . 4473             | 4. 5912  | 44  |
| 6        | 100.0  | FCD3 | 200      | 6.0  | 1.600    | 4     | 0 | 0       | 0 | 0                | 0   | 0        | 1.368        | . 100         | . 000    | . 1679             | 32. 2567 | 16  |
| 7        | 2198.0 | FCD3 | 200      | 6.0  | 1.600    | 6     | 2 | 0       | 0 | 0                | 0   | 1        | 1.368        | 10.000        | . 000    | 3.6906             | 32. 2567 | 360 |

### 【 ポンプ仕様 】

|   |   |   | 弁 | 弁 |         |       |       |   |     |          |         | 効       | 減衰     |         | T// #// 1/\ /&: |       |
|---|---|---|---|---|---------|-------|-------|---|-----|----------|---------|---------|--------|---------|-----------------|-------|
| 番 | 台 | 形 | 閉 | 番 | 全揚程     | 吐出量   | 出力    | 極 | 型 / | キ゚ンプ・モータ | フライホイール | 回転数 率   | 定数     | 揚程      | 吐出量 回転数         | トルク   |
| 号 | 数 | 定 | 鎖 | 号 | m       | m3/m  | kw    | 数 | 炷   | kg−m2    | kg-m2   | min−1 % | k      | m       | m3/m            |       |
| 1 | 1 | 1 | 1 | 0 | 147.000 | 2.400 | 450.0 | 4 | 1   | 63.000   | 100.000 | 1475 35 | . 1694 | 147.000 | 2. 400 1, 000   | 1.000 |
| 2 | 1 | 1 | 1 | 0 | 46.000  | 2.400 | 30. O | 4 | 1   | 1.960    | . 000   | 1470 55 | 2.8239 | 46.000  | 2, 400 1, 000   | 1.000 |

### 【 圧力線図仕様 】

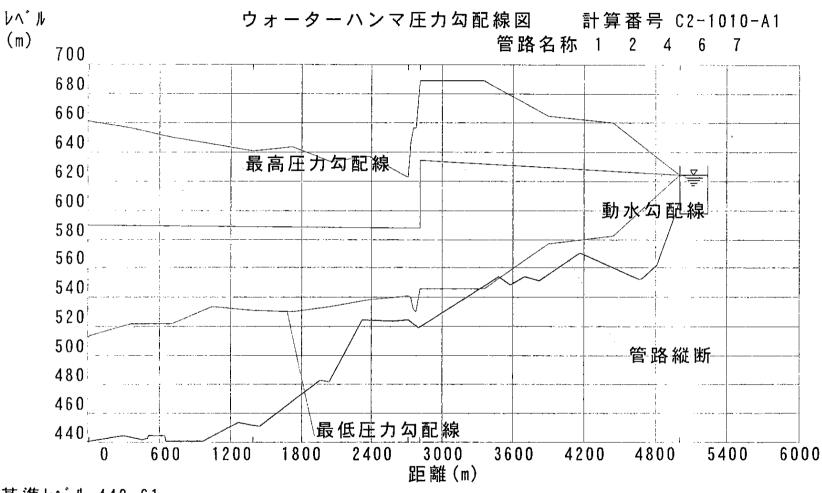
管路名称 1 2 4 6 7

# 【 縦断什梯 】

| 税 断 1 工<br>管路 | 像 』<br>追加距離 | レベル     | 追加距離   | レベル     | 追加距離   | レベル     | 追加距離   | レベル     |
|---------------|-------------|---------|--------|---------|--------|---------|--------|---------|
| 名称            | m           | m       | m      | m       | m      | m       | m      | m       |
| 1             | . 0         | 440.86  | 10.0   | 440, 86 |        |         |        |         |
| 2             | 10.0        | 440, 86 | 300.0  | 445.00  | 450.0  | 441.59  | 500, 0 | 442, 50 |
|               | 510.0       | 445.00  | 640.0  | 445.00  | 650.0  | 441.25  | 970.0  | 440.90  |
|               | 1270.0      | 454.00  | 1384.0 | 451.63  |        |         |        |         |
| 3             | 1384.0      | 451.63  | 1391.0 | 448, 09 | 1418.0 | 445. 29 | 1464.0 | 447, 75 |
|               | 1486.0      | 451.70  | 2035.0 | 494.90  | 2114.0 | 494.90  | 2433.0 | 506, 80 |
|               | 2691.0      | 494.01  | 3129.0 | 526.80  | 3262.0 | 547.92  | 3393.0 | 557.92  |
|               | 3443.0      | 558.50  |        |         |        |         |        |         |

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| r | 縦断仕 | <b>港</b> 】 |         |        |                 |         |         |         |         |
|---|-----|------------|---------|--------|-----------------|---------|---------|---------|---------|
|   | 管路  | 追加距離       | レベル     | 追加距離   | レベル             | 追加距離    | レベル     | 追加距離    | レベル     |
|   | 名称  | m          | मा      | m      | m               | n       | m       | m       | m       |
|   | 4   | 1384.0     | 451,63  | 1444.0 | 450.70          | 1958.0  | 483. 25 | 2039. 0 | 481.70  |
|   |     | 2316.0     | 524.62  | 2586.0 | 524.30          | 2692, 0 | 524.40  |         |         |
|   | 5   | 2692.0     | 524.40  | 2716.0 | 527.03          | 2783.0  | 524.38  | 2833.0  | 535. 58 |
|   |     | 2879.0     | 562.98  | 2929.0 | 563. 0 <b>0</b> |         |         |         |         |
|   | 6   | 2692.0     | 524.40  | 2702.0 | 524.40          |         |         |         |         |
|   | 7   | 2702.0     | 524.40  | 2711.0 | 524.79          | 2793.0  | 519.34  | 3480.0  | 553. 58 |
|   | '   | 3580.0     | 548. 90 | 3697.0 | 554. 22         | 3822.0  | 551.25  | 4172.0  | 570.03  |
|   |     | 4665.0     | 552, 25 | 4693.0 | 553. 24         | 4809.0  | 562.07  | 4940.0  | 590. 27 |
|   |     | 4990.0     | 604.00  |        |                 |         |         |         |         |



基準 L N° N 442.61 At Pomp:

Bahirandrada Reservoir int the vala

計算番号 1010A2PE

PAGE

ClearWaterPump(A2)Ph3

基準レベル 計算時間単位 442.610 m .00848 sec

| r  | 管 | 収  | 4  | t羊  |  |
|----|---|----|----|-----|--|
| L. |   | 比日 | 11 | 177 |  |

| 管路<br>名称 | 管長<br>m | 管種   | 管径<br>mm | 管厚   | ヤング<br>率 | 上流の管路 |   | え<br>番号 |   | サージ<br>タンク<br>番号 | 弁番号 | 終点<br>条件 | 管路流量<br>m3/m | 配管<br>損失 | 弁絞<br>損失<br>『 | 圧力波<br>往復時間<br>sec | 管路定数     | 分割  |
|----------|---------|------|----------|------|----------|-------|---|---------|---|------------------|-----|----------|--------------|----------|---------------|--------------------|----------|-----|
| 1        | 612.0   | FCD3 | 350      | 6.5  | 1,600    |       | 1 | 0       | 0 | 0                | 0   | 0        | 3.852        | 2.510    | . 000         | 1. 1188            | 9.6740   | 132 |
| 2        | 890.0   | FCD3 | 300      | 6. 5 | 1,600    | 1     | 0 | 0       | 0 | 0                | 0   | 0        | 2. 118       | 3.360    | . 000         | 1. 5786            | 13. 5715 | 188 |
| 3        | 793.0   | FCD3 | 250      | 6.0  | 1.600    | 1     | 0 | 0       | 0 | 0                | 0   | 0        | 1.734        | . 990    | . 000         | 1.3808             | 19.9081  | 164 |
| 4        | 100.0   | FCD3 | 200      | 6. 0 | 1.600    | 3     | 0 | 0       | 0 | 0                | 0   | 1        | . 841        | . 180    | . 000         | . 1679             | 32. 2567 | 20  |
| 5        | 1785.8  | FCD3 | 200      | 6.0  | 1.600    | 3     | 0 | 0       | 0 | 0                | 0   | 0        | . 893        | 1. 210   | .000          | 2.9985             | 32. 2567 | 352 |
| 6        | 50.0    | FCD3 | 200      | 6.0  | 1.600    | 5     | 0 | 0       | 0 | 0                | 0   | 1        | . 476        | . 130    | . 00đ         | . 0840             | 32. 2567 | 10  |
| 7        | 10.0    | FCD3 | 200      | 6.0  | 1.600    | 5     | 0 | 0       | 0 | 0                | 0   | 1        | . 417        | . 180    | . 000         | . 0168             | 32, 2567 | 2   |
| 10       | 520.0   | FCD3 | 300      | 6.5  | 1.600    | 2     | 0 | 0       | 0 | 0                | 0   | 1        | 2. 118       | 1.740    | .000          | . 9223             | 13, 5715 | 108 |

### 【ポンプ仕様】

|   |    |   | 弁 | 弁   |        |       |       |   |    |         |         | 効       | 減衰     |         | - 初期状 | 態     |       |
|---|----|---|---|-----|--------|-------|-------|---|----|---------|---------|---------|--------|---------|-------|-------|-------|
| 番 | 台  | 形 | 閉 | 番   | 全揚程    | 吐出量   | 出力    | 極 | 型。 | ポンプ・モータ | フライホイール | 回転数 率   | 定数     | 揚程      | 吐出量   | 回転数   | トルク   |
| 목 | 娄攵 | 定 | 鍞 | 뮥   | m      | m3/m  | kw    | 数 | 疘  | kg-m2   | kg-m2   | min−1 % | k      | m       | m3/m  |       |       |
| 1 | 1  | 1 | 1 | 0 1 | 04.000 | 3.852 | 90. 0 | 4 | 1  | 8.300   | 20.000  | 1470 74 | . 5275 | 104.000 | 3.852 | 1.000 | 1.000 |

### 【 圧力線図仕様 】

| 管路名称 | 1 | 2 | 10 |   |
|------|---|---|----|---|
| 管路名称 | 1 | 3 | 4  |   |
| 管路名称 | 1 | 3 | 5  | 6 |
| 管路名称 | 1 | 3 | 5  | 7 |

# 【 縦断仕様 】

| 144 (A) (TT |        |         |       |        |        |         |       |        |
|-------------|--------|---------|-------|--------|--------|---------|-------|--------|
| 管路          | 追加距離   | レベル     | 追加距離  | レベル    | 追加距離   | レベル     | 追加距離  | レベル    |
| 名称          | m      | m       | m     | m      | m      | m       | m     | m      |
| 1           | . 0    | 444.67  | 225.1 | 456.51 | 282.2  | 454. 34 | 349.7 | 466.71 |
|             | 487.0  | 467.00  | 612.0 | 467.00 |        |         |       |        |
| 2           | 612.0  | 467, 10 | 699.3 | 469.83 | 779. 1 | 474. 34 | 887.9 | 453.74 |
|             | 1502.0 | 503.85  |       |        |        |         |       |        |
| વ           | 612 0  | 467 NO  | 833 7 | 476 33 | 1405 0 | 489 D6  |       |        |

Flywheel: 20kgf-m2

A2. Phase 3

| ウォーターハン | /マ計算条件 |
|---------|--------|
|---------|--------|

計算番号 1010A2PE PAGE 2

| 【縦断仕 | -様 】   |        |        |        |        |        |        |         |
|------|--------|--------|--------|--------|--------|--------|--------|---------|
| 管路   | 追加距離   | レベル    | 追加距離   | レベル    | 追加距離   | レベル    | 追加距離   | レベル     |
| 名称   | П      | m      | m      | m      | m      | m      | m      | m       |
| 4    | 1405.0 | 489.06 | 1505.0 | 524,00 |        |        |        |         |
| 5    | 1405.0 | 489.06 | 1872.1 | 493.39 | 2230.7 | 502.73 | 2521.9 | 486. 26 |
|      | 2672.4 | 497.54 | 2824.9 | 505.23 | 2979.8 | 507.98 | 3124.0 | 507.42  |
|      | 3190.8 | 519.59 |        |        | •      |        |        |         |
| 6    | 3190.8 | 519.59 | 3240.8 | 529.00 |        |        |        |         |
| 7    | 3190.8 | 519.59 | 3200.8 | 529,00 |        |        |        |         |
| 10   | 1502.0 | 503.85 | 1510.0 | 503.85 | 1585.0 | 496.42 | 1759.0 | 514, 59 |
| . •  | 1805.0 | 513.54 | 1865.0 | 515.98 | 1925.0 | 516.47 | 2012.0 | 523.27  |
|      | 2022.0 | 529.75 |        |        |        |        |        |         |

1. 計算インターバル 14

3. 管路の圧力変化

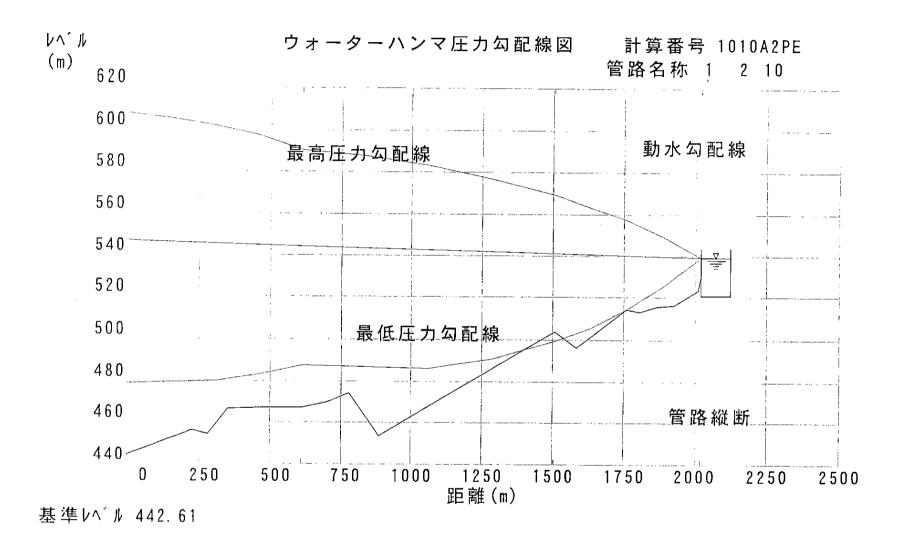
| ٠. | 日的い         | 江刀支孔     |         | 最高/    | 平力               |               |        | 最低日   | ドカ               |               |
|----|-------------|----------|---------|--------|------------------|---------------|--------|-------|------------------|---------------|
|    | 管路<br>番号    | 追加<br>距離 | 経過時間    | 流量     | 上/<br>圧力<br>(水頭) | 圧力<br>(レベル表示) | 経過時間   | 流量    | 上)<br>圧力<br>(水頭) | 圧力<br>(レペル表示) |
|    | ш,          | m        | sec     | m3/m   | m                | m             | sec    | m3/m  | m                | m             |
|    | 1           | . 0      | 5. 187  | . 000  | 164. 599         | 607. 209      | 2, 060 | . 001 | 35.860           | 478. 470      |
|    | 1           | 153, 0   | 5. 217  | . 014  | 161.972          | 604. 582      | 2. 199 | 030   | 36.443           | 479.053       |
|    | 1           | 306.0    | 5.399   | , 228  | 158.777          | 601.387       | 2.339  | 073   | 37. 288          | 479.898       |
|    | 1           | 459.0    | 5, 268  | . 021  | 154. 513         | 597. 123      | 2. 259 | . 060 | 40. 388          | 482. 998      |
|    | 2           | . 0      | 5. 136  | . 452  | 147. 790         | 590. 400      | 2. 288 | . 072 | 44. 953          | 487. 563      |
|    | 2           | 222.5    | 5. 717  | , 886  | 145. 263         | 587.873       | 2.352  | . 082 | 44.041           | 486.651       |
|    | 2<br>2<br>2 | 445. 0   | 5.670   | . 859  | 140.758          | 583.368       | 2. 517 | . 094 | 43.619           | 486. 229      |
|    | 2           | 667.5    | 5. 734  | . 933  | 134. 256         | 576, 866      | 2. 471 | . 254 | 47. 751          | 490.361       |
|    | 3           | . 0      | 5, 136  | 761    | 147, 790         | 590. 400      | 2. 288 | 070   | 44, 953          | 487. 563      |
|    | 3           | 198.3    | 5. 573  | 155    | 139. 278         | 581.888       | 1.945  | . 453 | 52.614           | 495. 224      |
|    | 3           | 396.5    | 11.536  | 541    | 129.901          | 572, 511      | 1, 771 | . 663 | 60.891           | 503, 501      |
|    | 3           | 594.8    | 11.523  | 578    | 120. 307         | 562.917       | 8.802  | 956   | 72. 216          | 514.826       |
|    | 4           | . 0      | 11.697  | -1.092 | 111. 239         | 553, 849      | 1. 593 | . 311 | 87. 121          | 529.731       |
|    | 4           | 25.0     | 4.420   | -2.491 | 108, 717         | 551, 327      | 1. 572 | . 359 | 90. 190          | 532.800       |
|    | À           | 50.0     | 4, 399  | -2.535 | 106, 269         | 548.879       | 1. 551 | . 409 | 93, 411          | 536.021       |
|    | 4           | 75. 0    | 4. 403  | -2.524 | 103.471          | 546.081       | 1.530  | . 462 | 96. 788          | 539, 398      |
|    | 5           | . 0      | 11, 697 | . 741  | 111. 239         | 553.849       | 1, 593 | . 686 | 87. 121          | 529, 731      |
|    | 5           | 446.5    | 4, 577  | . 806  | 115.680          | 558.290       | 8. 272 | . 742 | 87. 315          | 529.925       |
|    | 5           | 892.9    | 4. 984  | . 875  | 111, 474         | 554. 084      | 9, 578 | . 652 | 89.532           | 532, 142      |
|    | 5           | 1339. 4  | 5. 221  | . 792  | 113.798          | 556. 408      | 6. 001 | . 809 | 87. 386          | 529, 996      |
|    | 6           | . 0      | 5, 425  | . 406  | 99, 915          | 542, 525      | 2, 831 | . 459 | 98. 187          | 540. 797      |
|    | 6           | 10. 0    | 5. 331  | . 385  | 99.874           | 542. 484      | 2.822  | . 459 | 98. 176          | 540.786       |
|    | 6           | 20. 0    | 5. 323  | . 385  | 99. 828          | 542, 438      | 2.814  | . 460 | 98. 182          | 540.792       |
|    | 6           | 30.0     | 5. 314  | . 384  | 99. 753          | 542.363       | 2.806  | . 461 | 98. 239          | 540.849       |
|    | 6           | 40. 0    | 5, 306  | . 382  | 99. 596          | 542, 206      | 2.797  | . 465 | 98, 453          | 541.063       |
|    | ~           | , •      |         |        |                  |               |        |       |                  |               |

ウォーターハンマ計算結果

計算番号 1010A2PE PAGE 4

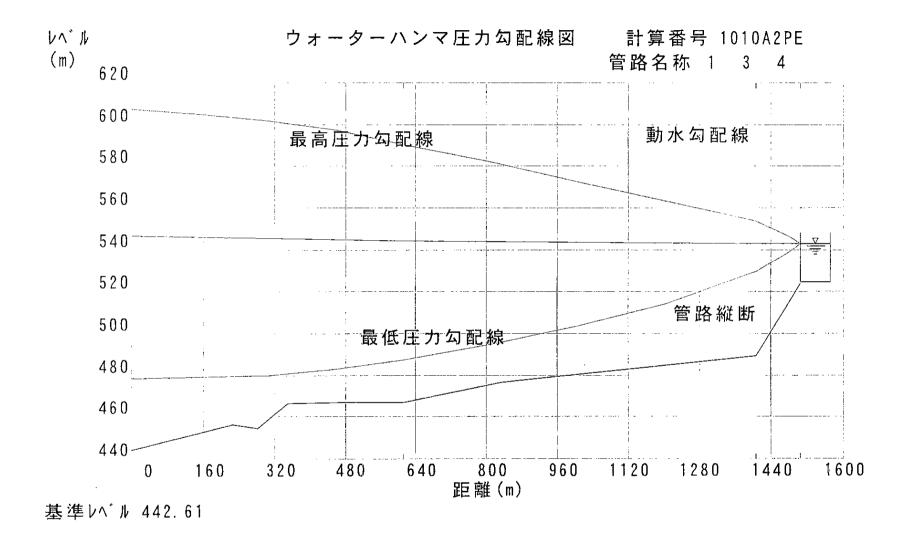
| 3. 管路の圧力変化 | 3. | 管 | 路 | の | 圧 | カ | 変 | ( | ۲ |
|------------|----|---|---|---|---|---|---|---|---|
|------------|----|---|---|---|---|---|---|---|---|

|                |                                   |                                      | 图 吉 1                           | ¬¬• +  |  |                                      | 最低月                                | L <del>-  </del>                         |  |
|----------------|-----------------------------------|--------------------------------------|---------------------------------|--|--|--------------------------------------|------------------------------------|--|--|
| 管路<br>番号       | 追加<br>距離                          | 経過時間                                 | 最高/<br>流量                       | ェハ<br>圧力<br>(水頭)                             | <br>圧力<br>(レベル表示)                            | 経過時間                                 | 流量                                 | エカ<br>圧力<br>(水頭)                         | 圧力<br>(レベル表示)                                |
| 田ワ             | M<br>M                            | s e c                                | m3/m                            | m  | m  | sec                                  | m3/m                               | m  | m  |
| 7<br>7         | . 0<br>5. 0                       | 5, 425<br>5, 344                     | . 464<br>. 390                  | 99. 915<br>99. 514                           | 542, 525<br>542, 124                         | 2.831<br>2.835                       | . 287<br>. 279                     | 98. 187<br>98. 648                       | 540. 797<br>541. 258                         |
| 10<br>10<br>10 | . 0<br>130. 0<br>260. 0<br>390. 0 | 5, 899<br>5, 785<br>5, 670<br>5, 556 | 1. 140<br>. 911<br>. 710<br>415 | 126. 555<br>120. 243<br>114. 780<br>106. 801 | 569, 165<br>562, 852<br>557, 390<br>549, 411 | 2. 272<br>2. 157<br>2. 043<br>1. 928 | . 593<br>. 836<br>1. 152<br>1. 572 | 56. 737<br>63. 262<br>71. 660<br>82. 596 | 499. 347<br>505. 872<br>514. 270<br>525. 206 |

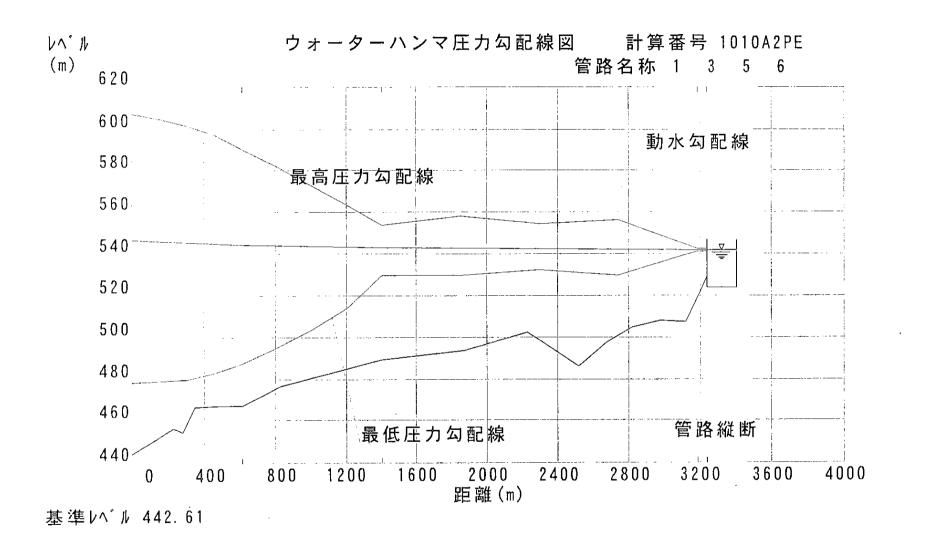


to Kondadeniya

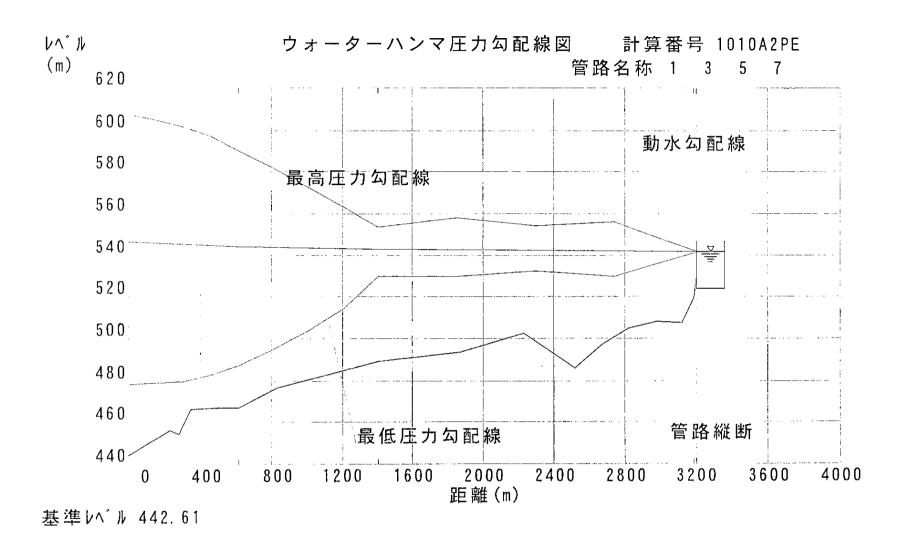
Phase 3 Flywheel: 20 kgf-m²



to Gohagoda (Wegiriya) Phase 3 Flywheel: 20 kgf-m²



to Gohagoda (New) Phase 3. Flywheel: 20 kgf-m²



to Gohagoda (Old) Phase 3. Flywheel: 20kgf-m²

計算番号 C2-1010-A3

PAGE 1

Clear Water Pump (A3)

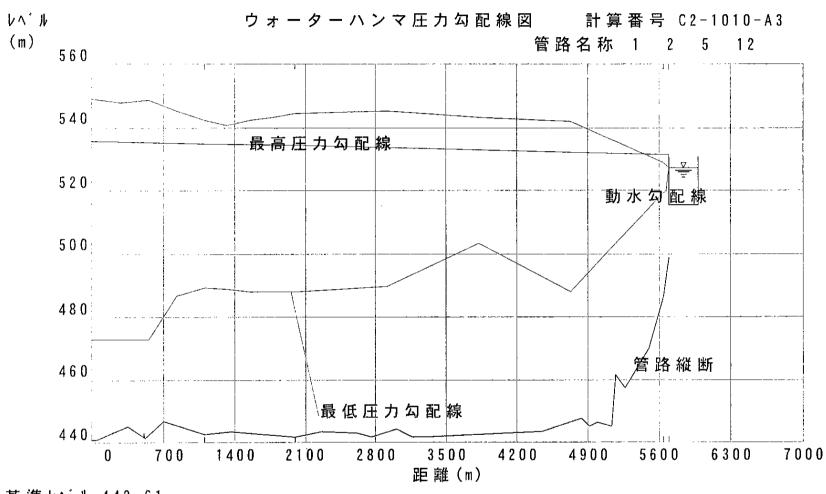
ウォーターハンマ計算条件

基準レベル 計算時間単位 442.610 m .04819 sec

|                                       | 計算時間単位                             | .04819 sec    |   |                                       |  |
|---------------------------------------|------------------------------------|---------------|---|---------------------------------------|--|
| 【 管路仕様 】                              |                                    |               | _ サージ 弁                                 | · · · · · · · · · · · · · · · · · · · | 弁絞 圧力波   |
| 管路 管長 管種<br>名称 m                      | 管径 管厚 ヤング                          | 上流の管路 ポン<br>番 | サージ 弁<br>ンプ タンク 番<br>等号 番号 号<br>O O O ( | :                                     | 損失 往復時間 管路定数 分割 sec  |
| 1 1107.0 FCD3                         | 600 9.0 1.600                      |               | 0 0 0 0                                 | 9. 989 . 900<br>0 7. 369 . 400        | . 000 2. 1204 3. 1419 44<br>. 000 1. 7009 3. 1419 36                                   |
| 2 888.0 FCD3<br>3 1783.0 FCD3         | 600 9.0 1.600<br>600 9.0 1.600     | 1 0           | 0 0 0 0                                 | 0 2.620 .200                          | . 000 3. 4152 3. 1419 70   |
| 4 882.0 FCD3                          | 200 6. 0 1. 600                    | 2 0           | 0 0 0 0                                 | 1 1.166 1.400                         | 36, 000 1, 4810 32, 2567 30  |
| 5 3653. 0 FCD3<br>6 3541. 0 FCD3      | 500 8, 0 1, 600<br>300 6, 5 1, 600 |               |   | 0 6. 203 2. 900<br>0 1. 713 3. 200    | . 000 6. 8950 4. 5912 144<br>. 000 6. 2807 13. 5715 132                                |
| 7 904.0 VP 1                          | 225 12.7 .027                      | 3 0           | 0 0 0                                   | ) 1 .907 .900                         | 7. 000 4. 8451 7. 9846 100   |
| 8 921.0 FCD3                          | 200 6.0 1.600                      |               | 0 0 0 0                                 | 0 .732 .600                           | . 000 1. 5464 32. 2567 32  |
| 10 1305, 0 FCD3<br>9 252, 0 VP 1      | 250 6.0 1.600<br>225 12.7 .027     |               | 0 0 0 0                                 | 0 1 .981 1.000<br>0 1 .732 .200       | 2, 000 2, 2722 19, 9081 48<br>1, 000 1, 3506 7, 9846 28<br>10, 000 2, 1727 32, 2567 44 |
| 11 1294.0 FCD3                        | 200 6.0 1.600                      | 5 0           | 0 0 0 0                                 | ) 1 1.620 3.600                       | 10.000 2.1727 32.2567 44   |
| 12 50.0 FCD3                          | 500 8.0 1.600                      | 5 0           | 0 0 0 0                                 | 1 4. 583 . 100                        | 4. 000 . 0944 4. 5912 2  |
| 【ポンプ仕様】                               | 45                                 |               |   | <b>첫 试</b> 事                          | 初期状態   |
| # # # # # # # # # # # # # # # # # # # | 弁<br>番 全揚程 吐出<br>号 m m3/1          | 出力 極 型 ホ      | ポンプ・モータ フライホ                            | 効 減衰 が<br>はイール 回転数 率 定数               | 場程 吐出量 回転数 トルク   |
| 番 台 形 閉<br>号 数 式 鎖                    | 号 - 17 m - m3/1                    | n kw 数 式      | kg-m2 kg                                | g−m2 min−1 % k                        | m m3/m   |
| 1 1 1 1                               | 0 93,000 9,99                      | ) 250.0 4 1   | 29.000 .                                | 000 1475 78 1.1249                    | 93.000 9.990 1.000 1.000   |
| 【 圧力線図仕様 】                            |                                    |               |   |                                       |  |
| 管路名称 1 3                              | 6 10                               |               |   |                                       |  |

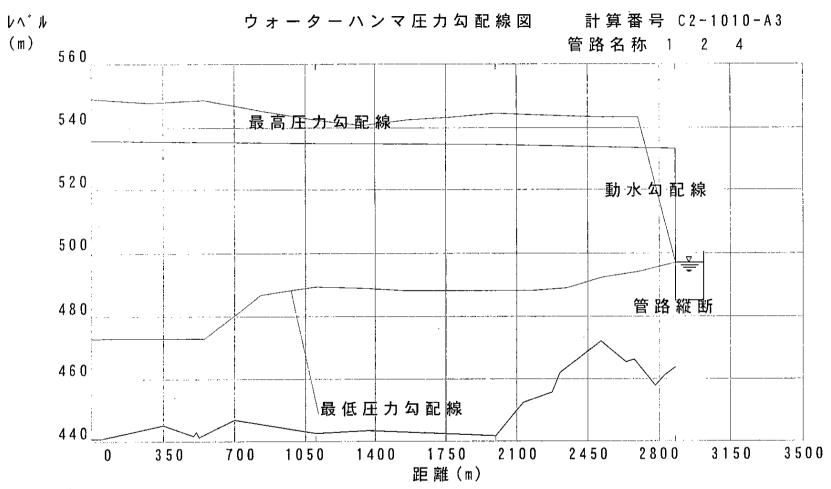
| ( | 縦断仕<br>管路 | 様 】<br>追加距離 | レベル     | 追加距離         | レベル     | 追加距離    | レベル     | 追加距離    | レベル     |
|---|-----------|-------------|---------|--------------|---------|---------|---------|---------|---------|
|   | 名称        |             | m .,,   | M W          | m       | m       | m       | m       | ır      |
|   | 1211      | m           | 111     |              |         |         |         |         |         |
|   | 1         | . 0         | 440.86  | 50. <b>0</b> | 440, 86 | 350.0   | 445.00  | 500.0   | 441. 59 |
|   | ,         | 509.0       | 442.85  | 522.0        | 441.23  | 701.0   | 446.85  | 1107.0  | 442. 52 |
|   | 2         | 1107.0      | 442. 52 | 1366.0       | 443.49  | 1995. 0 | 441. 50 |         | ,       |
|   | 3         | 1107.0      | 442, 52 | 1367.0       | 444. 57 | 1687.0  | 441.08  | 1906. 0 | 445. 22 |

| ľ | 縦断仕 | 様 】     |         |        |         |        | •             |                |         |
|---|-----|---------|---------|--------|---------|--------|---------------|----------------|---------|
| - | 管路  | 追加距離    | レベル     | 追加距離   | レベル     | 追加距離   | レベル           | 追加距離           | レベル     |
|   | 名称  | m       | m       | m      | m       | m      | m             | m              | m       |
|   |     | 2404.0  | 440.54  | 2890.0 | 440.74  |        |               |                |         |
|   | 4   | 1995.0  | 441.50  | 2135.0 | 452.30  | 2276.0 | 455.76        | 2315.0         | 461.79  |
|   |     | 2518.0  | 471.90  | 2639.0 | 465.30  | 2676.0 | 466.13        | 2785.0         | 457.89  |
|   |     | 2827.0  | 460.88  | 2877.0 | 463.50  |        |               |                |         |
|   | 5   | 1995.0  | 441.50  | 2254.0 | 443.33  | 2614.0 | 442, 85       | 2750.0         | 441.67  |
|   |     | 2997.0  | 444.30  | 3153.0 | 441.82  | 3293.0 | 441.63        | 4451.0         | 443. 21 |
|   |     | 4837.0  | 447.52  | 4912.0 | 445.08  | 4993.0 | 446. 47       | 5131.0         | 445.05  |
|   |     | 5171.0  | 461.28  | 5269.0 | 457.12  | 5494.0 | 469.87        | 5648.0         | 486. 14 |
|   | 6   | 2890.0  | 440.74  | 3330.0 | 444. 28 | 3509.0 | 443.59        | 3669.0         | 447.10  |
|   | •   | 3770.0  | 445.99  | 3890.0 | 448.68  | 4027.0 | 443.86        | 4570.0         | 449.46  |
|   |     | 5064.0  | 442.95  | 6431.0 | 453.72  |        |               |                |         |
|   | 7   | 2890.0  | 440.74  | 2895.0 | 441. 42 | 2987.0 | 448, 14       | 3053.0         | 449. 40 |
|   | •   | 3078.0  | 452.65  | 3231.0 | 460.39  | 3261.0 | 461.12        | 3444.0         | 482.80  |
|   |     | 3525.0  | 486.70  | 3548.0 | 490, 70 | 3574.0 | 490.83        | 3696.0         | 505, 07 |
|   |     | 3722.0  | 510.68  | 3744.0 | 511.70  | 3794.0 | 511.50        | •              |         |
|   | 8   | 6431.0  | 453.72  | 6485.0 | 454. 37 | 6700.0 | 476, 21       | 6781.0         | 463.97  |
|   | •   | 6836.0  | 464.56  | 6918.0 | 480. 58 | 7097.0 | 490.81        | 7135.0         | 486, 09 |
|   |     | 7176.0  | 486.09  | 7321.0 | 500. 53 | ,,,,,, | , , , , , , , |                |         |
|   | 9   | 7321.0  | 500, 53 | 7352.0 | 503.62  | 7420.0 | 499, 19       | 7479.0         | 504.30  |
|   |     | 7504.0  | 510, 79 | 7604.0 | 517, 50 |        |               |                |         |
|   | 10  | 6431, 0 | 453, 72 | 6602.0 | 456.24  | 6652.0 | 460.17        | 6672.0         | 466. 20 |
|   | • • | 6691.0  | 465.15  | 6832.0 | 479.26  | 6931.0 | 484.09        | 7109.0         | 506. 15 |
|   |     | 7180.0  | 504.74  | 7230.0 | 506.01  | 7300.0 | 500. 53       | 7350.0         | 501.53  |
|   |     | 7459.0  | 500.05  | 7516.0 | 503.96  | 7636.0 | 494.99        | 7736.0         | 518.50  |
|   | 11  | 5648.0  | 486.14  | 5745.0 | 484.10  | 5833.0 | 487. 52       | 5921.0         | 484. 14 |
|   | , , | 6008.0  | 476.10  | 6084.0 | 475.32  | 6162.0 | 485.85        | 6484.0         | 495. 12 |
|   |     | 6524.0  | 498, 43 | 6627.0 | 490.87  | 6665.0 | 494. 40       | 6739.0         | 488. 58 |
|   |     | 6832.0  | 496.09  | 6892.0 | 507, 61 | 6942.0 | 508, 50       | - · · <b>-</b> |         |
|   | 12  | 5648.0  | 486. 14 | 5698.0 | 498.50  |        |               |                |         |



基準 V^\* N 442.61 A3 Pumpi

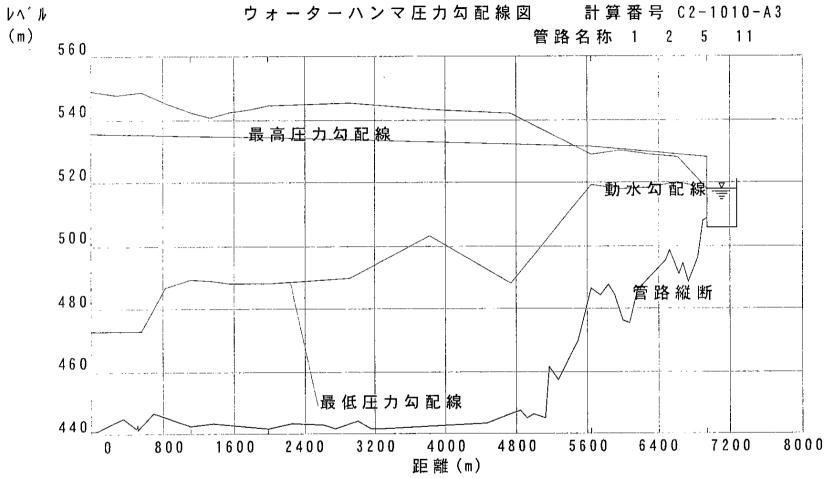
To Kahawatta Reservoir



基準 レペル 442.61

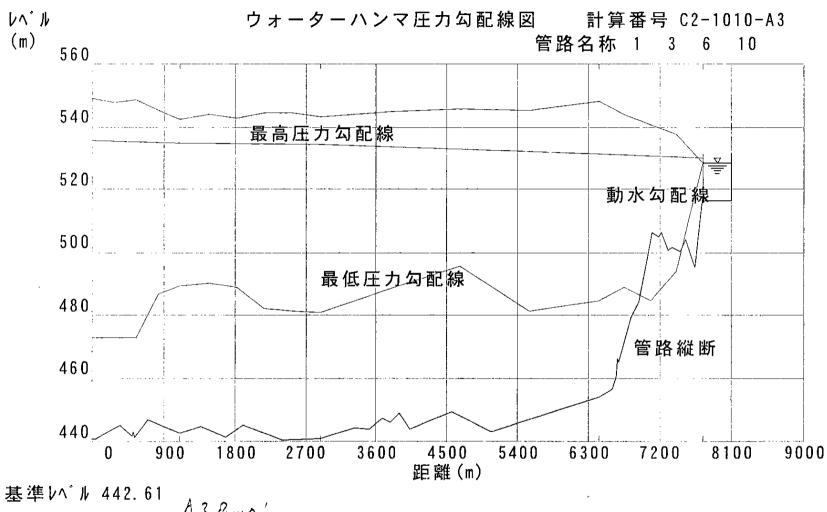
A3 Romp:

To Kahalla Roservoir



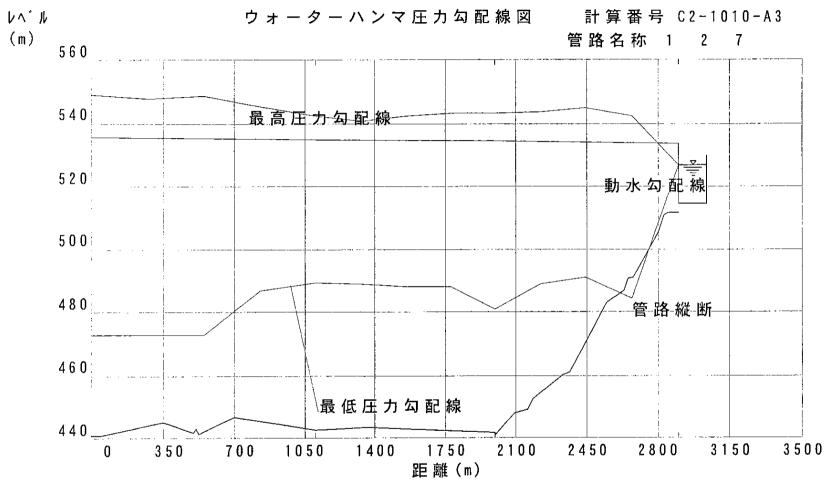
基準 V^ N 442.61 A3 Pomp:

To Akurana Reservoir



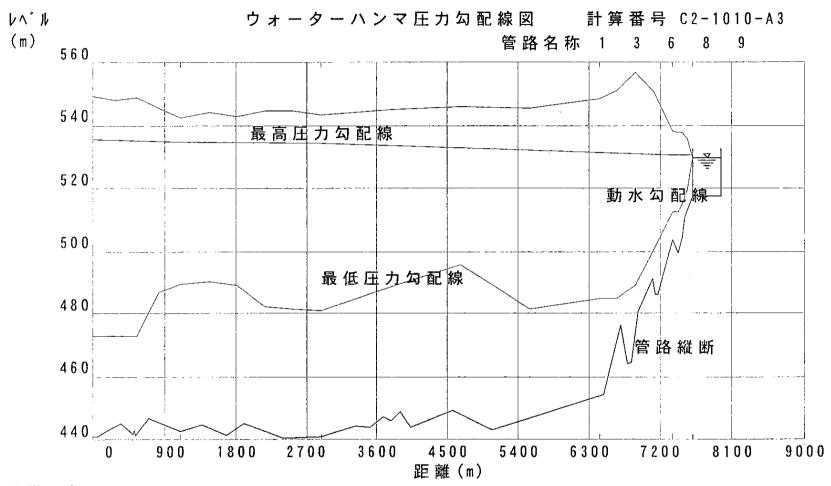
A3 Pumpi

To Banfalanatta Reservir



基準 レヘ・ル 442.61 A3 Purpi

to Balangla la Reservoir



基準 レベル 442.61

As Pump:

To Philadoniya Rosevoik

計算番号 C2-1010-A3

PAGE 1

Clear Water Pump (A3)

基準レベル 計算時間単位 442.610 m .04819 sec

|        |                      |             | DI AFE    | of let - let let  |                    |              |  |              |           |         |                 |                 |                   |                                     |                      |          |
|--------|----------------------|-------------|-----------|-------------------|--------------------|--------------|--|--------------|-----------|---------|-----------------|-----------------|-------------------|-------------------------------------|----------------------|----------|
| 【管路仕   | 様】                   |             |           |                   |                    |              |  | <b>リ</b> - ジ | 44        |         |                 | 配管              | 弁絞                | 圧力波                                 |                      |          |
| 管路     | 管長                   | 管種          | 管径        | 管厚                | ヤング                | 上流の管路        | ポンプ  | タンク          | 弁番号       | 終点質     | 路流量             | 損失              | 損失                | 往復時間                                | 管路定数                 | 分割       |
| 名称     | m<br>1107. 0         | FCD3        | mm<br>600 | им<br>9. <b>С</b> | <u>率</u><br>1. 600 |              | 番号<br>1 0 0  | 番号<br>0      | 7-7<br>() | 条件<br>0 | nt3/m<br>9. 989 | m<br>. 900      | m<br>000          | sec<br>2. 1 <b>204</b>              | 3. 1419              | 44       |
| ,      | 888. IJ              | FCD3        | 600       | 9. 0              | 1.600              | 1            | 0 0 0  | Õ            | ō         | Ď       | 7.369           | . 400           | . 000             | 1, 7009                             | 3. 1419              | 36       |
| 3      | 1783. 0              | FCD3        | 600       | 9. 8              | 1. 600             | Ì            | 0 0 0  | 0            | 0         | Û       | 2, 620          | . 200           | . 000             | 3. 4152                             | 3. 1419              | 70       |
| 4      | 882.0                | FCD3        | 200       | 6, 0              | 1, 600             | 2            | 0 0 0  | 0            | Û         | 1       | 1, 166          | 1.400           | 36, 000           | 1. 4 <b>81</b> 0                    | 32, 2567             | 30       |
| 5      | 3653.0               | FCD3        | 500       | 8. 0              | 1. 600             | 2            | 0 0 0  | 0            | Û         | 0       | 6, 203          | 2, 900          | . 000             | 6, <b>89</b> 50                     | 4, 5912              | 144      |
| 6      | 3541.0               | FCD3        | 300       | 6, 5              | 1. 6DO             | 3            | 0 0 0  | 0            | 0         | 0       | 1. 713          | 3. 200          | . 000             | 6. 2 <b>80</b> 7                    | 13. 5715             | 132      |
| 7      | 904.0                | <b>VP</b> 1 | 225       | 12. 7             | . 027              | 3            | 0 0 0  | 0            | Q.        | 1       | , 907           | . 900           | 7. 000            | 4. 8451                             | 7. 9846              | 100      |
| 8      | 921. 0               | FCD3        | 200       | 6. <b>0</b>       | 1.600              | 6            | 0 0 0  | 0            | ₹Į        | Ų       | . 732           | . 600           | . 000             | 1. 5464                             | 32, 2567<br>19, 9081 | 32<br>48 |
| 19     | 1305. 0              | FCD3        | 250       | 6. 0              | 1. 600             | 6            | 0 0 0  | U            | Ü         |         | . 981           | 1.000           | 2. 000            | 2. 2 <b>72</b> 2<br>1. 3 <b>506</b> | 7. 9846              | 28       |
| 9      | 252. 0               | ΥΡ 1        | 225       | 12. 7             | . 027              | 8            | 0 0 0  | 0            | U         | 3       | . 732<br>1. 629 | . 200<br>3. 600 | 1, 000<br>10, 000 | 2, 1727                             | 32, 2567             | 44       |
| 11     | 1294. 0              | FCD3        | 200       | 6. 0              | 1, 600             | ģ.           | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | 0            | 1)<br>O   | 1       | 4. 583          | 3. 600<br>100   | 4. 080            | . 0944                              | 4. 5912              | 2        |
| 12     | <b>5</b> 0. <b>0</b> | FCD3        | 500       | 8. D              | 1.600              | 3            | Ų Ų U  | v            | U         | 1       | 4, 505          | . 100           | 4. 000            | . 0344                              | 4. 0516              | •        |
| 【 ポンプ( | 什様 】                 |             |           |                   |                    |              |  |              |           |         |                 |                 |                   |                                     |                      |          |
|        |                      | 弁           | 弁         |                   |                    |              |  |              |           |         | 効               | 咸衰              |                   | 初期状的                                | <u> </u>             |          |
| 番 :    | 台 形                  | 弁別          | 弁番号       | 全揚程               | 吐出量                | 出力 極<br>kw 数 | 型 ギンプ・   |              |           | ♪ 回転    |                 | 定数              | 揚程                |                                     | 回転数 トル               | 9        |
| 番号     | 台 形数 式               | 鎖           | 号         | (fi               | m3/a               |              |  | g~m2         | kg−a      | n2 min  |                 | k               | m<br>an an        | m3/m                                | . 000 1 0            | n a      |
| 1      | 1 1                  | 3           | 0         | 93.000            | 9. 990             | 250. 0 4     | 1 29.  | 000          | 50.00     | 10 14   | 75 78           | . 4129          | 93.000            | 9. 990                              | 1.000 1.0            | uv       |
|        |                      |             |           |                   |                    |              |  |              |           |         |                 |                 |                   |                                     |                      |          |

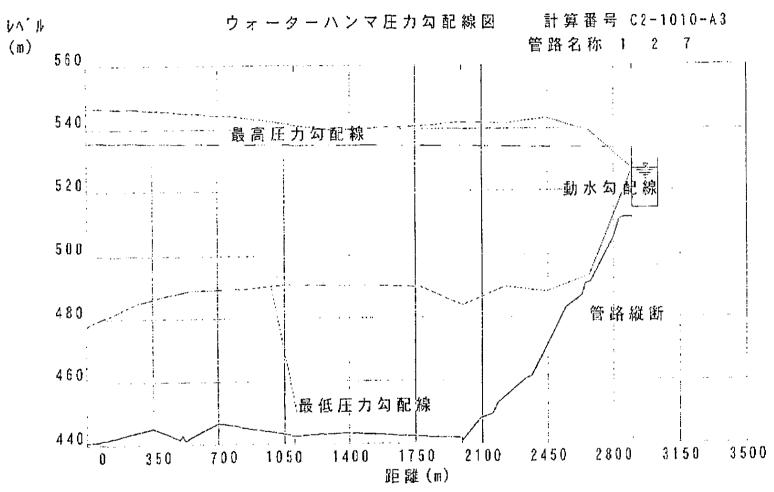
# 【 圧力線図仕様 】

管路名称 1 3 6 10

| ľ | 擬断仕 | 様. 】    |         | od I – ne dell |         | · 스 스 - 이트 소비 | 1 -8 11 | <b>"在</b> 本在DC" <b>会</b> 基 | ال غمال |
|---|-----|---------|---------|----------------|---------|---------------|---------|----------------------------|---------|
|   | 管路  | 追加距離    | レベル     | 追加距離           | レベル     | 追加距離          | レベル     | 追加距離                       | レベル     |
|   | 名称  | Ci.     | m       | ונו            | m       | m             | III     | m                          | m       |
|   | 1   | Ď.      | 440, 86 | 50.0           | 440.86  | 350.0         | 445. 00 | 500.0                      | 441. 59 |
|   | '   | 509. Ď  | 442, 85 | 522.0          | 441, 23 | 701.0         | 446.85  | 1107.0                     | 442, 52 |
|   | 2   | 1107. 0 | 442, 52 | 1366.0         | 443. 49 | 1995.0        | 441.50  |                            |         |
|   | 3   | 1107. 0 | 442, 52 | 1367.0         | 444. 57 | 1687. 0       | 441.08  | 1906. D                    | 445, 22 |

| 4   |
|-----|
| - 2 |

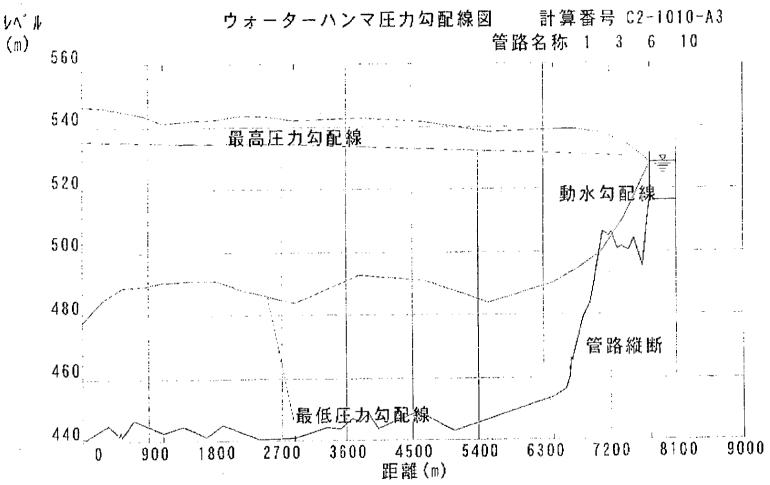
| ľ | 拟断仕 | 議 】 .                  |                 |                        |         |                  |                 |                |         |
|---|-----|------------------------|-----------------|------------------------|---------|------------------|-----------------|----------------|---------|
| _ | 管路  | 追加距離                   | レベル             | 追加距離                   | レベル     | 追加距離             | レベル             | 追加距離           | レベル     |
|   | 名称  | m                      | m               | EN                     | m       | m                | វា              | m              | m       |
|   |     | 2404. 0                | 440, 54         | 2890. 0                | 440. 74 |                  |                 |                |         |
|   | 4   | 1995. 0                | 441.50          | 2135.0                 | 452, 30 | 2276.0           | 455. 7 <b>6</b> | 2315.0         | 461.79  |
|   |     | 2518.0                 | 471.90          | 2639. O                | 465.30  | 2676.0           | 466. 13         | 2785. O        | 457.89  |
|   |     | 2827. 0                | 460.88          | 2877. 0                | 463, 50 |                  |                 |                |         |
|   | 5   | 1995.0                 | 441.50          | 2254. 0                | 443.33  | 2614, 0          | 442.85          | 2750.0         | 441, 67 |
|   |     | 2997. <b>0</b>         | 444.30          | 3153.0                 | 441, 82 | 3293, 0          | 441.63          | 4451.0         | 443. 21 |
|   |     | 4837.0                 | 447. 52         | 4912. O                | 445.08  | 4993. 0          | 446. 47         | 5131.0         | 445, 05 |
|   |     | 5171.0                 | 461.28          | 5269. O                | 457, 12 | 5494. 0          | 469.87          | 5648. <b>0</b> | 486, 14 |
|   | 6   | <b>289</b> 0. 0        | 440.74          | 3 <b>330</b> . 0       | 444. 28 | 3509. 0          | 443, 59         | 3669.0         | 447. 10 |
|   |     | 3770. 0                | 445, 99         | 3890. O                | 448.68  | 402 <i>T</i> . 0 | 443.86          | 4570. B        | 449, 46 |
|   |     | 5064. 0                | 442. 95         | 6431.0                 | 453, 72 |                  |                 |                |         |
|   | 7   | <b>2890.</b> 0         | 440.74          | 2895.0                 | 441.42  | 2987. O          | 448, 14         | 3053.0         | 449, 40 |
|   |     | 3078. O                | 452.65          | <b>323</b> 1. <b>0</b> | 460.39  | 3261.0           | 461. 12         | 3444. 0        | 482, 80 |
|   |     | <b>352</b> 5. <b>0</b> | 486, 70         | 3548.0                 | 490, 70 | 3574.0           | 490.83          | 3696.0         | 505, 07 |
|   |     | 3722, 0                | 510.68          | 3744.0                 | 511, 70 | 3794. O          | 511, 50         |                |         |
|   | 8   | 6431.0                 | 453.72          | 6485. O                | 454, 37 | 87 <b>00.</b> 0  | 476.21          | 6781.0         | 463. 97 |
|   |     | 6836.0                 | 464, 56         | 6918. C                | 480.58  | 7097. 0          | 490.81          | 7135.0         | 486.09  |
|   |     | 7176. 0                | 486. D9         | 7321.0                 | 500. 53 |                  |                 |                |         |
|   | 9   | 7321.0                 | <b>500</b> , 53 | 7352.0                 | 503.62  | 7420. 8          | 499. I <b>9</b> | 7479.0         | 504. 30 |
|   |     | 7504.0                 | 510, 79         | 7604. 0                | 517.50  |                  |                 |                | _       |
|   | 10  | 6431.0                 | 453. 72         | 6602. <b>0</b>         | 456. 24 | 6652. 9          | 460.17          | 6672.0         | 466. 20 |
|   |     | 6691. 0                | 465, 15         | 6832. 0                | 479.26  | 6931. <b>0</b>   | 484. 09         | 7109.0         | 506. 15 |
|   |     | 7180.0                 | 504.74          | 7230. <b>0</b>         | 508.01  | 7300. 0          | 500. 53         | 7350.0         | 501, 53 |
|   |     | 7459. 0                | 500.05          | 7516.0                 | 503.96  | 76 <b>36. 0</b>  | 494. 99         | 7736.0         | 518. 50 |
|   | 11  | 5648. 0                | 486.14          | 57 <b>45.</b> 0        | 484.10  | 583 <b>3. 0</b>  | 487. 52         | 5921.0         | 484, 14 |
|   |     | 6008.0                 | 476, 10         | 6084. 0                | 475.32  | 6162.0           | 485. 85         | 6484. 0        | 495. 12 |
|   |     | 6524.0                 | 498, 43         | 6627. D                | 490.87  | 6665. Q          | 494, 40         | 6739.0         | 488, 58 |
|   |     | 6832.0                 | 496.09          | 6892. 0                | 507.61  | 6942. O          | 508.50          |                |         |
|   | 12  | <b>564</b> 8. 0        | 486.14          | 5 <b>6</b> 98. 0       | 498, 50 |                  |                 |                |         |



基準 by A 442.61 A3 Pomp:

To Balanajala Reservoire

277: Flywheel 509-n² 4218



基準 LA \* N 442.61 A 3 Pamp:

To Banfalawatta Reservoir

77 F. Flywheel 50 Bin 1817.

計算番号 C2-1010-B

PAGE 1

Transmission Pump (B)

基準レベル 計算時間単位 566.000 m .05491 sec

# 【 管路仕様 】

| 管路<br>名称 | 管長    | 管種   | 管径<br>mm | 管厚   | ヤング<br>率 | 上流の管路 | ポン<br>番号 |   | サージ<br>タンク<br>番号 | 弁番号 | 終点<br>条件 | 管路流量<br>m3/m | 配管<br>損失 | 弁絞<br>損失<br>。 | 圧力波<br>往復時間<br>sec | 管路定数     | 分割 |
|----------|-------|------|----------|------|----------|-------|----------|---|------------------|-----|----------|--------------|----------|---------------|--------------------|----------|----|
| 1        | 327.0 | FCD3 | 200      | 6.0  | 1.600    |       | 1 0      | 0 | 0                | 0   | 0        | 1.900        | 2.600    | . 000         | . 5491             | 32. 2567 | 10 |
| 2        | 564.0 | FCD3 | 200      | 6.0  | 1.600    | 1     | 0 0      | 0 | 0                | 0   | 0        | 1.900        | 4.400    | . 000         | . 9470             | 32. 2567 | 18 |
| 3        | 201.0 | VP 1 | 225      | 12.7 | . 027    | 2     | 0 0      | 0 | 0                | 0   | 0        | 1.900        | . 800    | . 000         | 1. 0773            | 7.9846   | 20 |
| 4        | 250.0 | VP 1 | 225      | 12.7 | . 027    | 3     | 0 0      | 0 | 0                | 0   | 1        | 1.900        | 1.000    | 5. 200        | 1. 3399            | 7.9846   | 24 |

# 【ポンプ仕様】

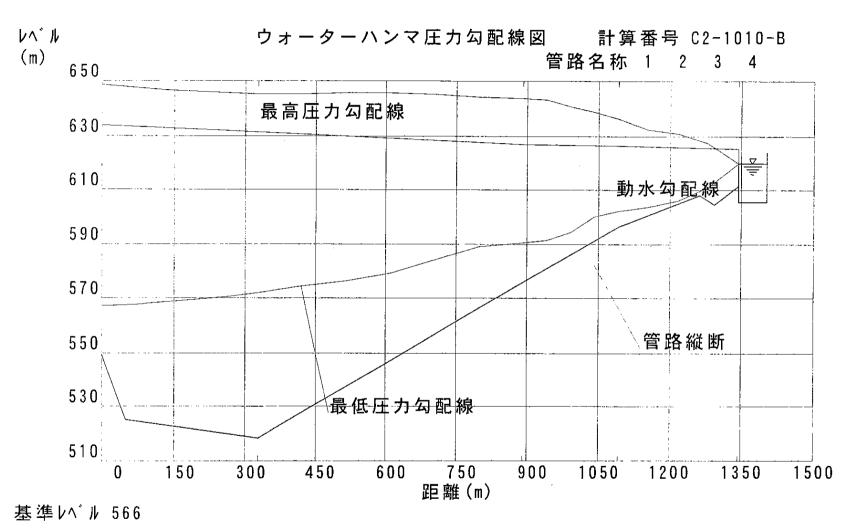
|   |   |   | 弁 | 弁 |        |        |      |   |    |                 |         | 効       | 減衰     |        | 一 初期状 | 態     |       |
|---|---|---|---|---|--------|--------|------|---|----|-----------------|---------|---------|--------|--------|-------|-------|-------|
| 番 | 台 | 形 | 閉 | 番 | 全揚程    | 吐出量    | 出力   | 極 | 型相 | <b>ポンプ・モー</b> タ | フライホイール | 回転数 率   | 定数     | 揚程     | 吐出量   | 回転数   | トルク   |
| 뮥 | 数 | 定 | 鎖 | 号 | m      | m3/m   | kw   | 数 | 式  | kg-m2           | kg-m2   | min−1 % | k      | m      | m3/m  |       |       |
| 1 | 1 | 1 | 1 | 0 | 68.000 | 1, 900 | 37.0 | 2 | 1  | . 850           | . 000   | 2900 69 | 1.5607 | 68.000 | 1.900 | 1.000 | 1.000 |

#### 【 圧力線図仕様 】

管路名称 1 2 3 4

【 縦断仕様 】

| 管路 | 追加距離   | レベル    | 追加距離   | レベル    | 追加距離   | レベル    | 追加距離   | レベル     |
|----|--------|--------|--------|--------|--------|--------|--------|---------|
| 名称 | m      | m      | m      | m      | m      | m      | m      | m       |
| 1  | , 0    | 549.50 | 50.0   | 525.32 | 327.0  | 518.49 |        |         |
| 2  | 327.0  | 518.49 | 891.0  | 575.88 |        |        |        |         |
| 3  | 891.0  | 575.88 | 1092.0 | 596.33 |        |        |        |         |
| 4  | 1092.0 | 596.33 | 1261.0 | 608.33 | 1292.0 | 604.62 | 1342.0 | 611, 50 |



TRANSMISSION PLAMP (B):

Heerosofala Lowsk - Heavosofala Middle SR.

計算番号 C2-1010-C

PAGE

Transmission Pump (C)

基準レベル 計算時間単位 613.000 m .08880 sec

#### 【 管路仕様 】

| 管路<br>名称 | 管長    | 管種   | 管径<br>mm | 管厚   | ヤング<br>率 | 上流の管路 | ポン<br>番 |   | サージ<br>タンク<br>番号 | 弁番号 | 終点<br>条件 | 管路流量<br>m3/m | 配管<br>損失 | 弁絞<br>損失<br>『 | 圧力波<br>往復時間<br>sec | 管路定数     | 分割 |
|----------|-------|------|----------|------|----------|-------|---------|---|------------------|-----|----------|--------------|----------|---------------|--------------------|----------|----|
| 1        | 110.0 | FCD3 | 150      | 6.0  | 1.600    |       | 1 1     | 0 | 0 0              | 0   | Ô        | . 490        | . 300    | . 000         | . 1776             | 59, 6353 | 2  |
| 2        | 200.0 | FCD3 | 150      | 6. 0 | 1.600    | 1     | 0       | 0 | 0 0              | 0   | Ō        | . 490        | . 600    | . 000         | . 3229             | 59.6353  | 4  |
| 3        | 350.0 | VP 1 | 160      | 12.7 | . 027    | 2     | 0       | 0 | 0 0              | 0   | 1        | . 490        | . 600    | 7.500         | 1.6038             | 18.4690  | 18 |

### 【 ポンプ仕様 】

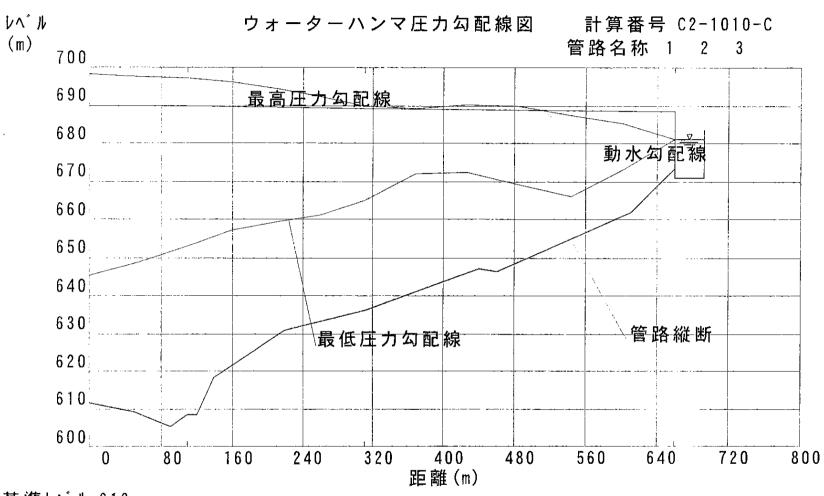
|   |   | _ | 弁 | 弁 |        |       |      |   |   |                 |         |        | 边  | 減衰     |        | - 初期状 | :態    |       |  |
|---|---|---|---|---|--------|-------|------|---|---|-----------------|---------|--------|----|--------|--------|-------|-------|-------|--|
| 番 | 台 | 形 | 閉 | 番 | 全揚程    | 吐出量   | 出力   | 極 | 型 | <b>ポンプ・モ</b> ータ | フライホイール | 回転数    | 枢  | 定数     | 揚程     | 吐出量   | 回転数   | トルク   |  |
| 号 | 数 | 尤 | 鎖 | 号 | m      | m3/m  | kw   | 数 | 迮 | kg-m2           | kg-m2   | min-1  | %  | k      | m      | m3/m  |       |       |  |
| 1 | 1 | 1 | 1 | 0 | 77.000 | . 490 | 18.5 | 2 | 1 | 460             | . 000   | 2900 4 | 17 | 1.2364 | 77 000 | 490   | 1 000 | 1 000 |  |

#### 【 圧力線図仕様 】

管路名称 1 2 3

#### 【 縦断仕様 】

| 和此為任工 |       |         |                |        |       |        |       |        |
|-------|-------|---------|----------------|--------|-------|--------|-------|--------|
| 管路    | 追加距離  | レベル     | 追加距離           | レベル    | 追加距離  | レベル    | 追加距離  | レベル    |
| 名称    | m     | m       | វា             | m      | m     | m      | m     | m      |
| 1     | . 0   | 611.50  | <b>50</b> . 0  | 609.00 | 90.0  | 605.28 | 110.0 | 608.47 |
| 2     | 110.0 | 608.47  | 120.0          | 608.37 | 140.0 | 618.19 | 220.0 | 630.85 |
|       | 310.0 | 636, 10 |                |        |       |        |       |        |
| 3     | 310.0 | 636.10  | 44 <b>0</b> .0 | 646.97 | 460.0 | 646.20 | 610.0 | 661.64 |
|       | 660.0 | 673.50  |                |        |       |        |       |        |



基準レベル 613

TRANSMISSion Pump (C):

Heerasafola Middle SR - Heerasafola High sR.

計算番号 C2-1010-D1

PAGE

Transmission Pump (D1)

基準レベル 計算時間単位 582, 500 m . 05248 sec

| • | <u>^</u> | 0.45 | 44 | 1* | • |
|---|----------|------|----|----|---|
| L |          | 此    | 11 | 様  |   |

| 自此江海     | F .     |      |     |      |       |       |       | サージ | 弁 |    |       | 配管       | 弁絞    | 圧力波     |          |    |
|----------|---------|------|-----|------|-------|-------|-------|-----|---|----|-------|----------|-------|---------|----------|----|
| 管路<br>名称 | 管長      | 管種   | 管径  | 管厚   | ヤング   | 上流の管路 | ポンプ   | タンク | 番 | 終点 | 管路流量  | 配管<br>損失 | 損失    | 往復時間    | 管路定数     | 分割 |
| 名称       | m       |      | mm  | mm   | 率     |       | 番号    | 番号  | 号 | 条件 | m3/m  | m        | វា    | sec     |          |    |
| 1        | 235.0   | VP 1 | 225 | 12.7 | 027   |       | 1 0 0 | 0   | 0 | 0  | 830   | . 200    | . 000 | 1. 2595 | 7. 9846  | 24 |
| ż        | 2774. 0 | FCD3 | 200 | 6.0  | 1.600 | 1     | 0 0 0 | 0   | 0 | 0  | . 830 | 4.700    | . 000 | 4. 6578 | 32. 2567 | 88 |
| 3        | 958. 0  | VP 1 | 225 | 12.7 | . 027 | 2     | 0 0 0 | 0   | 0 | 1  | . 830 | . 800    | 3.800 | 5. 1345 | 7. 9846  | 98 |

# 【 ポンプ仕様 】

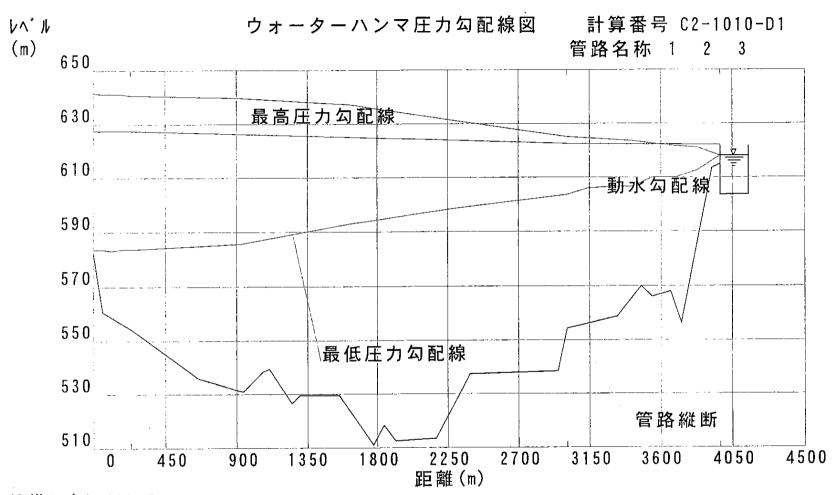
| - |   | - | 弁   | 弁 |        |      |      |   |    |         | •       | 効       | 減衰     |        |            | <del></del> |
|---|---|---|-----|---|--------|------|------|---|----|---------|---------|---------|--------|--------|------------|-------------|
| 番 | A | 形 | 혦   | 番 | 全揚程    | 吐出量  | 出力   | 極 | 型。 | ポンプ・モータ | フライネイール |         | 定数     | 揚程     | 吐出量 回転     | 数 トルク       |
| 昙 | 数 | Ť | 鎖   | 号 | m      | m3/m | kw   | 数 | 式  | kg-m2   | kg-m2   | min−1 % | k      | m      | m 3 / m    |             |
| í | 1 | i | - î | Ō | 45.000 | 830  | 11.0 | 2 | 1  | . 270   | . 000   | 2900 66 | 1.4850 | 45.000 | . 830 1. 0 | 00 1.000    |

### 【 圧力線図仕様 】

管路名称 1 2 3

【 縦断仕様 】

| 豵断性 |         |         |         |         |        |        |        |         |
|-----|---------|---------|---------|---------|--------|--------|--------|---------|
| 管路  | 追加距離    | レベル     | 追加距離    | レベル     | 追加距離   | レベル    | 追加距離   | レベル     |
| 名称  | m ·     | m       | m       | m       | m      | m      | m      | m       |
| 1   | . 0     | 582.08  | 58.0    | 560.55  | 235.0  | 554.00 |        |         |
| 2   | 235.0   | 554,00  | 662.0   | 536, 23 | 940.0  | 531.00 | 1068.0 | 538. 59 |
| _   | 1108.0  | 539, 48 | 1250.0  | 526.64  | 1306.0 | 529.73 | 1551.0 | 529.79  |
|     | 1767. 0 | 510.75  | 1840.0  | 518, 40 | 1915.0 | 512.30 | 2169.0 | 513. 27 |
|     | 2389.0  | 537.46  | 2949.0  | 538.39  | 3009.0 | 554.00 |        |         |
| 3   | 3009.0  | 554.00  | 3330.0  | 558. 58 | 3479.0 | 569.84 | 3547.0 | 565.77  |
| Ü   | 3657.0  | 568.00  | 3727. 0 | 556. 25 | 3917.0 | 613.50 | 3967.0 | 615.00  |
|     |         |         |         |         |        |        |        |         |



基準レベル 582.5

TRANSMISSION Pump (-D-1):

Ampstiga SR - othera SR,

計算番号 1010D2PC

PAGE

1

Trans. P(D2) Mulle Ph3

基準レベル 計算時間単位 582.500 m . 18784 sec

【 管路仕様 】

| 管路<br>名称 | 管長    | 管種   | 管径  | 管厚  |       | 上流の管路 | ポンプ   | サーン<br>タンク_ | 番 | 終点 | 管路流量<br>m3/m | 配官<br>損失 | 开叙<br>損失 | 注力液<br>往復時間 | 管路定数    | 分割 |
|----------|-------|------|-----|-----|-------|-------|-------|-------------|---|----|--------------|----------|----------|-------------|---------|----|
| 名称       | m     |      | mm  | mm  | 率     |       | 番号    | 番号          | 号 | 条件 |              | m        |          | sec         |         |    |
| 1        | 930.7 | FCD3 | 150 | 6.0 | 1.600 |       | 1 0 0 | 0           | 0 | 0  | . 680        | 4. 415   | . 000    | 1.5027      | 59.6353 | 8  |
| 2        | 961.8 | FCD3 | 150 | 6.0 | 1.600 | 1     | 0 0 0 | 0           | 0 | 1  | . 680        | 4. 563   | 3, 922   | 1.5529      | 59.6353 | 8  |

【ポンプ仕様】

カフライホイール 回転数 率 kg-m2 min-1 % 弁 番 全揚程 号 m 0 146.000 減衰 定数 ----- 初期状態 ------弁閉鎖 型式 極数2 木°ンプ・モータ 吐出量 回転数 トルク 番号 形式 吐出量 kg-m2 m3/m k m3/m kw 2.000 . 541 2900 60 . 680 1. 000 1. 000 . 4614 146.000 . 680 30.0 1

【 圧力線図仕様 】

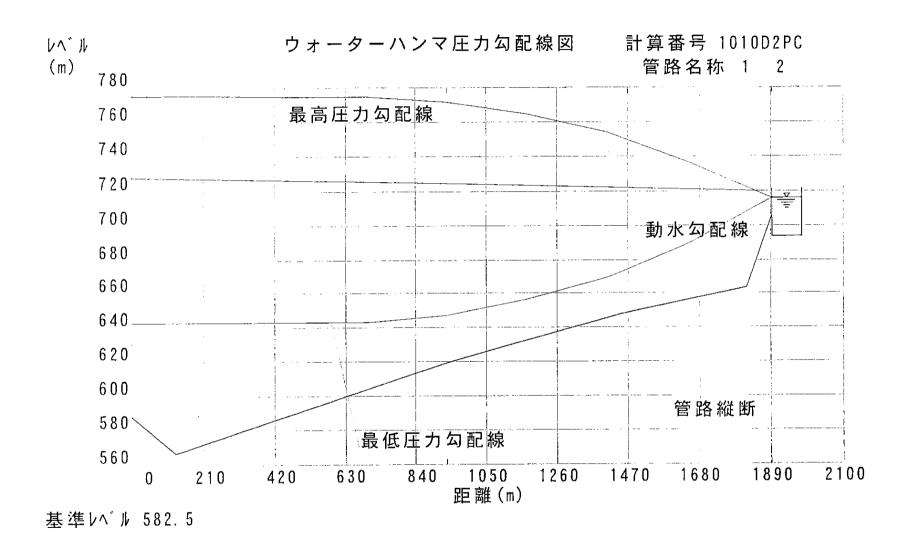
管路名称 1 2

【 縦断仕様 】 管路 追加距離 追加距離 追加距離 レベル 追加距離 レベル レベル レベル m m m m m m 127. 0 930, 7 619.30 1108.9 629.14 . 0 588.83 567.07 1818. 2 663.13 1892.5 705.80 1892.5 713.00 1450.0 647.84

1. 計算インターバル

3. 管路の圧力変化

|          |          |        | 最高/   | 工力                        |               | ~      | 最低1       | 平力 <b>-</b>       |               |
|----------|----------|--------|-------|---------------------------|---------------|--------|-----------|-------------------|---------------|
| 管路<br>番号 | 追加<br>距離 | 経過時間   | 流量    | エノ <b>)</b><br>圧力<br>(水頭) | 圧力<br>(レベル表示) | 経過時間   | 最低/<br>流量 | 上/,<br>圧力<br>(水頭) | 圧力<br>(レベル表示) |
| ш,       | m        | s e c  | m3/m  | m                         | m             | s e c  | m3/m      | m                 | M             |
| 1        | . 0      | 5. 447 | . 000 | 192.627                   | 775. 127      | 3.005  | . 000     | 60.492            | 642.992       |
| 1        | 232.7    | 5. 447 | . 000 | 192. 578                  | 775. 078      | 2.818  | . 000     | 60.549            | 643.049       |
| 1        | 465.4    | 5.635  | . 001 | 192. 452                  | 774, 952      | 2.630  | . 002     | 60.733            | 643.233       |
| i        | 698.0    | 5. 447 | 002   | 192. 026                  | 774, 526      | 2. 442 | . 006     | 61. 243           | 643.743       |
| 2        | . 0      | 5. 260 | 028   | 188. 973                  | 771. 473      | 2. 254 | . 035     | 64.608            | 647. 108      |
| 2        | 240.4    | 5.072  | 086   | 182.057                   | 764. 557      | 2.066  | . 114     | 74.038            | 656. 538      |
| 2        | 480.9    | 4.884  | 179   | 171. 169                  | 753, 669      | 1.878  | . 227     | 87. 313           | 669.813       |
| 2        | 721. 3   | 4. 884 | - 166 | 153.400                   | 735. 900      | 1.691  | . 398     | 106. 798          | 689. 298      |



D2 Phase 3 Flywheel : 2kgf-m2

計算番号 1010D3PA

PAGE 1

Trans. P(D3) to Meeka. R

基準レベル 計算時間単位 582.500 m .00807 sec

| ľ   | 笞 | 炂  | 什  | 様   | 1   |
|-----|---|----|----|-----|-----|
| - Ł | = | шп | 11 | Tak | - 4 |

| 管路<br>名称 | 管長     | 管種   | 管径<br>mm | 管厚<br>mm | ヤング<br>率 | 上流の管路 | ポンプ<br>番号 | サーン<br>タンク<br>番号 | 开番号 | 終点<br>条件 | 管路流量<br>m3/m | 配官<br>損失<br>「 | 开殺<br>損失<br>m | 注刀波<br>往復時間<br>sec | 管路定数    | 分割  |
|----------|--------|------|----------|----------|----------|-------|-----------|------------------|-----|----------|--------------|---------------|---------------|--------------------|---------|-----|
| 1        | 10.0   | FCD3 | 150      | 6. 0     | 1,600    |       | 1 0 0     | _ 0_             | Ó   | 0        | . 868        | . 062         | . 000         | . 0161             | 59.6353 | 2   |
| ż        | 465.0  | FCD3 | 150      | 6. 0     | 1,600    | 1     | 0 0 0     | Ō                | 0   | 0        | 868          | 2.865         | . 000         | . 7508             | 59.6353 | 92  |
| 5        | 1625.0 | VP 1 | 160      | 12. 7    | . 027    | 2     | 0 0 0     | 0                | 0   | 0        | . 868        | 7.312         | . 000         | 7. 4460            | 18.4690 | 924 |
| Š        | 10.0   | VP 1 | 160      | 12, 7    | . 027    | 5     | 0 0 0     | 0                | 0   | 1        | . 868        | . 045         | . 000         | . 0458             | 18.4690 | 6   |

#### 【ポンプ仕様】

| - |     | =              | 弁 | # |        |      |      |   |     |         |         | 効       | 減衰     |        | アノノ ナ・ハ フヘン・ | 怎     |       |
|---|-----|----------------|---|---|--------|------|------|---|-----|---------|---------|---------|--------|--------|--------------|-------|-------|
| 番 | 씀   | HS.            | 锦 | 番 | 全揚程    | 叶出量  | 出力   | 極 | 型:  | ポンプ・モータ | フライホイール | 回転数 率   | 定数     | 揚程     | 吐出量「         | 回転数   | トルク   |
| 畧 | 数   | $\frac{2}{17}$ | 絈 | 兽 | m      | m3/m | kw   | 数 | 迁   | kg-m2   | kg-m2   | min-1 % | k      | m      | m3/m         |       |       |
| 1 | - 1 | 1              | 1 | ń | 73 000 | 868  | 37 B | 2 | _ i | 860     | _000    | 2900 67 | . 7791 | 73.000 | . 868        | 1.000 | 1.000 |

#### 【 圧力線図仕様 】

管路名称 1 2 5

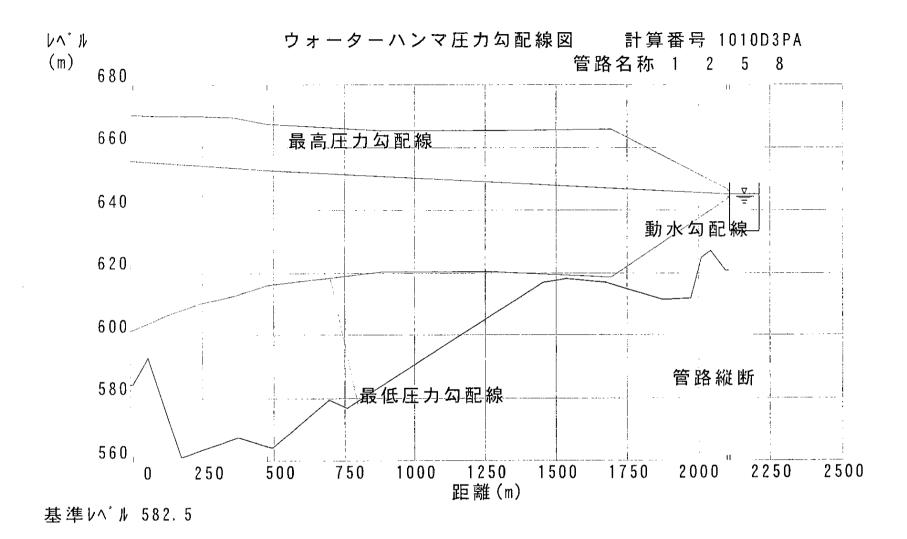
#### 【 縦断仕様 】

| 管路 | 追加距離   | レベル     | 追加距離   | レベル    | 追加距離   | レベル     | 追加距離   | レベル     |
|----|--------|---------|--------|--------|--------|---------|--------|---------|
| 名称 | m      | m       | m      | m      | m      | its.    | m      | m       |
| 1  | . 0    | 584, 26 | 10.0   | 584.26 | 60.0   | 592.69  | 175.0  | 561, 12 |
|    | 375.0  | 567.73  | 475.0  | 564.70 | 495.0  | 564.12  | 695.0  | 579.34  |
|    | 762.0  | 576.85  | 1455.0 | 616.85 | 1535.0 | 618,03  | 1675.0 | 616.86  |
|    | 1875.0 | 611.23  | 1975.0 | 611.70 | 2010.0 | 624, 69 | 2045.0 | 626.86  |
|    | 2095.0 | 620.50  | 2105.0 | 620.50 |        |         |        |         |

# 1. 計算インターバル 1638

# 3. 管路の圧力変化

|          |          |         | 最高月            | □+h     |               | <b></b> |             |                  |               |  |  |
|----------|----------|---------|----------------|---------|---------------|---------|-------------|------------------|---------------|--|--|
| 管路<br>番号 | 追加<br>距離 | 経過時間    | 流量             | 圧力      | 圧力<br>(レペル表示) | 経過時間    | 流量          | 上)<br>圧力<br>(水頭) | 圧力<br>(レベル表示) |  |  |
|          | m        | s e c   | m3/m           | m       | m             | sec     | m3/m        | m                | m             |  |  |
| 1        | . 0      | 9.550   | . 000          | 87.700  | 670. 200      | 1.631   | . 004       | 18.855           | 601.355       |  |  |
| 1        | 5. 0     | 9. 546  | . 000          | 87. 700 | 670. 200      | 1.643   | 002         | 19.095           | 601. 595      |  |  |
| 2        | . 0      | 9.550   | . 000          | 87, 699 | 670.199       | 1.647   | -, 004      | 19.330           | 601.830       |  |  |
| ž        | 116. 3   | 9, 570  | . 000          | 87. 529 | 670.029       | 1.740   | 043         | 23.972           | 606.472       |  |  |
| 2        | 232, 5   | 9, 712  | , 002          | 87. 449 | 669.949       | 1,833   | 072         | 27, 469          | 609.969       |  |  |
| 2        | 348.8    | 9.619   | 003            | 86.903  | 669. 403      | 1.925   | 095         | 30. 217          | 612. 717      |  |  |
| 5        | . 0      | 9.526   | 021            | 84. 741 | 667. 241      | 2.018   | 122         | 33. 495          | 615.995       |  |  |
| 5        | 406.3    | 10.604  | . 054          | 82.754  | 665. 254      | 6.955   | . 013       | 37.684           | 620.184       |  |  |
| 5        | 812.5    | 11.609  | . 055          | 82.756  | 665. 256      | 6.022   | . 019       | 37. 911          | 620.411       |  |  |
| 5        | 1218.8   | 12.598  | . 046          | 82. 992 | 665. 492      | 5.042   | <b>0</b> 51 | 36. 162          | 618.662       |  |  |
| 8        | . 0      | 12.424  | 264            | 64. 209 | 646, 709      | 4. 158  | . 818       | 60.920           | 643.420       |  |  |
| 8        | 1.7      | 12.420  | <b>-</b> . 271 | 63, 967 | 646.467       | 4. 154  | . 826       | 61.208           | 643.708       |  |  |
| 8        | 3.3      | 12.416  | <b>-</b> . 277 | 63.723  | 646. 223      | 4. 150  | . 834       | 61.501           | 644.001       |  |  |
| 8        | 5. 0     | 12. 412 | 284            | 63.475  | 645.975       | 4. 146  | . 842       | 61.797           | 644. 297      |  |  |
| 8        | 6.7      | 12.408  | -, 291         | 63. 225 | 645.725       | 4. 141  | . 851       | 62.099           | 644. 599      |  |  |
| 8        | 8.3      | 12.404  | 298            | 62.972  | 645, 472      | 4. 137  | . 859       | 62.404           | 644.904       |  |  |



D3 Phase 1.

計算番号 C2-1010-D2

PAGE 1

Transmission Pump (D2)

基準レベル 計算時間単位

582.500 m .03202 sec

#### 【 管路仕様 】

| 管路<br>名称 | 管長     | 管種   | 管径  | 管厚   | ヤング   | 上流の管路 | ポンプ   | サージ<br>タンク<br>番号 | 番 | 終点的 | 管路流量<br>m3/m | 配官<br>損失 | 开叙<br>損失 | 注刀波<br>往復時間 | 管路定数    | 分割  |
|----------|--------|------|-----|------|-------|-------|-------|------------------|---|-----|--------------|----------|----------|-------------|---------|-----|
| 名称       | m      |      | m m | mm   | 率     |       | 番号    | 番号               | 号 | 条件  | m3/m         |          | m        | sec         |         | _   |
| - i      | 119.0  | FCD3 | 150 | 6.0  | 1.600 |       | 1 0 0 | 0                | 0 | 0   | . 680        | . 600    | . 000    | . 1921      | 59.6353 | 6   |
| ż        | 2031.0 |      |     | 6. 0 | 1.600 | 1     | 0 0 0 | 0                | 0 | 1   | . 680        | 9,600    | 2.300    | 3. 2793     | 59.6353 | 104 |

#### 【 ポンプ仕様 】

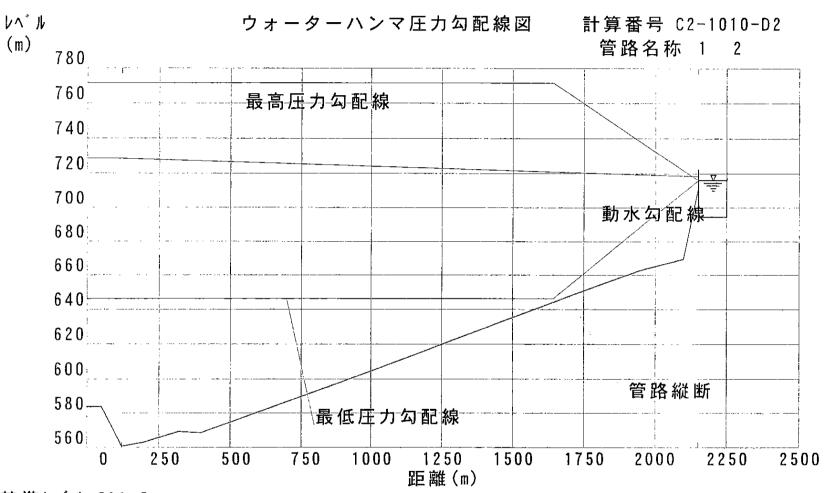
|   | ,, |   | 弁 | # |         |       |      |   |   |           |         | 効       | 減衰      |         | 初期状態  | 鳫     |       |
|---|----|---|---|---|---------|-------|------|---|---|-----------|---------|---------|---------|---------|-------|-------|-------|
| 悉 | ÷  | 形 | 舗 | 番 | 全揚程     | 叶出量   | 出力   | 極 | 퓆 | す゜ンフ゜・モータ | フライホイール |         | 定数      | 揚程      | 吐出量   |       | トルク   |
| 불 | 数  | 莊 | 鎖 | 导 | m       |       | kw   | 数 | 亢 | kg-m2     | kg-m2   | min-1 % | k       | m       | m3/m  |       |       |
| í | î  | Ĩ | Ĩ | Ó | 146,000 | . 680 | 30.0 | 2 | 1 | . 541     | . 000   | 2900 60 | 2. 1669 | 146.000 | . 680 | 1,000 | 1.000 |

#### 【 圧力線図仕様 】

管路名称 1 2

## 【縦断什様】

| レベル    | 追加距離   | レベル    | 追加距離   | レベル    | 追加距離   | レベル     | 追加距離   | <b>管路</b> |
|--------|--------|--------|--------|--------|--------|---------|--------|-----------|
| m      | m      | m      | m      | m      | m      | m       | m      | 名称        |
|        |        | 561.12 | 119.0  | 584.26 | 50.0   | 584. 26 | . 0    | - i       |
| 568.25 | 398.0  | 568.88 | 320.0  | 562.97 | 200.0  | 561.12  | 119.0  | 2         |
| 669.41 | 2100.0 | 662.83 | 1940.0 | 632.78 | 1450.0 | 614.37  | 1150.0 | -         |
|        |        |        |        |        |        | 711 50  | 2150 0 |           |



基準レベル 582.5

Transmission Rup (D-2):
Ampstija SR — Mullopikalla SR

計算番号 C2-1010-D3

PAGE 1

Transmission Pump (D3)

基準レベル 計算時間単位

582, 500 m . 00807 sec

#### 【 管路仕様 】

| 官 | 路住禄         | 1      |   |     |       |             |     |    |   |     |    |   | サージ | 弁  |    |        | 配管       | 弁絞    | 圧力波     |          |     |  |
|---|-------------|--------|---|-----|-------|-------------|-----|----|---|-----|----|---|-----|----|----|--------|----------|-------|---------|----------|-----|--|
| 쇝 | 多路          | 管長     | 管種                                      | 管径  | 管厚    | ヤング         | 上流  | の管 | 路 | ポ   | ンフ | ř | タンク | 番号 | 終点 | 管路流量   | 配管<br>損失 | 損失    | 往復時間    | 管路定数     | 分割  |  |
| 4 | 管路<br>ろ称    | m      | 1-1 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1 | mm  | mm    | <u> 38.</u> |     |    |   | 社   | 号  |   | 番号  | 븍  | 条件 | m3/m   | m        | m     | sec     |          |     |  |
| 7 | コ 1/3*<br>1 | 100    | FCD3                                    | 150 | 6. 0  | 1.600       |     |    |   | 1 - | 'n | 0 |     | Ō  | Ö  | 1, 490 | . 100    | . 000 | . 0161  | 59. 6353 | 2   |  |
|   | 1           | 355.0  | FCD3                                    | 150 | 6.0   | 1.600       | 1   |    |   | Ò   | ñ  | Ŏ | Õ   | ñ  | Ō  | 1.490  | . 900    | . 000 | . 5732  | 59.6353  | 72  |  |
|   | 2           | 355.0  | FCD3                                    | 150 | 6. 0  | 1. 600      | í   |    |   | ň   | ň  | ň | ň   | Ō  | Ō  | 1.490  | . 900    | . 000 | . 5732  | 59.6353  | 72  |  |
|   | 3           |        |   | 150 |       | 1. 600      | ί.  |    |   | ň   | ň  | ň | ň   | ň  | ň  | 1. 490 | . 900    | . 000 | . 5732  | 59.6353  | 72  |  |
|   | 4           | 355.0  | FCD3                                    |     | 6.0   |             | 'n  |    |   | n   | ň  | ň | ñ   | ň  | ň  | 1. 490 | 2. 900   | . 000 | 7. 8355 | 18.4690  | 972 |  |
|   | 5           | 1710.0 | VP 1                                    | 160 | 12. 7 | . 027       | 2   |    |   | U   | Ü  | 0 | U   | V  | 0  |        |          | . 000 | 7. 8355 | 18. 4690 | 972 |  |
|   | 6           | 1710.0 | VP 1                                    | 160 | 12. 7 | . 027       | . 3 |    |   | V   | U  | U | U   | Ū  | U  | 1. 490 | 2. 900   |       |         |          |     |  |
|   | 7           | 1710.0 | VP 1                                    | 160 | 12. 7 | . 027       | 4   |    |   | 0   | 0  | 0 | 0   | 0  | 0  | 1.490  | 2.900    | . 000 | 7. 8355 | 18. 4690 | 972 |  |
|   | Ŕ           | 10.0   | VP 1                                    | 160 | 12.7  | . 027       | 5   | 6  | 7 | 0   | 0  | 0 | 0   | 0  | 1  | 1. 490 | . 100    | . 000 | . 0458  | 18, 4690 | 6   |  |

#### 【 ポンプ仕様 】

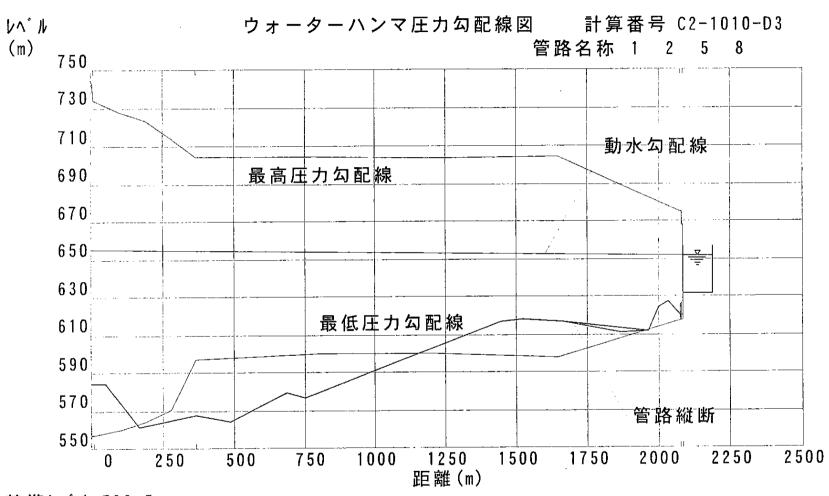
| ホン | 7 住私 | 表】 | 44 | 44 |        |       |       |   |     |         |         | 効       | 減衰      |        | - 初期状 | 態     |        |
|----|------|----|----|----|--------|-------|-------|---|-----|---------|---------|---------|---------|--------|-------|-------|--------|
| ₩. | 4    | 形  | 関  | 本  | 全揚程    | 叶出量   | 出力    | 極 | 型 / | ポンプ・モ−タ | フライホイール |         | 定数      | 揚程     | 吐出量   |       | トルク    |
| 番号 | 数    | 式  | 閉鎖 | 号  | m      | m3/m  | kw    | 数 | 定   | kg-m2   | kg−m2   | min−1 % | k       | m      | m3/m  |       |        |
| 1  | î    | ĩ  | Ĩ  | Ö  | 73.000 | 1.490 | 37. 0 | 2 | 1   | . 860   | , 000   | 2900 67 | 1. 3374 | 73.000 | 1.490 | 1.000 | 1. 000 |

#### 【 圧力線図仕様 】

管路名称 1 2 5 8

## 【縦断仕様】

| レベル     |
|---------|
| ពា      |
|         |
| 567. 73 |
| 579, 34 |
| 616.86  |
| 611.70  |
|         |
|         |
|         |



基準レベル 582.5

Transmission Pamp (日-3):
Amputige sk - Makanuwe sk.

計算番号 C2-1010-D3

PAGE

Transmission Pump (D3)

基準レベル 計算時間単位

582. 500 m .00807 sec Ely ashar (: 1570) - 12.

| 管 | 路 | 仕 | 様 | ] |
|---|---|---|---|---|
|   |   |   |   |   |

| 、官龄证例    | ₹ .]   |      |     |       |        |        |     |          |   |    |    | サージ | 弁  |    |        | 配管       | 弁絞    | 圧力波     |          |     |
|----------|--------|------|-----|-------|--------|--------|-----|----------|---|----|----|-----|----|----|--------|----------|-------|---------|----------|-----|
| 管路       | 管長     | 管種   | 管径  | 管厚    | ヤング    | 上流     | の管路 | <u> </u> | ボ | ンフ | j' | タンク | 番号 | 終点 | 管路流量   | 配管<br>損失 | 損失    | 往復時間    | 管路定数     | 分割  |
| 名称       | m      |      | m m | mm    | 埊      |        |     | -        | ₹ | 号  |    | 番号  | 号  | 条件 | m3/m   | m        | m     | sec     |          |     |
| 1        | 10.0   | FCD3 | 150 | 6. 0  | 1,600  |        |     |          | 1 | 0  | 0  | 0   | Ó  | 0  | 1. 490 | . 100    | . 000 | . 0161  | 59.6353  | 2   |
| ż        | 355.0  | FCD3 | 150 | 6. 0  | 1.600  | 1      |     |          | Ó | 0  | Ó  | 0   | 0  | 0  | 1, 490 | . 900    | . 000 | . 5732  | 59. 6353 | 72  |
| 3        | 355.0  | FCD3 | 150 | 6. 0  | 1. 600 | i      |     |          | Ō | Ō  | Ō  | Ò   | 0  | 0  | 1.490  | . 900    | . 000 | . 5732  | 59.6353  | 72  |
| J<br>A   | 355. O | FCD3 | 150 | 6. 0  | 1. 600 | i      |     |          | ň | ň  | ñ  | ň   | Ŏ  | Õ  | 1. 490 | . 900    | . 000 | . 5732  | 59.6353  | 72  |
| 4        | 1710.0 | VP 1 | 160 | 12.7  | . 027  | ģ      |     |          | ň | ň  | ň  | ň   | ň  | ñ  | 1. 490 | 2.900    | . 000 | 7.8355  | 18.4690  | 972 |
| 2        |        | VP 1 |     |       | . 027  | 2      |     |          | ñ | ň  | ň  | ň   | ñ  | ň  | 1. 490 | 2, 900   | . 000 | 7. 8355 | 18, 4690 | 972 |
| b        | 1710.0 | VP 1 | 160 | 12.7  |        | J<br>A |     |          | n | ň  | ñ  | n   | ň  | ň  | 1. 490 | 2. 900   | . 000 | 7. 8355 | 18. 4690 | 972 |
| <u>f</u> | 1710.0 | 4.1  | 160 | 12. 7 | . 027  | 4      | c   | 7        | 0 | -  | 0  | 0   | ٨  | 1  | 1. 490 | . 100    | . 000 | . 0458  | 18. 4690 |     |
| 8        | 10.0   | VP 1 | 160 | 12. 7 | . 027  | 5      | D   | í        | Ų | 0  | U  | U   | U  | ,  | 1. 490 | . 100    | . 000 | . 0430  | 10. 4030 | U   |

#### 【 ポンプ仕様 】

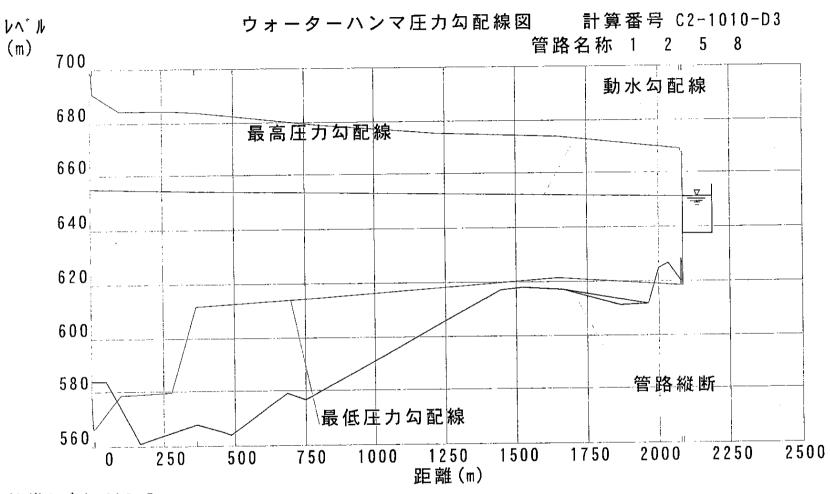
| ホンフ | 111移     | ŧ ] | 45 | 43 |        |       |       |   |   |           |         | 効       | 減衰     |        | - 初期状態 | 能     |        |
|-----|----------|-----|----|----|--------|-------|-------|---|---|-----------|---------|---------|--------|--------|--------|-------|--------|
| 悉   | <u> </u> | 形   | 閉  | 番  | 全揚程    | 吐出量   | 出力    | 極 | 型 | 末。ンフ゜・モータ | フライホイール | 回転数 率   | 定数     | 揚程     | 吐出量(   | 回転数   | トルク    |
| 兽   | 数        | #   | 閉鎖 | 号  | m      | m3/m  | kw    | 数 | 左 | kg-m2     | kg-m2   | min−1 % | k      | m      | m3/m   |       |        |
| í   | î        | i   | ~ì | Ó  | 73,000 | 1.490 | 37, 0 | 2 | 1 | . 860     | 15.000  | 2900 67 | . 0725 | 73.000 | 1.490  | 1.000 | 1. 000 |

#### 【 圧力線図仕様 】

管路名称 1

| [ | 縦 | 断 | 仕 | 様 | 1 |
|---|---|---|---|---|---|
|---|---|---|---|---|---|

| 縦断仕 | ∶様 】   | 1       |         |         |        |        | 5-4- ( - mm -bit |        |
|-----|--------|---------|---------|---------|--------|--------|------------------|--------|
| 管路  | 追加距離   | レベル     | 追加距離    | レベル     | 追加距離   | レベル    | 追加距離             | レベル    |
| 名称  | m      | m       | m       | m       | m      | m      | M                | m      |
| 1   | . 0    | 584. 26 | 10.0    | 584. 26 |        |        |                  |        |
| ż   | 10.0   | 584, 26 | 50.0    | 584. 26 | 165.0  | 561.12 | 365.0            | 567.73 |
| 5   | 365.0  | 567.73  | 465.0   | 564.70  | 485.0  | 564.12 | 685.0            | 579.34 |
| ·   | 752.0  | 576, 85 | 1445.0  | 616.85  | 1525.0 | 618.03 | 1665.0           | 616.86 |
|     | 1865.0 | 611, 23 | 1965.0  | 611.70  | 1665.0 | 616.86 | 1965.0           | 611.70 |
|     | 2000.0 | 624.69  | 2035.0  | 626.86  | 2075.0 | 620.50 |                  |        |
| 8   | 2075.0 | 620.50  | 2085. O | 620.50  |        |        |                  |        |
|     |        |         |         |         |        |        |                  |        |



計算番号 C2-1010-E

PAGE

Transmission Pump (E)

基準レベル 計算時間単位

516.000 m .04570 sec

| 7 | 44. | ᇡ | 4  | ł 苯 | 7 |
|---|-----|---|----|-----|---|
|   | 管.  | 田 | 11 | 17X | ] |

| 管路<br>名称 | 管長     | 管種   | 管径<br>mm | 管厚   | ヤング<br>率 | 上流の管路 | ボる | ンフ<br>B号 | ブ | ザーソ<br>タンク<br>番号 | 开番号 | 終点<br>条件 | 管路流量<br>m3/m | 配管<br>損失<br>m | 开殺<br>損失<br>m | 注刀波<br>往復時間<br>sec | 管路定数     | 分割 |
|----------|--------|------|----------|------|----------|-------|----|----------|---|------------------|-----|----------|--------------|---------------|---------------|--------------------|----------|----|
| 1        | 50.0   | FCD3 | 350      | 6. 5 | 1.600    |       | 1  | 0        | 0 | 0                | 0   | 0        | 5.080        | . 100         | . 000         | . 0914             | 9.6740   | 2  |
| 2        | 836.0  | FCD3 | 350      | 6, 5 | 1,600    | 1     | 0  | 0        | 0 | 0                | 0   | 0        | 5.080        | 2.600         | . 000         | 1. 5283            | 9.6740   | 34 |
| 3        | 1624.0 | FCD3 | 350      | 6.5  | 1.600    | 2     | 0  | 0        | 0 | 0                | 0   | 0        | 5. 080       | 5.100         | . 000         | 2. 9689            | 9.6740   | 64 |
| 4        | 1396.0 | FCD3 | 350      | 6. 5 | 1.600    | 3     | 0  | 0        | 0 | 0                | 0   | 1        | 3.750        | 2. 500        | 5.700         | 2. 5521            | 9.6740   | 56 |
| 5        | 949.0  | FCD3 | 200      | 6.0  | 1.600    | 3     | 0  | 0        | 0 | 0                | 0   | 1        | 1.330        | 3.900         | 11, 800       | 1. 5935            | 32. 2567 | 34 |

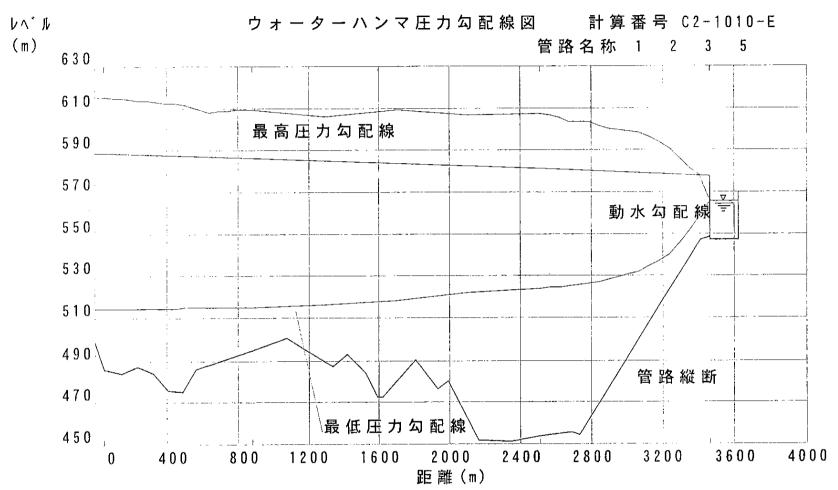
#### 【 ポンプ仕様 】

|   |    |   | 弁 | 弁 |        |       |      |   |   |                 |         | 効       | 减衰     |        | 7// 共// 1人 ///:: |         |
|---|----|---|---|---|--------|-------|------|---|---|-----------------|---------|---------|--------|--------|------------------|---------|
| 番 | 台  | 形 | 閉 | 番 | 全揚程    | 吐出量   | 出力   | 極 | 型 | <b>ポンプ・モ</b> ータ | フライホイール | 回転数 率   | 定数     | 揚程     | 吐出量 回転           | と トルク   |
| 号 | 娄女 | 走 | 鎖 | 号 | m      | m3/m  | kw   | 数 | 炷 | kg−m2           | kg-m2   | min-1 % | k      | m      | m3/m             |         |
| 1 | 2  | 1 | 1 | Λ | 73 000 | 2 540 | 55 0 | 2 | 1 | 960             | 000     | 2900 68 | 2 0124 | 73 000 | 2 540 1 00       | 0 1.000 |

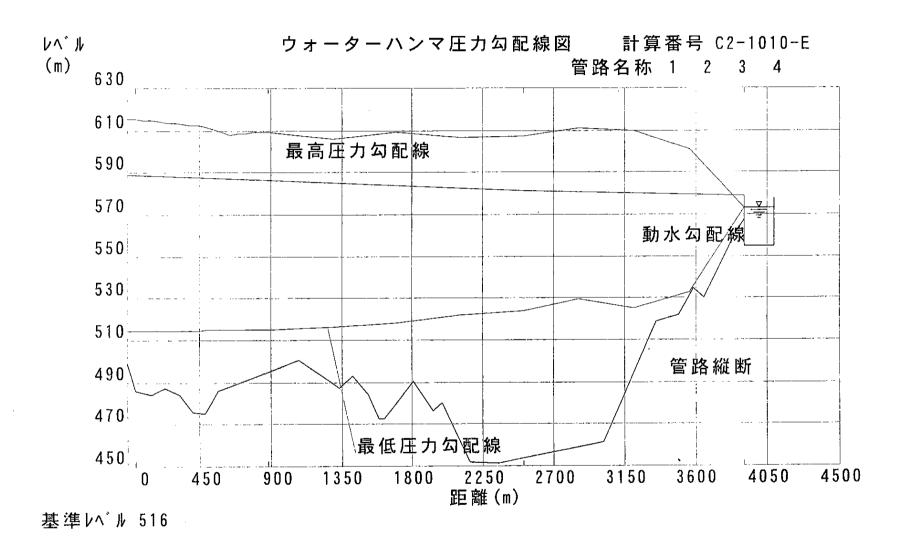
#### 【 圧力線図仕様 】

管路名称 1 2 3 4

| 涎断 仕 | 禄】     |         |        |         |        |         |         |         |
|------|--------|---------|--------|---------|--------|---------|---------|---------|
| 管路   | 追加距離   | レベル     | 追加距離   | レベル     | 追加距離   | レベル     | 追加距離    | レベル     |
| 名称   | m      | m       | Ш      | m       | m      | m       | m       | m       |
| 1    | . 0    | 498.50  | 50, 0  | 486, 14 |        |         |         |         |
| 2    | 50.0   | 486.14  | 147.0  | 484.10  | 235.0  | 487. 52 | 323.0   | 484, 14 |
|      | 410.0  | 476.10  | 486.0  | 475, 32 | 564.0  | 485.85  | 886. 0  | 495.12  |
| 3    | 886.0  | 495.12  | 1078.0 | 500.46  | 1333.0 | 487. 24 | 1418.0  | 493.21  |
|      | 1523.0 | 483.87  | 1586.0 | 473.01  | 1622.0 | 472.93  | 1807. 0 | 490, 55 |
|      | 1932.0 | 476.41  | 1990.0 | 480.34  | 2160.0 | 451.89  | 2349.0  | 451.01  |
|      | 2510.0 | 453.53  |        |         |        |         |         |         |
| 4    | 2510.0 | 453.53  | 3013.0 | 461.30  | 3354.0 | 518.97  | 3492.0  | 522.09  |
|      | 3586.0 | 534.91  | 3650.0 | 530, 52 | 3856.0 | 561.75  | 3906.0  | 567. 50 |
| 5    | 2510.0 | 453, 53 | 2690.0 | 455.90  | 2732.0 | 454.58  | 3409.0  | 547.02  |
| _    | 3459 0 | 548.50  |        |         |        |         |         |         |



基準 レベル 516



FOR Kurufoda Reservoir

計算番号 C2-1010-E1

PAGE 1

Transmission Pump (E)

基準レベル 計算時間単位

516.000 m .04570 sec

| 管 | 路 | 仕 | 様 | 3 |
|---|---|---|---|---|
|   |   |   |   |   |

| 管路<br>名称 | 管長     | 管種   | 管径<br>mm | 管厚<br>mm | ヤング<br>率 | 上流の管路 | ポン<br>番 | ンフ<br>号 | f | ァーソ<br>番号 | 番号 | 終点<br>条件 | 管路流量<br>m3/m | 損失    | 損失    | 注り版<br>往復時間<br>sec | 管路定数   | 分割         |
|----------|--------|------|----------|----------|----------|-------|---------|---------|---|-----------|----|----------|--------------|-------|-------|--------------------|--------|------------|
| 1        | 50.0   | FCD3 | 350      | 6.5      | 1.600    |       | 1       | 0       | 0 | 0         | 0  | 0        | 5. 250       | . 100 | . 000 | . 0914             | 9.6740 | 2          |
| 2        | 836.0  | FCD3 | 350      | 6. 5     | 1.600    | 1     | 0       | 0       | 0 | 0         | 0  | 0        | 5. 250       | 2.800 | . 000 | 1. 5283            | 9.6740 | 34         |
| 3        | 1624.0 | FCD3 | 350      | 6. 5     | 1,600    | 2     | 0       | 0       | 0 | 0         | 0  | 0        | 5.250        | 5.400 | . 000 | 2.9689             | 9.6740 | 64         |
| 4        | 1396.0 | FCD3 | 350      | 6.5      | 1.600    | 3     | 0       | 0       | 0 | 0         | 0  | 1        | 5. 250       | 4.700 | . 000 | 2. 5521            | 9.6740 | 5 <b>6</b> |

#### 【ポンプ仕様】

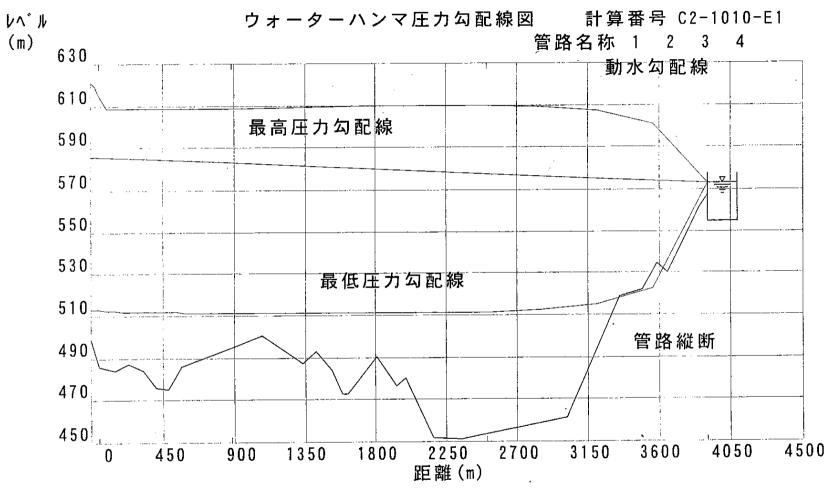
|   |   |   | 弁 | 弁 |        |       |      |   |   |         |         | 効       | 減衰     |        | 70 升1人 15     |        |
|---|---|---|---|---|--------|-------|------|---|---|---------|---------|---------|--------|--------|---------------|--------|
| 番 | 台 | 形 | 閉 | 番 | 全揚程    | 吐出量   | 出力   | 極 | 型 | ポンプ・モータ | フライホイール | 回転数 率   | 定数     | 揚程     | 吐出量 回転数       | トルク    |
| 号 | 数 | 定 | 鎖 | 号 | m      | m3/m  | kw   | 数 | 左 | kg-m2   | kg-m2   | min-1 % | k      | m      | m3/m          |        |
| 1 | 2 | 1 | 1 | 0 | 70.000 | 2.625 | 55.0 | 2 | 1 | . 960   | . 000   | 2900 67 | 2.0240 | 70.000 | 2. 625 1. 000 | 1. 000 |

#### 【 圧力線図仕様 】

管路名称 1 2 3 4

【絲

| 縦断仕 | 様】      |         |         |         |         |         |         |         |
|-----|---------|---------|---------|---------|---------|---------|---------|---------|
| 管路  | 追加距離    | レベル     | 追加距離    | レベル     | 追加距離    | レベル     | 追加距離    | レベル     |
| 名称  | m       | m       | m       | m       | m       | m       | m       | m       |
| 1   | . 0     | 498.50  | 50.0    | 486. 14 |         |         |         |         |
| 2   | 50.0    | 486.14  | 147.0   | 484.10  | 235.0   | 487. 52 | 323.0   | 484. 14 |
|     | 410.0   | 476.10  | 486.0   | 475.32  | 564.0   | 485.85  | 886.0   | 495.12  |
| 3   | 886.0   | 495, 12 | 1078.0  | 500.46  | 1333.0  | 487. 24 | 1418.0  | 493.21  |
|     | 1523.0  | 483.87  | 1586, 0 | 473.01  | 1622, 0 | 472.93  | 1807. 0 | 490.55  |
|     | 1932, 0 | 476.41  | 1990.0  | 480.34  | 2160.0  | 451.89  | 2349.0  | 451.01  |
|     | 2510.0  | 453.53  |         |         |         |         |         |         |
| 4   | 2510.0  | 453.53  | 3013.0  | 461.30  | 3354.0  | 518.97  | 3492.0  | 522.09  |
|     | 3586.0  | 534, 91 | 3650.0  | 530, 52 | 3856.0  | 561.75  | 3906.0  | 567.50  |
| 5   | 2510.0  | 453, 53 | 2690.0  | 455, 90 | 2732.0  | 454.58  | 3409.0  | 547.02  |
| _   | 3459, 0 | 548.50  |         |         |         |         |         |         |



基準レベル 516

For Kutyfoda Reservoir adjactific

計算番号 C2-1010-F

PAGE

1

Transmission Pump (F)

基準レベル 計算時間単位 549, 490 m .06786 sec

【管路仕様】

弁番号 0 配管 損失 サージ 圧力波 管路定数 タンク 終点 管路流量 損失 往復時間 分割 ヤング 上流の管路 管路 管長 番号 坙 番号 条件 m3/m sec 名称 mm m m .000 32. 2567 24 1.600 1 0 0 0 4. 100 3.400 1.6287 FCD3 200 6.0 1 970.0

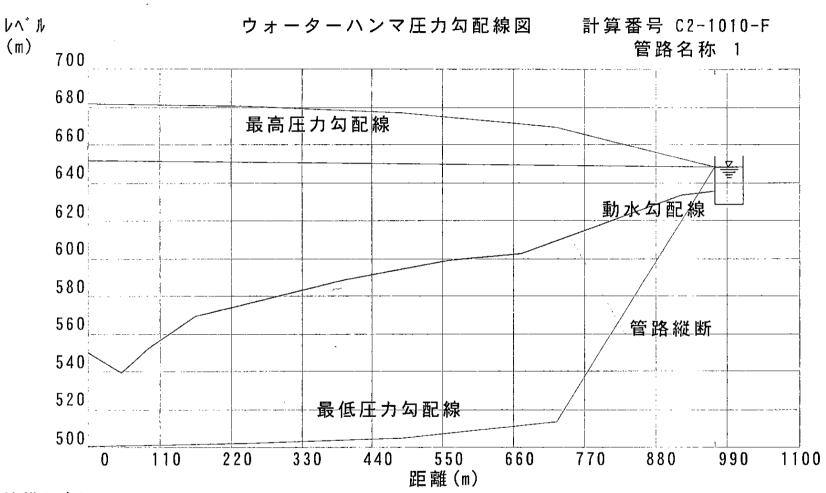
【ポンプ仕様】

効 減衰 ----- 初期状態 -----弁番号 型 ポンプ・モータ 式 kg-m2 定数 吐出量 回転数 トルク 極数 フライホイール 回転数 率 番号 形式 全揚程 吐出量 出力 台数 kg-m2 min-1 % 鎖 m3/m kw k m m3/m 1. 440 2900 58 1.1767 102.000 1. 360 1.000 1.000 0 102..000 1.360 55.0 2 . 000

【 圧力線図仕様 】

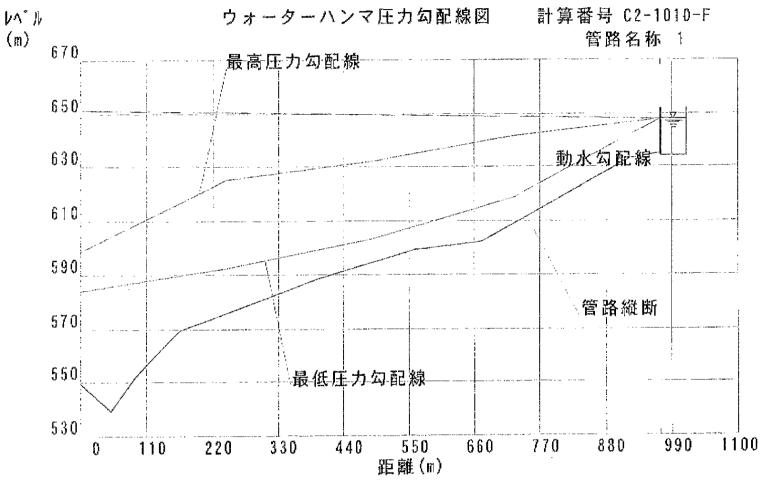
管路名称 「

【 縦断仕様 】 管路 追加距離 名称 追加距離 追加距離 追加距離 レベル レベル レベル レベル m m m 552. 24 91.0 164.0 569, 40 50.0 539.49 . 0 549.50 599.15 672.0 602.37 920.0 633.36 397.0 588. 57 559.0 635.30 970.0



基準Vn' N 549.49 Travamission Pump(F):
R2. SR -> Hantana place SR.

芝江菜: 龙葵兰



基準VA'N 549.49 Transmission Purp (F):

Re SR - Hartena Mace SR

STRITED FOR (Inn Pit) - BARIA

計算番号 C2-1010-F

PAGE 1

Transmission Pump (F)

基準レベル 計算時間単位 549, 490 m . 06786 sec

【 管路仕様 】

弁綾 圧力波 #--> 損失 往復時間 管路定数 番号 終点 管路流量 管厚 ヤング mm 率 979 管路 名称 上流の管路 管長 番号 m3/mE) m sec Ш 000 1.6287 24 970.0 FCD3 200 6.0 1.600 1 0 0 4. 100 3.400

【ポンプ仕様】

----- 初期状態 -----弁番号 型 ポンプ・モータ 吐出量 回転数 トルク 出力 極 kw 数 75/4/-/ 国転数 率 定数 全揚程 吐出屋 kg-m2 min-1 % 数式 īţ kg-m2 k П m3/mm J/mm 1.440 .000 2900 58 1.1767 102.000 1.360 1.000 1.000 0 102,000 1.360 55.0 2

【サージタンク仕様】

初期 戻り管 連絡管 損失 管路 定数 ヤング 圧力波 水位 空気弁 連絡管 塞 空気量 損失 形式3 断面積 個数 長さ 管種 管径 管厚 往復時間 高さ mЗ sec ar 2 Ø m 5, 000 . 1 . 000 .0000 . 000 0 . 100 Û . 0 . 0 . 000 7. 347

#### 【 圧力線図仕様 】

管路名称 1

【 擬断仕様 】

| 被断位<br>管路 | 禄」<br>追加距離  | レベル     | 追加距離   | レベル            | 追加距離  | レベル     | 追加距離           | レベル     |
|-----------|-------------|---------|--------|----------------|-------|---------|----------------|---------|
| 名称        | <b>(</b> II | Т       | 13     | M              | M:    | Ø       | m              | U       |
| ]         | . 0         | 549, 50 | 50. Ü  | 539.49         | 91. 0 | 552, 24 | 184. D         | 569. 40 |
|           | 397.0       | 588. 57 | 559, 0 | 599. <b>15</b> | 672.0 | 602.37  | 92 <b>0.</b> 0 | 633. 36 |
|           | 970.0       | 635, 30 |        |                |       |         |                |         |

計算番号 C2-1010-H

PAGE

1

Transmission Pump (H)

基準レベル 計算時間単位

531.250 m .04811 sec

| 管 | 路 | 仕 | 様 | 3 |
|---|---|---|---|---|
|   |   |   |   |   |

| 管路<br>名称 | 管長     | 管種   | 管径  | 管厚    | ヤング<br>率 | 上流の管路 |   | ンフ<br><b>8号</b> | Í | サージ<br>タンク<br>番号 | 弁<br>番<br>号 | 終点<br>条件 | 管路流量<br>m3/m | 配管<br>損失<br>m | 弁級<br>損失 | 上力波<br>往復時間<br>sec | 管路定数     | 分割  |
|----------|--------|------|-----|-------|----------|-------|---|-----------------|---|------------------|-------------|----------|--------------|---------------|----------|--------------------|----------|-----|
| 1        | 42.0   | VP 1 | 160 | 12. 7 | . 027    |       | 1 | 0               | 0 | 0                | 0           | 0        | 1. 110       | . 310         | . 000    | . 1925             | 18.4690  | 4   |
| 2        | 1483.0 | VP 1 | 160 | 12, 7 | . 027    | 1     | 0 | 0               | 0 | 0                | 0           | 0        | 1. 110       | 10.900        | . 000    | 6. 7953            | 18.4690  | 140 |
| 3        | 160.0  | VP 1 | 225 | 12.7  | . 027    | 2     | 0 | 0               | 0 | 0                | 0           | 0        | 1. 110       | . 220         | . 000    | . 8575             | 7. 9846  | 18  |
| 4        | 296.0  | FCD3 | 200 | 6. 0  | 1.600    | 3     | 0 | 0               | 0 | 0                | 0           | 1        | 1. 110       | . 850         | . 000    | . 4970             | 32. 2567 | 10  |

### 【ポンプ仕様】

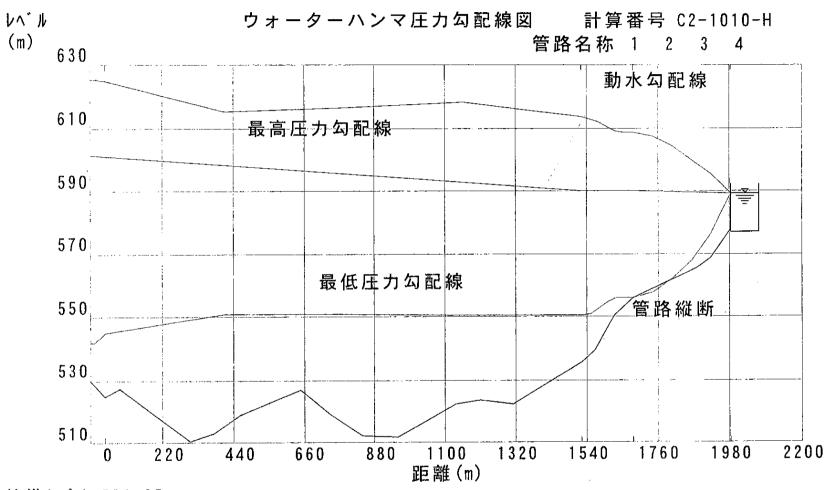
| , | 1== 1 | - | 弁  | 弁 |        |       |      |   |     |          |         | 効       | 減衰     |         | - 初期状態 | 焦     |       |
|---|-------|---|----|---|--------|-------|------|---|-----|----------|---------|---------|--------|---------|--------|-------|-------|
| 番 | 台     | 形 | 閉鎖 | 番 | 全揚程    | 吐出量   | 出力   | 極 | 型 ; | キ゚ンプ・モータ | フライホイール | 回転数 率   | 定数     | 揚程      | 吐出量    | 可転数   | トルク   |
| 号 | 数     | 定 | 鎖  | 号 | m      | m3/m  | kw   | 数 | 定   | kg-m2    | kg-m2   | min−1 % | k      | m       | m3/m   |       |       |
| 1 | 1     | 1 | 1  | n | 70 NNN | 1 110 | 30.0 | 2 | 1   | 555      | 000     | 2900 53 | 1.8715 | 70, 000 | 1. 110 | 1.000 | 1.000 |

### 【 圧力線図仕様 】

管路名称 1 2 3 4

【 縦断仕様 】

| 柳面江, | 恢 /    | 1 .3 .1 | ↑☆ .Le. ロビ ☆#  | 1 -2 11 | *产 土n 四广 赤丝 | 1 48 11 | `스 뉴스 NE 호셔 | 1 . 65 .1 |
|------|--------|---------|----------------|---------|-------------|---------|-------------|-----------|
| 管路   | 追加距離   | レベル     | 追加距離           | レベル     | 追加距離        | レベル     | 追加距離        | レベル       |
| 名称   | m      | m       | m              | m       | m           | m       | m           | m         |
| İ    | . 0    | 529.75  | 42.0           | 524.66  |             |         |             |           |
| 2    | 42.0   | 524.66  | 90.0           | 527.14  | 304.0       | 510.40  | 380.0       | 512.86    |
|      | 460.0  | 518.88  | 650, 0         | 526.76  | 738.0       | 519.25  | 840.0       | 512.14    |
|      | 950.0  | 511.53  | 1130. <b>0</b> | 522.13  | 1210.0      | 523.54  | 1310.0      | 522.40    |
|      | 1525.0 | 535, 84 |                |         |             |         |             |           |
| 3    | 1525.0 | 535, 84 | 1563.0         | 539.32  | 1625.0      | 550.31  | 1685.0      | 555.94    |
| 4    | 1685.0 | 555.94  | 1875.0         | 565.00  | 1921.0      | 568. 42 | 1981.0      | 577. 94   |



基準レベル 531.25

Transmission Pup (H):

Kondadenija SR. — Kulyfamana SR.



# A. INTAKE [Phase 1] 1. LOAD LIST FOR ELECTRICAL WORKS SUMMARY SHEET

| Facility name | Equipment name                      |             | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Nummbers) | Generator<br>(kW)                     | Remarks                             |
|---------------|-------------------------------------|-------------|-------------------|-----------------------|--------------------|--------------------------|-------------------------|---------------------------------------|-------------------------------------|
| HAGODA Intake |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               | 1. Intake                           |             | 7                 | 4                     | 11                 | 298.30                   | 6                       | 297.10                                | NO.1Tr                              |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          | <br>                    |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          | <del></del>             |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          | <del></del>             |                                       |                                     |
|               |                                     | <del></del> |                   |                       |                    | •                        | <del></del>             |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             | ļ. <u></u>        |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               | 2.Architectural and others          |             | <del> </del>      | <del></del>           |                    |                          |                         |                                       |                                     |
|               | Architectural (1) Architectural (1) | kW<br>kVA   | 1 2               |                       | - 1                | 35.00                    | 1                       |                                       | NO.1Tr                              |
|               | Areintecturar (1)                   | KVA         |                   |                       | 2                  | 4.70                     |                         | 4./0                                  | NO.1Tr                              |
| •             |                                     |             | <del> </del> -    |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             | <del> </del>      |                       |                    |                          |                         |                                       | <del> </del>                        |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             | <del> </del>      |                       |                    |                          |                         |                                       |                                     |
|               | Total (NO.1 Transformer)            | kVA         |                   |                       |                    | 333.30                   |                         | 332.10                                | Σ1, Three Phase                     |
|               | Total (NO.1 Transformer)            | kVA         | -                 |                       |                    | 4.70                     | <u> </u>                | 4.70                                  | Σ2, Three Phase<br>Σ3, Single Phase |
|               |                                     | A.Y.A.      |                   |                       |                    |                          |                         |                                       | AJ, Bligie Fliase                   |
|               |                                     |             | <del>  "-</del>   |                       |                    |                          |                         | · · · · · · · · · · · · · · · · · · · |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         |                                       |                                     |
|               |                                     |             |                   |                       |                    |                          |                         | ····                                  |                                     |
|               | Total                               |             |                   |                       |                    | 337.53                   |                         | 336.33                                |                                     |

Total(kW)= $\Sigma 1+\Sigma 2\times 0.9+\Sigma 3\times 0.8$ 

## A. INTAKE [Phase 1] 2. LOAD LIST FOR ELECTRICAL WORKS

| 1. Intake     |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|---------------|---|------------|-------------------|-----------------------|--------------------|--------------------------|------------------------|--------------|-------------------------------------|--|--|--|--|
| Load tag No.  | Load name   | Power (kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer,<br>Power<br>(kW) | Generator<br>(Numbers) |              | Remarks                             |  |  |  |  |
| 01 MH 01      | Screening Hoist                                     | 1.20       | J                 |                       | 1                  | 1.20                     |                        |              |                                     |  |  |  |  |
| 01 FS 11/21   | Fine Screen   | 2.20       | 2                 |                       | 2                  | 4.40                     | 2                      | 4.40         |                                     |  |  |  |  |
| 01 SW 01/02   | Screen Wash Pump                                    | 11.00      | 1                 | 1                     | 2                  | 11.00                    | 1                      | 11.00        |                                     |  |  |  |  |
| 01 RW 11to41  | Raw Water Pump                                      | 280.00     | i                 | 1                     | 2                  | 280.00                   | 1                      | 280.00       | SC is to be installed at each load. |  |  |  |  |
| 01 MV 11to 41 | Discharge Valve                                     | 0,20       | 1                 | 1                     | 2                  | 0.20                     | 1                      | 0.20         |                                     |  |  |  |  |
| 01 DP 01/02   | Sump Drainage Pump                                  | 1.50       | 1                 | 1                     | 2                  | 1.50                     | 1                      | 1.50         | :                                   |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        | <del> </del> |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              | Duty load for SC (1)<br>16.80       |  |  |  |  |
|               | TOTAL (Distribution Tank and Grit Chamber Facility) | kW<br>kVA  | 7                 | 4                     | 11                 | 298.30                   | 6                      | 297,10       |                                     |  |  |  |  |
|               |   |            |                   |                       |                    |                          |                        |              |                                     |  |  |  |  |

## A. INTAKE [Phase 1] 2. LOAD LIST FOR ELECTRICAL WORKS

2.Architectural and others

↓ Not including stand-by

| tremiteetal al al | ural and others ↓ Not including stand-by |            |               |                   |                       |                    |                          |                        | <del> </del>      |                          |
|-------------------|--|------------|---------------|-------------------|-----------------------|--------------------|--------------------------|------------------------|-------------------|--------------------------|
| Load tag No.      | Load name                                |            | Power<br>(kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks                  |
|                   | Architectural Power                      |            | 25.00         | 1                 |                       | 1                  | 25.00                    | 1                      | 25.00             |                          |
|                   |  |            |               |                   |                       |                    |                          |                        |                   |                          |
|                   | DC Power (kVA)                           |            | 1.70          | 1                 |                       | 1                  | 1.70                     | 1                      | 1.70              |                          |
|                   | UPS Power (kVA)                          |            | 3.00          |                   |                       |                    | 3.00                     | 1                      | 3.00              |                          |
|                   | lors rower (kVA)                         |            | 3.00          |                   | -                     | 1                  | 3.00                     | 1                      | 3.00              |                          |
|                   | Generator Panel                          |            | 10.00         | 1                 |                       | 1                  | 10.00                    | 1                      | 10.00             |                          |
|                   |  |            |               |                   |                       |                    |                          |                        |                   |                          |
|                   |  |            |               |                   |                       |                    |                          |                        |                   |                          |
|                   |  |            |               |                   |                       |                    |                          |                        |                   |                          |
| . <u> </u>        |  |            |               |                   |                       |                    |                          |                        |                   |                          |
| <del></del>       |  |            |               |                   |                       |                    |                          |                        |                   |                          |
|                   |  | •          |               | _ <del></del>     |                       |                    |                          |                        | · · · ·           |                          |
|                   |  |            |               |                   |                       |                    |                          |                        |                   |                          |
|                   | TOTAL                                    | kW         |               | 2                 |                       | 2                  |                          | 2                      |                   | Three Phase              |
|                   | (Architectural Facility)                 | kVA<br>kVA |               | 2                 |                       | 2                  | 4.70                     | 2                      |                   | Three Phase Single Phase |

### A. INTAKE [Phase 1]

### 3-1. Capacity Calculation Sheet for Transformer

|                              | Duty Transformer Name   | Three Phase Load Ca     | apacity (Σ         | P1) kVA                                       | Load Equip  | ment (ΣP2 | Si     | ingle Phase l                | Load E | quipmen     | t (ΣP3) |
|------------------------------|---|-------------------------|--------------------|---|-------------|-----------|--------|------------------------------|--------|-------------|---------|
| ndition                      | Duty Transformer tvame  | ( kW )                  | )                  |   | ( kVA       | .)        |        |                              | (kVA   | .)          | •       |
| ၂ ပို                        | NO.1 Power Transformer  | 333.30                  | )                  |   | 4.70        |           |        |                              |        |             |         |
| Calculation Condition        | NO.2 Power Transformer  |                         |                    |   |             |           |        |                              |        |             |         |
| ථ                            | Calculation Formula for Power   | Transformer 1           |                    |   |             |           |        |                              |        |             |         |
| nula                         | $TR = (\frac{\sum P1}{\eta \times \phi} + \sum P2 + \sqrt{R} + \sqrt{R} + \sum P2 + \sqrt{R} + \sqrt{R} + \sum P2 + \sqrt{R} $ |                         | Calculation Result | Transformer NO.1-1 Power Tra NO.1-2 Power Tra | insformer   | Required  |        | sformer Capacity i<br>466.01 |        | Ren         | marks   |
| For                          | ΣP1~3: Total Capacity for eac   | h facility in kW/kVA    | ర                  |   |             |           |        |                              |        |             |         |
| tion                         | η : General Efficiency  | 0.85                    |                    | ed capacity of tran                           | sformer     | 10 15     | 20 30  | <del></del>                  |        | <del></del> | 200 300 |
| ula                          | φ : General Power Factor  | <b>——</b>               | in k               |   | <b>-</b> i- | 500       | 750    | 1000                         | 1.5    | 500         | 2000    |
| Capacity Calculation Formula | lpha: Surplus Factor $eta$ : Demand Factor  | 1                       | Prop               | osed Transformer                              | kVA         |           | Number |                              |        | Voltage     |         |
| paci                         |   |                         | 170                | 1 m . 6                                       |             |           |        | Prima                        | ary    | Seco        | ondary  |
| ్ర                           |   |                         |                    | 1 Transformer<br>2 Transformer                |             | 500       |        |                              |        |             |         |
|                              |   |                         |                    |   |             |           |        |                              |        |             |         |
|                              | The upper rated transformer capacity is to  | be proposed through the | capacity c         | alculation.                                   |             |           |        |                              |        |             |         |

### A. INTAKE [Phase 1]

## 3-2. Calculation for Transformer Voltage Regulation (Motor-starting)

| Calculation Formula   |                                  | Calculation Result | •          |
|---|----------------------------------|--------------------|------------|
| [ Calculation Formula for Power Transfomer Voltage Regulation]  | Item                             | 500kVA             | · <b>-</b> |
|   | Max. Load Capacity (kW)          | 280                |            |
| ① Base Load Capacity (kVA)  | 1. Base Load Capacity (kVA)      | 112,46             |            |
| K1 = Load Capacity - Max. Motor Capacity (kVA)  | 2. Starting Load Capacity        | 697.58             |            |
|   | 3. Active Power (kW)             | 374.62             |            |
| ② Starting Load Capacity (kVA)  | 4. Reactive Power                | 698.58             |            |
| K2 = Max. Motor Capacity (kVA) × Starting Factor  | 5. Total Starting Capacity (kVA) | 792.69             |            |
|   | 6. Voltage Regulation (%)        | 8.40               |            |
| ③ Active Power (kW)   | Result                           | 10% > 8.40%        |            |
| $P = P1 + P2 = K1\cos\theta \ 1 + K2\cos\theta \ 2$   |                                  | O.K.               |            |
| <ul> <li>⑤ Total Starting Capacity (kVA)         K = √(P² + Q²)</li> <li>⑥ Voltage Regulation (%)         ε = Total Starting Capacity</li></ul> |                                  |                    |            |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |                                  |                    |            |

A. INTAKE [Phase 1]
4. Calculation Sheet for Static Capacitor (SC)

|                                    |                    | Du                 | ity Load fo | r SC        |  |   |                   |                                   |                    |           |                         |             |               |             |             |           |
|------------------------------------|--------------------|--------------------|-------------|-------------|--|---|-------------------|-----------------------------------|--------------------|-----------|-------------------------|-------------|---------------|-------------|-------------|-----------|
| Equipment Name                     | For SC (1)<br>(kW) | For SC (2)<br>(kW) |             |             |  |   |                   |                                   | Calculation Form   | ıula      |                         |             |               |             |             |           |
| Distribution Tank and Grit chamber | 16.80              | -                  |             |             |  | [Formula]                                       |                   |                                   |                    |           |                         |             |               |             |             |           |
|                                    | ļ                  | •                  |             |             | -  | <u></u>   | ſ                 | / <del></del>                     |                    |           |                         |             | ٠,            |             |             |           |
|                                    |                    |                    |             |             |  | $Q = \frac{P \times \beta}{\eta}$               | · × {             | $\sqrt{\frac{1}{(\cos\theta 1)}}$ | )2 - 1 -           | √(cos     | $\frac{1}{\theta} 2)^2$ | 1           | } +           | ΣTi         | ХγТ         | •         |
|                                    |                    |                    | <br>        |             | <u> </u>   | O · Required                                    | Static C          | Capacitor Capacity in             | kVar               |           |                         |             |               |             |             |           |
|                                    |                    |                    |             |             |  | P : Duty Load                                   | d Outpu           |                                   | K v di             | ΣΤ: Ο     | apacity                 | of Trans    | sformer       | (kVA)       | F           | 0         |
|                                    |                    |                    |             |             |  | η : Efficiency                                  |                   |                                   | 0.85               |           |                         |             |               |             | =           |           |
|                                    |                    |                    |             |             |  | $\beta$ : Demand F<br>COS $\theta$ 1: Power Fac |                   | hout SC at Bus Bar                | 0.7~ 0.8<br>0.85   |           |                         |             |               |             | L           |           |
|                                    | -                  |                    |             |             |  | COS θ 2 : Power Fac                             |                   |                                   | 0.95               | γT:T      | ransforn                | ner Exci    | ting Fac      | etor [      | 0.01~       | 0.03      |
|                                    |                    |                    |             |             | ļ  |   |                   | SC (1) (For NO.1 7                |                    |           | 4.03                    |             | ~             |             | 4.60        |           |
|                                    |                    |                    |             |             | <del>                                     </del> | _   | Result            | SC (2) (For NO.2 1                | ransformer)        |           | 0.00                    |             | ~             |             | 0.00        |           |
|                                    |                    |                    |             |             |  |   | ಷ                 |                                   |                    |           |                         |             |               |             |             |           |
|                                    |                    |                    |             |             | -  |   |                   |                                   | NO.1 SC            |           |                         |             | 5             |             | kV          | 'a#       |
|                                    |                    |                    |             |             |  |   |                   | SC (1)                            | NO.2 SC            | -         |                         |             |               |             | kV<br>kV    |           |
|                                    |                    |                    |             | _           |  |   |                   |                                   |                    |           |                         |             |               |             | kV          |           |
| <u> </u>                           | <del> </del>       |                    |             | <del></del> |  |   | city              | SC (2)                            | NO.1 SC<br>NO.2 SC |           |                         | <del></del> |               |             | kV<br>kV    |           |
|                                    |                    |                    |             | ·           |  |   | Zapa              |                                   | NO.3 SC            |           |                         |             |               |             | kV          |           |
|                                    |                    |                    |             |             |  |   | sed (             |                                   | <b>_</b>           |           |                         |             |               |             |             |           |
|                                    | <del></del> -      |                    |             |             | -  |   | Proposed Capacity |                                   |                    |           | <del></del>             |             |               | <del></del> | <del></del> |           |
|                                    |                    |                    |             |             | ļ <u>.</u>                                       |   | 1                 |                                   |                    |           |                         |             |               |             |             |           |
|                                    |                    |                    |             |             | <del>                                     </del> |   |                   |                                   |                    |           |                         | <del></del> | <del></del> . |             |             |           |
|                                    |                    |                    |             |             | -  |   |                   |                                   |                    |           |                         |             | *** • •       | ,           |             | ,         |
|                                    |                    |                    |             |             | <del> </del>                                     |   |                   | Rated Capacity                    |                    | 10<br>150 | 15<br>200               | 20<br>250   | 25<br>300     | 30<br>400   | 50<br>500   | 75<br>750 |
|                                    |                    |                    |             |             |  |   |                   | (JIS - C - 4902)                  |                    | 1000      | 200                     | 230         | 300           | 700         | 500         | ,50       |
|                                    |                    |                    | -           |             | <u> </u>   |   |                   |                                   |                    |           |                         |             |               |             |             |           |
| Total                              | 16.80              | 0.00               |             |             |  |   |                   |                                   |                    |           |                         |             |               |             |             |           |

#### A. INTAKE [Phase 1]

#### 5. Capacity Calculation of Alternator

|                       | Descri  | ption  | Value                            |          |                    |                | Value                     | Remarks      |                         | Rated A1 | ternator Ca | nacity |      |
|-----------------------|---|--|----------------------------------|----------|--------------------|----------------|---------------------------|--------------|-------------------------|----------|-------------|--------|------|
| e o                   | ΣP0 Load Capacity Cover   |  | raido                            | 336.33   |                    | PG 1           | 494.60                    | Romans       | 20                      | 37.5     | 50          | 62.5   | 75   |
| Calculation Condition |   | Load Name  | Raw Water Pump                   | 000100   | Calculation Result | PG 2           | 378.00                    |              | 100                     | 150      | 200         | 250    | 300  |
| Į                     | Pm Max. Motor   | Starting Method  | SOFT STERTER                     |          | Re                 | PG 3           | 368.58                    |              | 375                     | 500      | 625         | 750    | 875  |
| 1 2                   |   | kW   | JOH T BILLIER                    | 280.00   | ou                 | PG 4           | 13.33                     |              | 1000                    | 1250     | 1500        | 2000   | 2500 |
| l ifi                 | R Harmonic wave gener   | 1  |                                  | 0.00     | lati               |                |                           |              | 3125                    | 1230     | 1300        | 2000   | 2500 |
| l g                   | Transfer wave gener   | A (kW)   | <del></del>                      | 0.00     | lcu                | PG max         | 494.60                    |              | 3123                    |          | EM-1354     |        | ———  |
| Ę                     | Unbalanced load capacity  | B (kW)   |                                  | 0.00     | Ca                 | Selected       | 750                       |              |                         | J.       | 12101-1224  |        |      |
|                       | embaranced road capacity  | $\frac{B}{C}$ $\frac{(kW)}{(kW)}$  |                                  | 0.00     |                    | (kVA)          |                           | Diesel-engin | <br> e   Radiato        | r type   |             |        | ľ    |
| <b></b>               | The rated alternator capacity is                                    |  | f the maximum value a            |          | follow             | , ,            |                           | Dieser-engin | ic , Radiato            | ттурс    |             |        |      |
|                       | a. Required for all load operation                                  |  | t the maximum value at           | mong me  | IUIIOW.            | ing carculatio | ,111,                     |              |                         |          |             |        |      |
|                       | a. Required for an load operation                                   | n idikvaj  |                                  |          | β                  | . Starting     | kVA for max, n            |              |                         | _        | 7.20        |        |      |
|                       | Σ. ΡΩ   |  |                                  |          | C                  | _              | tarter factor             | iotot pet kw |                         |          |             |        |      |
|                       | $PG1 = \frac{\Sigma PO}{\eta L \times \phi L} \times \alpha \times$ | Sf   |                                  |          | _                  |                |                           |              |                         |          | 0.25        |        |      |
|                       | // LX VL  |  |                                  |          |                    |                | ue to allowable           |              |                         |          | 0.15        |        |      |
| 1                     | h Dania d C 11 11 1   | DOS TIL  |                                  |          | R                  |                | rmonic wave ge            | _            |                         |          | ~ ^ ^ ]     |        |      |
|                       | b. Required from allowable vol                                      | tage drop PGZ[KVA]   |                                  |          | Δ]                 |                | igle phase unbal          |              | y in kW                 |          | 0.00        |        |      |
|                       |   | 1 4 5  |                                  |          |                    | Where A        | $A \ge B \ge C, \Delta P$ | = A+B-2C     |                         |          | <del></del> |        | 1    |
|                       | $PG2 = Pm \times \beta \times C \times Xd'$                         | <u>1-ΔΕ</u>  |                                  |          | U                  | : Single p     | hase unbalance            | factor U     | $J = \frac{A - C}{A P}$ |          | 0.00        |        |      |
|                       |   | ΔΕ   |                                  |          | _                  |                |                           |              | ΔΡ                      |          |             |        |      |
|                       | 7   | . 1 .1   |                                  |          | fv                 | l : Decreas    | e factor of load s        | tarting      |                         |          | 0.95        |        | Ī    |
| ļ                     | c. Required for starting the max                                    | . motor lastly PG3 [kVA]   |                                  |          | 37                 |                | C                         |              |                         |          |             |        |      |
| E]                    |   |  |                                  |          |                    |                | se factor of load         |              |                         |          |             |        |      |
| I                     | $PG3 = \frac{fv1}{vG} \{ (\Sigma PO - Pm) \}$                       | $\times \frac{\alpha}{1 \times 1} + Pm \times \beta \times C$  | <u>;</u> }                       |          | Nu                 | mber of Pole   | ,                         |              | Remarl                  | cs       |             |        |      |
| F <sub>O</sub>        | γG  | $\eta \perp \times \phi m$   |                                  |          | _                  |                | 0~ 0.8                    | 0.9 1        |                         |          |             |        |      |
| e e                   |   |  |                                  |          | <u> </u>           | 2P             | 1 0.9                     |              | PG3, fv1                |          |             |        |      |
| lati                  | d. Required from allowable neg                                      | ative phase current PG4 [kV  | Aj                               |          | <u> </u>           | Over 4P        | 1 0.95                    |              | PE2-2, fv               |          |             |        |      |
| Calculation Formula   | 1 /   | ······································   | <del></del> · · ··               |          | <u> </u>           | 2P             | 0.9 0.85                  |              | PE2-1 ,fv2              |          |             |        |      |
| ్రి                   | $PG4 = \frac{1}{KG4} \sqrt{\{(0.432F)\}}$                           | $(1.23 \Delta P)^2 \times (1.3U + 1.23 \Delta P)^2 \times (1.3U + 1.3U$ | -3U <sup>2</sup> )}              |          |                    | Over 4P        | 0.9 0.9                   | 0.9 0.9      |                         |          |             |        |      |
|                       | KG4 V ·   |  | //                               |          |                    |                |                           |              |                         |          |             |        |      |
| 1                     |   |  |                                  |          |                    |                |                           |              |                         |          |             |        | ľ    |
| ŀ                     |   |  |                                  |          |                    |                |                           |              |                         |          |             |        |      |
|                       | Where   |  |                                  |          |                    |                |                           |              |                         |          |             |        |      |
|                       | η L : General Effici  | -  |                                  |          |                    |                |                           |              |                         |          |             |        |      |
| ł                     | φ L : General Powe  | <u> </u>   |                                  |          |                    |                |                           |              |                         |          |             |        |      |
|                       | α : Demand Facto  |  |                                  |          |                    |                |                           |              |                         |          |             |        |      |
|                       | Xd': Alternator Fac   |  |                                  |          |                    |                |                           |              |                         |          |             |        |      |
|                       |   | acity covered by generator in  |                                  |          | 1                  |                |                           |              |                         |          |             |        |      |
|                       |   | sing factor due to unbalanced  | load ( = $1+0.6\times(\Delta P)$ | ÷ Σ P0 ) |                    | 1.00           |                           |              |                         |          |             |        | J    |
|                       | ΔE : Allowable vol  | tage drop factor   |                                  | 0.25     |                    |                |                           |              |                         |          |             |        | İ    |
|                       |   | city for momentary overload o  | of Alternator                    | 1.5      |                    |                |                           |              |                         |          |             |        | - 1  |
| L                     | φ m :Max. motor po  | wer factor   |                                  | 0.85     |                    |                |                           |              |                         |          |             |        | Į    |

Notel: To exchange kVA load into kW, single phase load to be multiplied by 0.8, rectifier to be calculated as multiplying of rated Dc voltage and DC current, UPS to be calculated as multiplying of rated output in kVA and 0.9, and these exchanged value to be added to three phase load capacity in kW.

#### A. INTAKE [Phase 1]

#### 6. Capacity Calculation of Engine

| ۱ ـ                   | Description  |  | Value                        |                    |                 | Value          | Remarks                                | Ge         | nerator eff | iciency   |
|-----------------------|--|--|------------------------------|--------------------|-----------------|----------------|--|------------|-------------|-----------|
| Į į                   | PG Generator Output in kV  | <u> </u>   | 750                          | It                 | PE 1            | 887.92         |  | Rate       | ηG          | effi. (%) |
| ğ                     |  | Load name  | Raw Water Pump               | esn                | PE 2-1          | 175.59         |  | kVA        | 2~8P        | 10~18P    |
| Ö                     | Pm Maximum Motor   | Starting Method                                  | SOFT STERTER                 | ı R                | PE 2-2          | 132.35         |  | 20         | 79.0        | -         |
| E                     |  | kW   | 280                          | tion               |                 |                |  | 37.5       | 82.5        | -         |
| Calculation Condition | ΣP0 Load Capacity Covered  | by Alt. (kW)                                     | 168.165                      | Calculation Result | PE max          | 887.92         |  | 50         | 84.3        | -         |
| <u> </u>              |  |  |                              | alc                | FEIIIAX         | 007.94         |  | 62.5       | 85.2        | -         |
| ್ದ                    |  |  |                              | )                  | Selected        |                |  | 75         | 85.7        | -         |
|                       |  |  |                              |                    | (PS)            | 900            | Diesel-engine generator, Radiator type | 100        | 86.7        | -         |
|                       | Maximum value or over amon   |  |                              | engin              | e capacity.     | <del>-</del> - |  | 125        | 87.6        | -         |
| 1                     | a. PE1 in PS is to be derived fr                                     | om requirement for full loa                      | ad running                   |                    |                 |                |  | 150        | 88.1        | -         |
|                       |  |  |                              |                    |                 |                |  | 200        | 88.9        |           |
| ı                     | $PE1 = \frac{PG \times \phi G}{\eta G} \times 1.36$                  | ×ЛН  |                              |                    |                 |                |  | 250        | 89.5        | -         |
|                       | $\eta$ G   |  |                              |                    |                 |                |  | 300        | 90.0        |           |
|                       |  |  |                              |                    |                 |                |  | 375        | 90,6        |           |
|                       | b. PE2 in PS is to be derived fr                                     |  |                              |                    |                 |                |  | 500        | 91.3        |           |
| 1                     | ① PE2-1 is to be derived from  | based on allowable load s                        | tarting factor               |                    |                 |                |  | 625        | 91.9        | -         |
| 1                     |  |  |                              |                    |                 |                |  | 750        | 92.3        | 91.7      |
|                       | $PE2-1 = \text{fv2} \left\{ 0.75 \times \frac{1}{\eta'C} \right\}$   | $-\times (\Sigma P0-Pm)\times \frac{\alpha}{-}$  | - + <del>- 1</del>           | xPmx               | B×C× ds         | x136x A H      |  | 875        | 92.5        | 92.0      |
|                       | η'ο  | $\eta L$   | $\varepsilon \times \eta$ 'G | . 1111.            | ρ · · Ο · · ψ 3 | J              |  | 1000       | 92.8        | 92.3      |
|                       |  |  |                              |                    |                 |                |  | 1250       | 93.2        | 92.8      |
|                       | ② PE2-2 is to be derived from  | tolerant capacity for mom-                       | entary overload              |                    |                 |                |  | 1500       | 93.4        | 93.1      |
| <u>-6</u>             |  |  |                              | `                  |                 |                |  | 2000       | 93.8        | 93.5      |
| 1 8                   | $PE2-2 = \frac{\text{fv3}}{n'G \times \nu E} \times \left\{ \right.$ | $(\Sigma P0-Pm)\times \frac{\alpha}{1-\alpha} +$ | Pm× β×C× φs                  | } ×                | <1.36× Δ H      |                |  | 2500       | 93.9        | 93.7      |
| For                   | η 'G× γ Ε  | ηL   | p 0 po                       | J                  | 1.50 –11        |                |  | 3125       | 94.0        | 93.8      |
| l e                   |  |  |                              |                    |                 |                |  |            |             |           |
| Calculation Formula   | ***  |  |                              |                    |                 |                | a                                      |            |             |           |
| <u> </u>              | Where  |  |                              |                    |                 |                | Starting method                        |            |             | i         |
| ్రొ                   |  | pacity covered by generato                       | r in kW                      |                    |                 |                | β×C Starter Name                       |            |             |           |
|                       | η L : General Effic  | •  |                              |                    |                 | 0.85           | 7.2×1 Direct on-line                   |            |             | ŀ         |
|                       | φL : General Powe  |  |                              |                    |                 | 0.8            | 7.2×2 / 3 Star - delta                 |            |             | Ī         |
| j                     | α : Demand Fact  |  |                              |                    |                 | 0.8            | 7.2×1/3 Star - delta with resist       | or         |             | ŀ         |
| 1                     | φG: Generator Po   |  |                              |                    |                 | 0.8            | 1.2 VVVF                               |            |             |           |
| 1                     |  | city for momentary overlo                        | ad of Engine                 |                    |                 | 1.1            | 1.2 Wound - rotor type                 |            |             |           |
|                       | _  | for max. motor of per kW                         |                              |                    |                 | 7.2            | 7.2×0.5 Reactor 50%                    |            |             |           |
| 1                     | C: Motor starter   |  |                              |                    | _               | 0.25           | 7.2×0.65 Reactor 65%                   |            |             | ł         |
| 1                     |  | g Power Factor for max. m                        | otor starting kVA,           | Squirre            | el cage         | 0.4            | 7.2×0.8 Reactor 80%                    |            |             | 1         |
|                       | η G : Generator eff  |  |                              |                    |                 | 0.919          | 7.2×0.25 Auto - transformer 50         |            |             |           |
|                       | η 'G : Generator over  |  |                              |                    |                 | 0.855          | 7.2×0.42 Auto - transformer 65         |            |             | ľ         |
|                       |  | ctor due to motor starting                       |                              |                    |                 | 0.9            | 7.2×0.64 Auto - transformer 80         | <b>%</b> 0 |             |           |
| ĺ                     |  | ctor due to motor starting                       |                              |                    |                 | 1.0            |  |            |             |           |
|                       |  | city due to non-motor start                      | ing of Engine                |                    |                 | 1.0            |  |            |             | 1         |
| <u> </u>              | ΔH : Altitude com  | pensauon   | · · · · · ·                  |                    |                 | 1.0            |  |            |             |           |

## A. INTAKE [Phase 1] 7. Fuel Calculation

Calculation Formula

| п    | Description                            | Value, Type                  |      | Description | Value                   | Remarks     |
|------|--|------------------------------|------|-------------|-------------------------|-------------|
| iţi  | PG Generator output in kVA             | 750                          | Ħ    | Fuel tank   | 5677.6 → 6000 L × 1 set |             |
| Б    | P Engineoutput in PS                   | 900                          | esı  |             |                         | · · · · · · |
| ပိ   | Engine Type                            | Diesel-engine, Radiator type | n R  | -           |                         |             |
| ПO   | Fuel Type                              | Light oil                    | ioi  |             |                         | ·-··        |
| atić |  |                              | ilai |             |                         | ·           |
| cal  |  |                              | alc. |             |                         |             |
| Ę    |  |                              | ပိ   |             |                         |             |
| 0    |  |                              |      |             |                         |             |
|      | Fuel Tank Volume is to be derived from | the following calculation    |      |             | <del></del>             |             |

a. Q [m3] Fuel Tank Volume

$$Q = \frac{P \times be \times H}{d} \times \alpha$$

| be: Fuel consum | ption factor | [ unit : kg/PS+h ] |
|-----------------|--------------|--------------------|
| Output (PS)     | Diesel       | Gas turbine        |

|              | 1      |             |
|--------------|--------|-------------|
| Output (PS)  | Diesel | Gas turbine |
| 30 or less   | 0.23   | -           |
| over 30 and  | 0.22   | 0.5         |
| 250 or less  | 0.22   | 0.5         |
| over 250 and | 0.2    | 0.48        |
| 450 or less  | 0.2    | 0.48        |
| over 450 and | 0.10   | 0.42        |
| 750 or less  | 0.18   | 0.43        |
| over 750     | 0.17   | 0.38        |

: Fuel consumption factor 0.17 kg/PS·h

: Running hour 28 hours H

830 kg/m3 : Fuel density

(A heavy oil 850kg/m3) (Light oil 830kg/m3) (Kerosine 790kg/m3)

: Surplus Factor 1.1

# B. INTAKE [Phase 3] 1. LOAD LIST FOR ELECTRICAL WORKS SUMMARY SHEET

| Facility name  | Equipment name                                   |           | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Nummbers) | Generator<br>(kW) | Remarks                            |
|--|--|-----------|-------------------|-----------------------|--------------------|--------------------------|-------------------------|-------------------|------------------------------------|
| GOHAGODA Intake  |  |           |                   | :                     |                    |                          |                         |                   |                                    |
| <del> , , <u>,                              </u></del> | 1. Intake  |           | 11                | 4                     | 15                 | 858.70                   | 10                      | 857.50            | NO.1Tr                             |
|  |  |           |                   |                       |                    |                          |                         |                   |                                    |
|  |  |           |                   |                       |                    |                          |                         |                   |                                    |
|  |  |           |                   |                       |                    |                          |                         |                   |                                    |
|  | <del>                                     </del> |           | <del> </del>      |                       | -                  | <del></del>              |                         |                   |                                    |
|  |  |           |                   |                       |                    |                          |                         |                   |                                    |
|  |  |           |                   |                       |                    |                          |                         |                   |                                    |
|  |  |           | <u> </u>          |                       |                    |                          |                         | <u> </u>          |                                    |
|  | 2.Architectural and others                       |           |                   |                       |                    |                          |                         |                   |                                    |
|  | Architectural (1)                                | kW        | 1                 |                       | 1                  | 45.00                    | 1                       |                   | NO.1Tr                             |
|  | Architectural (1)                                | kVA       | 2                 |                       | 2                  | 4.70                     |                         | 4.70              | NO.1Tr                             |
|  | <del></del>                                      |           |                   |                       |                    |                          |                         |                   |                                    |
|  |  |           |                   |                       |                    |                          |                         |                   |                                    |
|  |  |           |                   |                       |                    |                          | <u> </u>                | ·                 |                                    |
|  |  |           |                   |                       |                    | <del>.</del>             |                         |                   |                                    |
|  |  |           |                   |                       |                    |                          |                         |                   |                                    |
|  | Trail (NO.1 Trains for many)                     | kW<br>kVA |                   |                       |                    | 903.70<br>4.70           | -                       |                   | Σ1, Three Phase<br>Σ2, Three Phase |
|  | Total (NO.1 Transformer)                         | kVA       |                   |                       |                    | 4.70                     |                         | 4.70              | Σ3, Single Phase                   |
|  |  | kW        |                   |                       |                    |                          |                         |                   | Σ1, Three Phase                    |
|  | Total (NO.2 Transformer)                         | kVA       |                   |                       |                    |                          | <u> </u>                | <del></del>       | Σ2, Three Phase                    |
|  |  | kVA       |                   |                       |                    |                          |                         |                   | Σ3, Single Phase                   |
|  |  |           | <del></del>       | -                     |                    |                          | <u> </u>                |                   |                                    |
|  |  |           |                   |                       |                    | 0.0# 0.4                 |                         | 007.50            |                                    |
|  | Total  |           |                   |                       |                    | 907.93                   |                         | 906.73            | <u>[</u>                           |

Total(kW)= $\Sigma 1+\Sigma 2\times 0.9+\Sigma 3\times 0.8$ 

## B. INTAKE [Phase 3] 2. LOAD LIST FOR ELECTRICAL WORKS

1. Intake

↓ Not including stand-by

| 1. Intake                               | <del></del>  | . ,             |             |                       |    |                    | uding stand-o          | · y               | <del></del>                         |
|---|--|-----------------|-------------|-----------------------|----|--------------------|------------------------|-------------------|-------------------------------------|
| Load tag No.                            | Load name  | Powe<br>(kW     | I           | Numbers<br>(Stand-by) |    | Commer. Power (kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks                             |
| 01 MH 01                                | Screening Hoist                                      | 1               | .20         |                       | 1  | 1.20               |                        |                   |                                     |
| 01 FS 11/21                             | Fine Screen  | 2               | ,20         | 2                     | 2  | 4.40               | . 2                    | 4.40              |                                     |
| 01 SW 01/02                             | Screen Wash Pump                                     | 11              | .00         | 1                     | 2  | 11.00              | 1                      | 11.00             |                                     |
| 01 RW 11to41                            | Raw Water Pump                                       | 280             | .00.        | 1                     | 4  | 840.00             | 3                      | 840.00            | SC is to be installed at each load. |
| 01 MV 11to 41                           | Discharge Valve                                      | C               | .20         | 1                     | 4  | 0.60               | 3                      | 0.60              |                                     |
| 01 DP 01/02                             | Sump Drainage Pump                                   | 1               | .50         | 1                     | 2  | 1.50               | 1                      | 1.50              |                                     |
|   |  | · <del>  </del> |             |                       |    |                    |                        |                   |                                     |
|   |  |                 |             |                       |    |                    |                        |                   |                                     |
|   |  |                 | <del></del> |                       |    |                    | <u> </u>               |                   |                                     |
|   |  |                 |             |                       |    |                    |                        |                   |                                     |
| · · · · · · · · · · · · · · · · · · ·   |  |                 |             |                       |    |                    |                        |                   |                                     |
|   |  |                 |             |                       |    |                    |                        |                   |                                     |
|   |  |                 |             |                       |    |                    |                        |                   |                                     |
|   |  |                 |             |                       |    |                    |                        |                   |                                     |
| - · · - · · · · · · · · · · · · · · · · |  |                 |             |                       |    |                    |                        |                   |                                     |
|   |  |                 |             |                       |    |                    | <del> </del>           |                   | Duty load for SC (1)                |
|   |  |                 | i           | 1                     |    |                    |                        |                   | 16.80                               |
|   | TOTAL (Distribution Touls and Cait Chambon Facility) | kW              | 1:          | 4                     | 15 | 858.70             | 10                     | 857.50            |                                     |
|   | (Distribution Tank and Grit Chamber Facility)        | kVA             |             |                       |    |                    |                        |                   |                                     |
|   |  |                 |             |                       |    |                    | <u> </u>               |                   | <u></u>                             |

### 2. LOAD LIST FOR ELECTRICAL WORKS

2.Architectural and others 

Not including stand-by

| Architectural a |                          |                                       |               | у  |                       |                    |                    |                        |                   |              |
|-----------------|--------------------------|---------------------------------------|---------------|--|-----------------------|--------------------|--------------------|------------------------|-------------------|--------------|
| Load tag No.    | Load name                |                                       | Power<br>(kW) | Numbers<br>(Duty)                                | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer. Power (kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks      |
|                 | Architectural Power      |                                       | 25.00         | 1  |                       | 1                  |                    | 1                      | 25.00             |              |
|                 |                          |                                       |               |  |                       |                    |                    |                        |                   |              |
|                 | DC Power (kVA)           |                                       | 1.70          | I  |                       |                    | 1.70               | l †                    | 1.70              |              |
|                 | UPS Power (kVA)          | · · · · · · · · · · · · · · · · · · · | 3.00          | 1  |                       | 1                  | 3.00               | 1                      | 3.00              |              |
| · ·             |                          |                                       |               |  |                       |                    |                    | <u> </u>               |                   |              |
| <del></del>     | Generator Panel          |                                       | 10.00         | 2  |                       | 2                  | 20.00              | 2                      | 20.00             |              |
|                 |                          |                                       |               | <del></del>                                      |                       |                    |                    |                        |                   |              |
|                 |                          |                                       |               |  |                       |                    |                    |                        |                   |              |
|                 |                          |                                       |               | -  |                       |                    | · ··- ··- · ·      |                        | <del> </del>      |              |
|                 |                          |                                       | :             | ·  |                       |                    |                    |                        |                   |              |
|                 |                          |                                       |               |  |                       | <u> </u>           |                    |                        |                   |              |
|                 |                          | <del></del>                           |               | <del>                                     </del> | <u> </u>              |                    |                    |                        | <del></del>       |              |
|                 |                          |                                       |               |  |                       |                    |                    |                        |                   |              |
|                 | TOTAL                    | kW                                    |               | 2  |                       | 2                  | 45.00              | 2                      | 45.00             | Three Phase  |
|                 | (Architectural Facility) | kVA                                   |               | 2  |                       | 2                  | 4.70               | 2                      |                   | Three Phase  |
| j               |                          | kVA                                   |               |  |                       |                    |                    |                        |                   | Single Phase |
|                 | L                        |                                       |               |  |                       |                    |                    |                        |                   | L            |

### 3-1. Capacity Calculation Sheet for Transformer

| ndition                      | Duty Transformer Name  | Three Phase Load Cap | oacity (ΣP | 1) kVA I  | Load Equip | ment ( $\Sigma$ P2 | ) Sin                 | Single Phase Load Equipment ( $\Sigma P3$ ) |         |         |         |  |
|------------------------------|--|----------------------|------------|---|------------|--------------------|-----------------------|---|---------|---------|---------|--|
|                              | Duty Transformer Name  | (kW)                 | (kW)       |   |            | (kVA)              |                       |   |         | (kVA)   |         |  |
| သို                          | NO.1 Power Transformer   |                      |            | 4.70  |            |                    |                       |   |         |         |         |  |
| Calculation Condition        | NO.2 Power Transformer   |                      |            |   |            |                    |                       |   |         |         |         |  |
| ŭ                            | [ Calculation Formula for Power  | Transforman          |            |   |            |                    |                       |   |         |         |         |  |
| Capacity Calculation Formula | $TR = (\frac{\sum P1}{\eta \times \phi} + \sum P2 + \sqrt{\frac{1}{\eta} \times \phi} + \sum P2 + \sqrt{\frac{1}{\eta} \times \phi}$ $R : Required Transformer$ $\sum P1 \sim 3 : Total Capacity for each$ | Capacity in kVA      | I 124 ⊦    | Transformer<br>NO.1-1 Power Tra<br>NO.1-2 Power Tra | nsformer   | Required           | Transformer<br>1255.5 |   | kVA     | Res     | marks   |  |
| on F                         | η : General Efficiency   | 0.85                 | Rated      | capacity of trans                                   | sformer    | 10 15              | 20 30                 | 50 75                                       | 100     | 150 2   | 200 300 |  |
| ılati                        | φ : General Power Factor   | 0.85                 | in kVA     | A   |            | 500                | 750                   | 1000  | 150     | 00      | 2000    |  |
| alcı                         | $\alpha$ : Surplus Factor  | 1                    | Propos     | sed Transformer                                     |            |                    |                       |   |         |         |         |  |
| ζC                           | β: Demand Factor   | 1                    |            |   | kVA        |                    | Number                | I   | Rated V | Voltage |         |  |
| paci                         |  |                      | <u> </u>   |   |            |                    |                       | Primar                                      | •       | Seco    | ondary  |  |
| $C_{aj}$                     |  |                      |            | Transformer   |            | 1500               | <u>×1</u>             | 33000                                       |         | 41      |         |  |
|                              |  |                      | NO.2       | Transformer   |            |                    |                       |   |         |         |         |  |
|                              |  |                      |            |   |            |                    |                       |   |         |         |         |  |

## 3-2. Calculation for Transformer Voltage Regulation (Motor-starting)

| Calculation Formula  |                                  | Calculation Result |              |
|--|----------------------------------|--------------------|--------------|
| [ Calculation Formula for Power Transfomer Voltage Regulation]   | Item                             | 1500kVA            | <del>-</del> |
|  | Max. Load Capacity (kW)          | 280                |              |
| ① Base Load Capacity (kVA)   | 1. Base Load Capacity (kVA)      | 1112.46            |              |
| K1 = Load Capacity - Max. Motor Capacity (kVA)   | 2. Starting Load Capacity        | 697.58             |              |
|  | 3. Active Power (kW)             | 1224.62            |              |
| ② Starting Load Capacity (kVA)   | 4. Reactive Power                | 1225.36            |              |
| K2 =Max. Motor Capacity (kVA) × Starting Factor  | 5. Total Starting Capacity (kVA) | 1732.40            |              |
|  | 6. Voltage Regulation (%)        | 6.12               |              |
| ③ Active Power (kW)  | Result                           | 10% > 6.12%        |              |
| $P = P1 + P2 = K1\cos\theta \ 1 + K2\cos\theta \ 2$  |                                  | O.K.               |              |
| <ul> <li>⑤ Total Starting Capacity (kVA)         K = √(P² + Q²)</li> <li>⑥ Voltage Regulation (%)         ε = Total Starting Capacity         Transformer Z (%)</li> </ul> |                                  |                    |              |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | -                                |                    |              |

B. INTAKE [Phase 3]
4. Calculation Sheet for Static Capacitor (SC)

|                                    | L                  | D                  | uty Load for | r SC         |          |  |  |                  |                        |   |                   |             |          |        |  |  |
|------------------------------------|--------------------|--------------------|--------------|--------------|----------|--|--|------------------|------------------------|---|-------------------|-------------|----------|--------|--|--|
| Equipment Name                     | For SC (1)<br>(kW) | For SC (2)<br>(kW) |              |              |          |  |  |                  | Calculation Form       | nula  |                   |             |          |        |  |  |
| Distribution Tank and Grit chamber |                    |                    |              |              |          | [Formula]                                |  |                  |                        |   |                   |             |          |        |  |  |
|                                    |                    |                    |              |              |          | $Q = \frac{P \times \beta}{\eta}$        | - × {  | (COS θ 1         | ) <sup>2</sup> · 1 · \ | $\sqrt{\frac{1}{\left(\cos\theta\ 2\right)^2}}$ | 1                 | +           | ΣTi >    | 〈γT    |  |  |
|                                    |                    |                    |              |              |          | P: Duty Loa η: Efficienc β: Demand       | d Out <del>p</del> t<br>y<br>Factor                                    |                  | 0.85<br>0.7~ 0.8       | ΣT: Capacity                                    | of Trans          | former      | (kVA)    | 15     |  |  |
|                                    |                    |                    |              |              |          | COS θ 1 : Power Fa<br>COS θ 2 : Power Fa |  |                  | 0.85<br>0.95           | γ T : Transfor                                  | ner Exci          | ting Fac    | etor 0.  | .01~ ( |  |  |
|                                    | <b></b>            | -                  |              | <del> </del> | 1        | 1  |  | SC (1) (For NO.1 | (ransformer)           | 19.03   |                   | ~           | 49       | .60    |  |  |
|                                    |                    |                    |              |              | <u> </u> |  | 불  | SC (2) (For NO.2 |                        | 0.00  | -                 | ~           |          | 00     |  |  |
|                                    |                    |                    |              |              |          |  | Result   |                  |                        |   |                   |             |          |        |  |  |
|                                    | -                  |                    |              |              |          | !  |  |                  | NO.1 SC                |   |                   | 5           |          | kVa    |  |  |
|                                    |                    |                    |              |              |          |  |  | SC (1)           | NO.2 SC                |   |                   | 30          |          | kVa    |  |  |
| <del></del>                        |                    |                    |              |              |          |  | l  |                  | - 170 : 44             |   |                   |             |          | kVa    |  |  |
|                                    | <del> </del>       |                    | <del></del>  | ļ            |          | -  | Æ  | SC (2)           | NO.1 SC<br>NO.2 SC     |   |                   |             | <u> </u> | kVa:   |  |  |
|                                    |                    |                    |              | <u> </u>     |          |  | Proposed Capacity  | 50 (2)           | NO.3 SC                |   |                   |             |          | kVa    |  |  |
|                                    |                    |                    |              |              |          |  | )<br>100<br>100<br>100<br>100<br>100<br>100<br>100<br>100<br>100<br>10 | 1                |                        |   |                   |             |          |        |  |  |
|                                    | <del></del>        | <del></del>        |              |              |          |  | sodo   |                  | ļ                      |   |                   |             | ·     -  |        |  |  |
|                                    | <del></del>        |                    |              |              |          |  | P.   |                  |                        | <del></del>                                     | · · · · · · · · · | <del></del> |          |        |  |  |
|                                    |                    |                    |              |              |          |  |  |                  |                        |   |                   |             |          |        |  |  |
|                                    |                    |                    |              |              |          |  |  | <b></b>          |                        |   |                   |             |          |        |  |  |
| <del></del>                        | <del> </del> -     |                    |              |              |          |  |  |                  |                        | 10 15   | 20                | 25          | 30       | 50     |  |  |
|                                    | ļ                  |                    |              |              |          |  |  | Rated Capacity   |                        | 150 200   | 250               | 300         |          | 500    |  |  |
|                                    |                    |                    | -            |              |          |  |  | (JIS - C - 4902) | <del> </del>           | 1000  |                   |             |          |        |  |  |
|                                    | ļ                  |                    |              |              |          |  |  |                  |                        |   |                   |             |          |        |  |  |
| Total                              | 16.80              | 0.00               |              |              |          |  |  |                  |                        |   |                   |             |          |        |  |  |

#### 5. Capacity Calculation of Alternator

|                       | The second  | to at a se  | 77-1                                  |          |  |                                       | 17-1             | D 1  |                            | D.4. 1.41   |        | · · · · · · |      |
|-----------------------|---|---|---------------------------------------|----------|--|---------------------------------------|------------------|--|----------------------------|-------------|--------|-------------|------|
| Ę                     | Descr.  |   | Value                                 | 006.55   |  | DG 1                                  | Value            | Remarks  |                            | Rated Alto  |        |             |      |
| Calculation Condition | Σ P0 Load Capacity Cover  | T   | 777                                   | 906.73   | 昔  | PG I                                  | 1333.43          |  | 20                         | 37.5        | 50     | 62.5        | 75   |
| μú                    | n   | Load Name   | Raw Water Pump                        |          | Calculation Result                             | PG 2                                  | 378.00           |  | 100                        | 150         | 200    | 250         | 300  |
| ပိ                    | Pm Max. Motor   | Starting Method   | SOFT STERTER                          |          | L E  | PG 3                                  | 868.58           |  | 375                        | 500         | 625    | 750         | 875  |
| .5                    |   | kW  |                                       | 280.00   | atio   | PG 4                                  | 13.33            |  | 1000                       | 1250        | 1500   | 2000        | 2500 |
| lat                   | R Harmonic wave gene  | <del>-</del>  |                                       | 0.00     | ) jij  | PG max                                | 1333.43          |  | 3125                       |             |        |             |      |
| 1 3                   |   | A (kW)  |                                       |          | ja l   |                                       |                  |  |                            | JE          | M-1354 |             |      |
| ပိ                    | Unbalanced load capacity  | B (kW)  |                                       |          |  | Selected                              | 750              |  |                            |             |        |             |      |
| L                     | <u>_</u>  | C (kW)  |                                       |          |  | (kVA)                                 |                  | Diesel-engin   | e, Radiato                 | r type      |        |             |      |
|                       | The rated alternator capacity is                                  | to be proposed on the basis of                                      | f the maximum value a                 | mong the | follow   | ing calculatio                        | n.               |  |                            |             |        |             |      |
| 1                     | a. Required for all load operation                                | on PG1 [kVA]  |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
| 1                     |   |   |                                       |          | β  | : Starting                            | kVA for max. n   | notor per kW   |                            | 7           | .20    |             |      |
|                       | $PG! = \frac{\sum PO}{\eta L \times \phi L} \times \alpha \times$ | . DE  |                                       |          | C  | : Motor s                             | tarter factor    |  |                            | 0           | .25    |             |      |
|                       | $\eta L \times \phi L \wedge \alpha \wedge$                       | . 31  |                                       |          | K  | 34 : Factor d                         | lue to allowable | negative pha   | se current                 | 0           | .15    |             |      |
|                       |   |   |                                       |          | R  | : Total ha                            | irmonic wave ge  | nerating load  | l in kW                    | <del></del> |        |             |      |
|                       | b. Required from allowable vol                                    | tage drop PG2 [kVA]   |                                       |          | Δ  |                                       | ngle phase unbal |  |                            | 0           | .00    |             |      |
|                       | •   |   |                                       |          |  |                                       | A≧B≧C,ΔP         |  | ,                          |             |        |             |      |
| 1                     |   | 1-ΔE  |                                       |          |  |                                       |                  |  | . A-C                      |             |        |             |      |
|                       | $PG2 = Pm \times \beta \times C \times Xd^{\dagger}$              | ΔE  |                                       |          | U  | : Single p                            | hase unbalance   | factor U   | $J = \frac{A-C}{\Delta P}$ | 0           | .00    |             |      |
|                       |   |   |                                       |          | fv   | 1 · Decreas                           | e factor of load | starting   | _                          | 0           | .95    |             |      |
|                       | c. Required for starting the max                                  | c motor lastly PG3 [kVA]  |                                       |          | -,   | . Doctors                             | c accor of four  | , and the first of |                            | ــــــ      | .,,    |             |      |
|                       | or resignation for balancing the man                              | . motor moto, 105 [k+11]  |                                       |          | Value of decrease factor of load starting (fv) |                                       |                  |  |                            |             |        |             |      |
| ula                   | fv1 .   | α.  |                                       |          |  | mber of Pole                          |                  | ΣΡΟ  |                            |             |        |             |      |
| Ę                     | $PG3 = \frac{\text{fv1}}{\gamma G} \{ (\Sigma P0 - Pm) \}$        | $p \times \frac{\alpha}{n \times \beta} + Pm \times \beta \times C$ | ;}                                    |          | ı vu   | moer or role                          | 0~ 0.8           | 0.9 1  | Remar                      | ks          |        |             |      |
| $F_0$                 | / 3   | η 2. · ψ III  |                                       |          | $\vdash$                                       | 2P                                    |                  |  | PG3, fv1                   |             |        |             |      |
| Calculation Formula   | d. Required from allowable neg                                    | rative phase overent DGA (IsV                                       | 'A1                                   |          | $\vdash$                                       | Over 4P                               |                  |  | PE2-2, fv                  | 2           |        |             |      |
| l ta                  | d. Required from anowable neg                                     | gative phase current 104 [xv  | A.J                                   |          | $\vdash$                                       | 2P                                    | 0.9 0.85         |  | PE2-1, fv2                 |             |        |             |      |
| <u>ੂ</u>              | 1 /   |   | <del></del>                           |          |  | Over 4P                               | 0.9 0.83         | 0.9 0.9  | FEZ-1,1V                   | <b>'</b>    |        |             |      |
| Ü                     | $PG4 = \frac{1}{KG4} \sqrt{\{(0.4321)\}}$                         | R) $^{2}$ + (1.23 $\Delta$ P) $^{2}$ × (1-3U+                       | -3U²)}                                |          | <u> </u>                                       | O V C1 +1                             | 0.5              | 0.5 0.5  | ·····                      |             |        |             |      |
|                       | Κ04 γ   |   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
|                       |   |   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
|                       | Where   |   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
|                       |   |   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
| 1                     | η L : General Effic   | · —   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
| 1                     | φ L : General Powe  |   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
|                       | α : Demand Fact   |   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
| I                     | Xd': Alternator Fa  |   |                                       |          |  |                                       |                  |  |                            |             |        |             |      |
|                       | -   | pacity covered by generator in                                      | •                                     | * *      | 1  |                                       |                  |  |                            |             |        |             |      |
| 1                     | Sf : Current incre  | asing factor due to unbalanced                                      | $1 \log d (= 1+0.6 \times (\Delta P)$ | ÷ΣP0)    |  | 1.00                                  |                  |  |                            |             |        |             |      |
| I                     | ΔE: Allowable vo  | ltage drop factor   |                                       | 0.25     |  | · · · · · · · · · · · · · · · · · · · |                  |  |                            |             |        |             |      |
|                       | γG: Tolerant capa   | city for momentary overload   | of Alternator                         | 1.5      |  |                                       |                  |  |                            |             |        |             |      |
|                       | φm :Max. motor po   | wer factor  |                                       | 0.85     |  |                                       |                  |  |                            |             |        |             |      |

Note1: To exchange kVA load into kW, single phase load to be multiplied by 0.8, rectifier to be calculated as multiplying of rated Dc voltage and DC current,

UPS to be calculated as multiplying of rated output in kVA and 0.9, and these exchanged value to be added to three phase load capacity in kW.

#### 6. Capacity Calculation of Engine

|                       | Desc   | ription  |  | Value                                      |                    |               | Value       | Remarks                                | Ger  | nerator eff | iciency   |
|-----------------------|--------|--|--|--|--------------------|---------------|-------------|--|------|-------------|-----------|
| ].<br>[].             | PG     | Generator Output in kV   | Ą  | 750  | <b>=</b>           | PE 1          | 887.92      |  | Rate |             | effi. (%) |
| Į į                   |        |  | Load name                                      | Raw Water Pump                             | nsa                | PE 2-1        | 463.80      |  | kVA  | 2~8P        | 10∼18P    |
| Ŗ                     | Pm     | Maximum Motor  | Starting Method                                | SOFT STERTER                               | 8                  | PE 2-2        | 501.09      |  | 20   | 79.0        | -         |
| Ĕ                     |        |  | kW   | 280  | ŢŌ.                |               |             |  | 37.5 | 82.5        | -         |
| Calculation Condition | ΣΡΟ    | Load Capacity Covered  | by Alt. (kW)                                   | 453.365                                    | Calculation Result |               | 207.00      |  | 50   | 84.3        | -         |
| <u>E</u>              |        |  | <del></del>                                    | <del> </del>                               | alc                | PE max        | 887.92      |  | 62.5 | 85.2        | -         |
| ਫ਼ੌ                   |        |  |  |  | 0                  | Selected      |             |  | 75   | 85.7        |           |
| -                     |        |  |  |  |                    | (PS)          | 900         | Diesel-engine generator, Radiator type | 100  | 86.7        |           |
|                       | Max    | imum value or over amon  | g the following calculation                    | n is to be proposed                        | as eng             | ine capacity. | <del></del> | <u> </u>                               | 125  | 87.6        | -         |
|                       | a. PE  | El in PS is to be derived fr   | om requirement for full lo                     | ad running                                 | Ü                  |               |             |  | 150  | 88.1        |           |
|                       |        |  | •  |  |                    |               |             |  | 200  | 88.9        |           |
|                       |        | PG× φ G  |  |  |                    |               |             |  | 250  | 89.5        | -         |
|                       | PEI    | $1 = \frac{PG \times \phi G}{\eta G} \times 1.36$                                  | ×ΔH  |  |                    |               |             |  | 300  | 90.0        | _         |
|                       |        |  |  |  |                    |               |             |  | 375  | 90.6        |           |
| 1                     | b. PE  | E2 in PS is to be derived fr   | om requirement of max. n                       | notor starting lastly                      |                    |               |             |  | 500  | 91.3        |           |
| 1                     |        | E2-1 is to be derived from   |  |  |                    |               |             |  | 625  | 91.9        |           |
|                       |        |  |  | <b>-</b>                                   |                    |               |             |  | 750  | 92.3        | 91.7      |
|                       | l      |  | α  | 1  |                    |               | )           |  | 875  | 92.5        | 92.0      |
| 1                     | PE2    | $-1 = \text{fv2} \left\{ 0.75 \times \frac{1}{\eta' \text{G}} \right.$             | $\times (\Sigma P0-Pm) \times \frac{\pi}{n} L$ | $\epsilon + \frac{1}{\epsilon \times n} G$ | ×Pm×               | β×C×φs        | ×1.36×ΔH    |  | 1000 | 92.8        | 92.3      |
|                       | į      | , -  | ., –   | , -  |                    | •             | ,           |  | 1250 | 93.2        | 92.8      |
|                       | (2) PI | E2-2 is to be derived from   | tolerant capacity for mon                      | nentary overload                           |                    |               |             |  | 1500 | 93.4        | 93.1      |
|                       |        |  | totormic oupmoney for mon                      |  |                    |               |             |  | 2000 | 93.8        | 93.5      |
| ula                   |        | . fv3  |  |  | )                  |               |             |  | 2500 | 93.9        | 93.7      |
| Ē                     | PE2-   | $-2 = \frac{\text{fv3}}{n  \text{G} \times \nu  \text{E}} \times \left\{ \right. $ | $(\Sigma P0-Pm) \times \frac{1}{n L} +$        | $Pm \times \beta \times C \times \phi s$   | <b>,</b>           | <1.36×ΔH      |             |  | 3125 | 94.0        | 93.8      |
| Ä                     |        | , - , - (  | –  |  | ,                  |               |             |  | 3.20 |             |           |
| Calculation Formula   |        |  |  |  |                    |               |             |  |      |             |           |
| <u> </u>              |        | Where  |  |  |                    |               |             | Starting method                        |      |             |           |
| arc                   |        | ΣP0 : Total load car   | pacity covered by generate                     | or in kW                                   |                    |               |             | β×C Starter Name                       |      |             |           |
|                       |        | η L : General Effic  | , ,  |  |                    |               | 0.85        | 7.2×1 Direct on-line                   |      |             |           |
|                       |        | φ L : General Powe   | •  |  |                    |               | 0.8         | 7.2×2 / 3 Star - delta                 |      |             |           |
|                       |        | α : Demand Fact  |  |  |                    |               | 0.8         | 7.2×1/3 Star - delta with resis        | tor  |             |           |
| 1                     |        | φG : Generator Po  |  |  |                    |               | 0.8         | 1.2 VVVF                               |      |             |           |
| ı                     |        |  | city for momentary overlo                      | and of Engine                              |                    |               | 1.1         | 1.2 Wound - rotor type                 |      |             |           |
|                       |        |  | for max, motor of per kW                       |  |                    |               | 7.2         | 7.2×0.5 Reactor 50%                    |      |             |           |
| l l                   |        | C : Motor starter  | -  |  |                    |               | 0.25        | 7.2×0.65 Reactor 65%                   |      |             | i         |
|                       |        |  | g Power Factor for max. m                      | notor starting kVA                         | Sanir              | rel core      | 0.4         | 7,2×0.8 Reactor 80%                    |      |             | 1         |
|                       |        | η G : Generator eff  |  | lotor starting x v A ,                     | , эquu.            | ici cage      | 0.919       | 7.2×0.25 Auto - transformer 50         | 10%  |             | 1         |
|                       |        | η 'G : Generator en  |  |  |                    |               | 0.855       | 7.2×0.42 Auto - transformer 65         |      |             | !         |
|                       |        |  | tor due to motor starting                      |  |                    |               | 0.833       | 7.2×0.42 Auto - transformer 80         |      |             | l         |
|                       |        |  | -  |  |                    |               | 1.0         | 7.2.0,07 Auto - transformer 60         | ~~   |             | 1         |
|                       |        |  | tor due to motor starting                      | al CTl-                                    |                    |               |             |  |      |             |           |
|                       |        |  | city due to non-motor star                     | ring of Engine                             |                    |               | 1.0         |  |      |             |           |
| Ц.                    |        | ΔH : Altitude comp   | ensation                                       | _  |                    |               | 1.0         |  |      |             |           |

## B. INTAKE [Phase 3] 7. Fuel Calculation

|                       | Description  | Value, Type                  |                    | Description               | Value                    | Remarks                               |
|-----------------------|--|------------------------------|--------------------|---------------------------|--------------------------|---------------------------------------|
| Calculation Condition | PG Generator output in kVA                         | 750                          | ##                 | Fuel tank                 | 5677.6 → 6000 L × 2 sets |                                       |
| ğ                     | P Engineoutput in PS                               | 900                          | Calculation Result |                           | or 12000 L × 1 set       |                                       |
| 1 8                   | Engine Type  | Diesel-engine, Radiator type | Ä.                 |                           |                          |                                       |
| Ιğ                    | Fuel Type  | Light oil                    | jo                 |                           |                          | · · · · · · · · · · · · · · · · · · · |
| Etic                  |  |                              | <u> </u>           |                           |                          |                                       |
| Ιä                    |  |                              | 걸                  |                           |                          |                                       |
| ğ                     |  |                              | ű                  |                           |                          |                                       |
| L                     |  |                              |                    |                           |                          |                                       |
|                       | Fuel Tank Volume is to be derived from             | the following calculation.   |                    |                           | ·-                       |                                       |
| 1                     |  |                              |                    |                           |                          | ļ                                     |
| 1                     | a. Q [m3] Fuel Tank Volume                         |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       | $Q = \frac{P \times be \times H}{d} \times \alpha$ |                              |                    |                           |                          |                                       |
|                       | $Q = \frac{1}{d} \wedge \alpha$                    |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
| 1                     |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       | be: Fuel consumption factor [unit:                 |                              | be                 | : Fuel consumption factor | 0.17 kg/PS·h             |                                       |
|                       | Output (PS) Diesel Gas tu                          |                              |                    |                           |                          |                                       |
|                       | 30 or less 0.23                                    | <u> </u>                     | H                  | : Running hour            | 28 hours                 |                                       |
| 1                     | over 30 and 0.22                                   | 0.5                          |                    |                           |                          |                                       |
| 탐                     | 250 of less  |                              | d                  | : Fuel density            | 830 kg/m3                | l l                                   |
| ΙĒ                    | over 250 and 0.2                                   | 0.48                         |                    | (A heavy oil 850kg/m3)    |                          |                                       |
| F                     | 450 or less  |                              |                    | (Light oil 830kg/m3)      |                          |                                       |
| E E                   | over 450 and 0.18                                  | 0.43                         |                    | (Kerosine 790kg/m3)       |                          |                                       |
| Calculation Formula   | 750 Of less  |                              |                    | . Complete Paratau        | <del></del>              |                                       |
| <u> </u>              | over 750 0.17                                      | 0.38                         | $\alpha$           | : Surplus Factor          | 1.1                      |                                       |
| ్రొ                   |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
| 1                     |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          | ļ                                     |
|                       |  |                              |                    |                           |                          |                                       |
|                       |  |                              |                    |                           |                          |                                       |
| 1                     |  |                              |                    |                           |                          |                                       |
|                       |  | <del></del>                  |                    |                           |                          |                                       |

C. WTP [Phase 1]
1. LOAD LIST FOR ELECTRICAL WORKS
SUMMARY SHEET

| Facility name | Equipment name                         |     | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Nummbers) | Generator<br>(kW) | Remarks          |
|---------------|--|-----|-------------------|-----------------------|--------------------|--------------------------|-------------------------|-------------------|------------------|
|               |  |     |                   |                       |                    |                          |                         |                   |                  |
|               | 1. Flocculation & Sedimentation Basins |     | 13                | 0                     | 13                 | 5.00                     | 13                      | 5.00              |                  |
|               |  |     |                   |                       | -                  | 5.00                     |                         |                   | NO.1Tr           |
|               |  |     |                   |                       |                    | 0.00                     |                         |                   | NO.2Tr           |
|               | 2.Filter Units                         |     | 26                | 4                     | 30                 | 99.90                    | 27                      | 154.90            |                  |
|               |  |     |                   |                       |                    | 154.90                   |                         |                   | NO.1Tr           |
|               |  |     |                   |                       |                    | 0.00                     |                         |                   | NO.2Tr           |
|               | 3.Clear Water Pump Station             |     | 9                 | 8                     | 17                 | 805.10                   | 9                       | 805.10            |                  |
|               |  |     |                   |                       |                    | 805.10                   |                         |                   | NO.1Tr           |
|               |  |     |                   |                       |                    | 0.00                     |                         |                   | NO.2Tr           |
|               | 4.Chemical Building                    |     | 10                | 3                     | 13                 | 17.45                    | 10                      | 17.45             |                  |
|               |  |     |                   |                       |                    | 17.45                    |                         |                   | NO.1Tr           |
|               |  |     |                   |                       | <u>-</u>           |                          |                         |                   | NO.2Tr           |
|               | 5.Backwash Recovery Facility           |     | 1                 | 1                     | 2                  |                          | 1                       | 30.00             | ,-               |
|               |  |     |                   |                       |                    | 30.00                    |                         |                   | NO.1Tr           |
|               |  |     |                   |                       |                    |                          |                         |                   | NO.2Tr           |
|               | 8. Architectural and others            | 1   |                   |                       |                    |                          |                         |                   |                  |
|               | Architectural (1)                      | kW  | 1                 |                       | 1                  | 80.00                    | 1                       |                   | NO.1Tr           |
|               | Architectural (2)                      | kW  | 1                 |                       | 1                  | 30.00                    | 1                       | 30.00             | NO.1Tr           |
|               | Architectural (3)                      | kW  |                   |                       |                    |                          |                         |                   | NO.2Tr           |
|               | Generator-1                            | kW  | 1                 |                       | 1                  | 20.00                    | 1                       | 20.00             | NO.1Tr           |
|               | Generator-1                            | kW  |                   |                       |                    |                          |                         |                   | NO.2Tr           |
|               | UPS                                    | kVA | 1                 |                       | 1                  | 33.00                    | 1                       | <del>'</del>      | NO.1Tr           |
|               |  | kW  |                   |                       |                    | 1142,45                  |                         |                   | Σ1, Three Phase  |
|               | Total (NO.1 Transformer)               | kVA | ļ <u>.</u>        |                       |                    | 33.00                    |                         | 33.00             | Σ2, Three Phase  |
|               |  | kVA |                   |                       |                    |                          |                         |                   | Σ3, Single Phase |
|               |  | kW  | ļ                 |                       |                    |                          |                         |                   | Σ1, Three Phase  |
|               | Total (NO.2 Transformer)               | kVA |                   |                       |                    |                          |                         |                   | Σ2, Three Phase  |
|               |  | kVA |                   |                       | - · ·              |                          |                         |                   | Σ3, Single Phase |
|               |  |     |                   |                       |                    |                          |                         |                   |                  |
|               |  |     |                   |                       |                    |                          |                         |                   |                  |
|               | Total                                  |     |                   | [                     | i                  | 1172.15                  |                         | 1172.15           |                  |

Total(kW)= $\Sigma 1+\Sigma 2\times 0.9+\Sigma 3\times 0.8$ 

# C. WTP [Phase 1] 2. LOAD LIST FOR ELECTRICAL WORKS 1. Flocculation & Sedimentation Basins

| Load tag No. | Load name   | Power (kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) |              | Commer,<br>Power<br>(kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks                               |
|--------------|---|------------|-------------------|-----------------------|--------------|--------------------------|------------------------|-------------------|---------------------------------------|
| 06 SC 11/21  | Sludge Collector                                    | 0.75       | 4                 |                       | 4            | 3.00                     | 4                      | 3.00              |                                       |
| 06 MV 11to24 | De-sludge Valve                                     | 0.20       | 8                 |                       | 8            | 1.60                     | 8                      | 1.60              |                                       |
| 06 SP 01     | Sampling Pump                                       | 0.40       | 1                 |                       | 1            | 0.40                     | 1                      | 0.40              |                                       |
|              |   |            |                   |                       |              |                          |                        |                   |                                       |
|              |   |            |                   |                       | · ·-         |                          |                        |                   |                                       |
|              |   |            |                   |                       |              |                          |                        |                   |                                       |
|              |   |            |                   |                       |              |                          |                        |                   |                                       |
|              |   |            |                   |                       |              |                          |                        |                   | · · · · · · · · · · · · · · · · · · · |
|              |   |            |                   |                       | <u> </u><br> |                          |                        |                   |                                       |
|              |   |            |                   |                       |              |                          |                        |                   |                                       |
|              |   |            |                   |                       |              |                          |                        |                   | Duty load for SC (I)                  |
| <del></del>  | TOTAL (Distribution Tank and Grit Chamber Facility) | kW<br>kVA  | 13                |                       | 13           | 5.00                     | 13                     | 5.00              | 5.00<br>Duty load for SC (2)          |
|              |   |            |                   |                       |              |                          |                        |                   |                                       |

# C. WTP [Phase 1] 2. LOAD LIST FOR ELECTRICAL WORKS 2.Filter Units

| Load tag No.   | Load name   | Power (kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks                        |
|----------------|---|------------|-------------------|-----------------------|--------------------|--------------------------|------------------------|-------------------|--------------------------------|
| 07 MG 11to41   | Inflow Gate   | 0.40       | 4                 |                       | 4                  | 1.60                     | 4                      | 1.60              |                                |
| 07 MG 12 to 42 | Backwash Drainage Gate                              | 0.40       | 4                 |                       | 4                  | 1.60                     | 4                      | 1.60              |                                |
| 07 MV 11to41   | Effluent Valve                                      | 0.20       | 4                 |                       | 4                  | 0.80                     | 4                      | 0.80              |                                |
| 07 MV 12to42   | Backwash Valve                                      | 0.20       | 4                 |                       | 4                  | 0.80                     | 4                      | 0.80              |                                |
| 07 MV 13to43   | Air Scour Valve                                     | 0.20       | 4                 |                       | 4                  | 0.80                     | 4                      | 0.80              |                                |
| 07 BP 11to31   | Backwash Pump                                       | 18.50      | 2                 | 1                     | 3                  | 37.00                    | 2                      | 37.00             |                                |
| 07 AB 11to21   | Air Blower  | 55.00      | 1                 | 1                     | 2                  | 55.00                    | 2                      | 110.00            | <del></del>                    |
| 07 DP 01/02    | Sump Drainage Pump                                  | 1.50       | 1                 | 1                     | 2                  | 1.50                     | 1                      | 1.50              |                                |
| 07 MM 11       | Lime Mixer  | 0.40       | 1                 |                       | 1                  | 0.40                     | 1                      | 0.40              |                                |
| 07 LP 11/21    | Lime Feed Pump                                      | 0,40       | 1                 | 1                     | 2                  | 0.40                     | 1                      | 0.40              |                                |
|                |   |            |                   |                       |                    |                          |                        |                   |                                |
|                |   |            | <del></del>       |                       |                    |                          |                        |                   |                                |
|                |   |            |                   |                       |                    | · <del>-</del> -         |                        |                   |                                |
| <del></del>    |   |            |                   |                       | · · · · -          |                          |                        |                   |                                |
|                |   |            |                   | ,                     |                    |                          | <del></del>            |                   | Duty load for SC (1)<br>154.90 |
|                | TOTAL (Distribution Tank and Grit Chamber Facility) | kW kVA     | 26                | 4                     | 30                 | 99.90                    | 27                     | 154.90            | Duty load for SC (2)           |
|                |   |            |                   |                       |                    |                          |                        |                   |                                |

# C. WTP [Phase 1] 2. LOAD LIST FOR ELECTRICAL WORKS 3.Clear Water Pump Station

| Load name                                     | Power  | ١., ,   | 1 :  | ł                     | Commer.               | 1                      |                       | 1                                   |
|---|--|---|--|-----------------------|-----------------------|------------------------|-----------------------|-------------------------------------|
| Arven MEMIV                                   | (kW)   | Numbers<br>(Duty)   | Numbers<br>(Stand-by)  | Numbers<br>(Total)    | Power (kW)            | Generator<br>(Numbers) |                       | Remarks                             |
| ransmission Pump (A-1)                        | 450.00   | 1   | 1  | 2                     | 450.00                | 1                      | 450.00                |                                     |
|   |  |   | <u> </u>   |                       |                       |                        |                       | SC is to be installed at each load. |
| ransmission Pump (A-2)                        | 90.00  | 1   | 1  | 2                     | 90.00                 | 1                      | 90.00                 | SC is to be installed at each load. |
| ransmission Pump (A-3)                        | 250.00   | 1   | 1  | 2                     | 250.00                | 1                      | 250.00                | SC is to be installed at each load. |
| ansmission Pump (A-4)                         | 250.00   |   |  |                       |                       |                        |                       | SC is to be installed at each load. |
| ischarge Valve (A-1)                          | 0.20   | 1   | 1  | 2                     | 0.20                  | 1                      | 0.20                  | SO IS to CO Instance in Cash loud.  |
| ischarge Valve (A-2)                          | 0.20   | 1   | 1  | 2                     | 0.20                  | 1                      | 0.20                  | <u></u>                             |
| ischarge Valve (A-3)                          | 0.20   | 1   | 1  | 2                     | 0.20                  | 1                      | 0.20                  |                                     |
| ischarge Valve (A-4)                          | 0.20   |   |  |                       |                       |                        |                       |                                     |
| unp Drainage Pump                             | 1.50   | 1   | 1  | 2                     | 1.50                  | 1                      | 1.50                  |                                     |
| ant Water Supply Unit                         | 7.50   | . 1   |  | 1                     | 7.50                  | 1                      | 7.50                  |                                     |
| alorination Booster Pump                      | 5.50   | 1   | 1  | 2                     | 5.50                  | 1                      | 5,50                  |                                     |
|   |  |   |  |                       |                       |                        |                       |                                     |
|   |  |   |  |                       |                       |                        |                       |                                     |
|   |  |   |  |                       |                       |                        |                       | D . 1 . 10 . 00 (1)                 |
|   |  |   |  |                       |                       |                        |                       | Duty load for SC (1)<br>15.10       |
| TOTAL   | kW   | 9   | 8  | 17                    | 805.10                | 9                      | 805.10                | Duty load for SC (1)                |
| (Distribution Tank and Grit Chamber Facility) | kVA  | - · · · · · · · · · · · · · · · · · · ·   |  |                       |                       |                        |                       |                                     |
|   |  |   |  |                       |                       |                        |                       |                                     |
| a   | Insmission Pump (A-2) Insmission Pump (A-3) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-4) Insharge Valve (A-1) Insharge Valve (A-2) Insharge Valve (A-3) Insharge Valve (A-4) Inp Drainage Pump Int Water Supply Unit Instinct Booster Pump  TOTAL | Insmission Pump (A-1) Insmission Pump (A-2) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-4) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-2) Insmission Pump (A-2) Insmission Pump (A-2) Insmission Pump (A-2) Insmission Pump (A-2) Insmission Pump (A-2) Insmission Pump (A-3) Insmission Pump (A-2) Insmission Pump (A-2) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-3) Insmission Pump (A-4) | Insmission Pump (A-1) 450.00 1 Insmission Pump (A-2) 90.00 1 Insmission Pump (A-3) 250.00 1 Insmission Pump (A-4) 250.00 1 Insmission Pump (A-4) 0.20 1 Incharge Valve (A-1) 0.20 1 Incharge Valve (A-2) 0.20 1 Incharge Valve (A-3) 0.20 1 Incharge Valve (A-4) 0.20 1 Insmission Pump Institute Instit | Insmission Pump (A-1) | Insmission Pump (A-1) | Insmission Pump (A-1)  | Insmission Pump (A-1) | Insmission Pump (A-1)               |

# C. WTP [Phase 1] 2. LOAD LIST FOR ELECTRICAL WORKS 4. Chemical Building

| 4. Chemical Dunc | ···· <u>B</u>                                       |            |                   |                       |                    |                    | uding stand-o          | <del>,</del>      | ·                             |  |  |
|------------------|---|------------|-------------------|-----------------------|--------------------|--------------------|------------------------|-------------------|-------------------------------|--|--|
| Load tag No.     | Load name   | Power (kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer. Power (kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks                       |  |  |
| 10 MM 11/21      | Alum Mixer  | 1.50       | 2                 |                       | 2                  | 3.00               | 2                      | 3.00              |                               |  |  |
| 10 AP 11/21      | Alum Pump   | 0.40       | 1                 | 1                     | 2                  | 0.40               | 1                      | 0.40              |                               |  |  |
| 10 MM 11/21      | Lime Mixer  | 2.20       | 2                 |                       | 2                  | 4.40               | 2                      | 4.40              |                               |  |  |
| 10 LP 11/12      | Lime Pump   | 5.50       | 1                 | 1                     | 2                  | 5.50               | 1                      | 5.50              |                               |  |  |
| 10 LP 21/22      | Lime Feed Pump                                      | 0.40       | 1                 | 1                     | 2                  | 0,40               | 1                      | 0.40              |                               |  |  |
| 10 EF 11         | Exhaust Fan   | 0.75       | 1                 |                       | 1                  | 0.75               | 1                      | 0.75              |                               |  |  |
| 10 MC 01         | Chemical Crane                                      | 1.50       | 1                 |                       | 1                  | 1.50               | 1                      | 1.50              |                               |  |  |
| 10 MC 02         | Chemical Crane                                      | 1.50       | 1                 |                       | 1                  | 1.50               | 1                      | 1.50              |                               |  |  |
|                  |   |            |                   |                       |                    |                    |                        |                   |                               |  |  |
|                  |   |            |                   |                       |                    |                    |                        |                   |                               |  |  |
|                  |   |            |                   | :                     |                    |                    |                        |                   |                               |  |  |
|                  |   |            |                   | :                     |                    |                    |                        |                   |                               |  |  |
|                  |   |            |                   |                       |                    |                    |                        |                   |                               |  |  |
|                  |   |            |                   |                       |                    |                    |                        |                   |                               |  |  |
|                  |   |            |                   |                       |                    |                    |                        |                   | Duty load for SC (1)<br>17.45 |  |  |
|                  | TOTAL (Distribution Tank and Grit Chamber Facility) | kW<br>kVA  | 10                | 3                     | 13                 | 17.45              | 10                     | 17.45             | 2210                          |  |  |
|                  |   |            |                   |                       |                    |                    |                        |                   |                               |  |  |

C. WTP [Phase 1]
2. LOAD LIST FOR ELECTRICAL WORKS
5.Backwash Recovery Facility

| Generator (kW)  1 30.00 | Remarks              |
|-------------------------|----------------------|
| 1 30.00                 |                      |
|                         |                      |
|                         | 1                    |
|                         |                      |
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| -                       |                      |
|                         |                      |
|                         | Duty load for SC (1) |
| 1 30.00                 | 30.00                |
|                         |                      |
|                         |                      |
|                         | 1 30.00              |

# C. WTP [Phase 1] 2. LOAD LIST FOR ELECTRICAL WORKS 6. Architectural and others

|                                       | <del></del>                          |                                       |                                       |                   | ,                     |          |                          | iding stand-c                         | <del></del>       | ,            |
|---------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|-------------------|-----------------------|----------|--------------------------|---------------------------------------|-------------------|--------------|
| Load tag No.                          | Load name                            |                                       | Power<br>(kW)                         | Numbers<br>(Duty) | Numbers<br>(Stand-by) |          | Commer.<br>Power<br>(kW) | Generator<br>(Numbers)                | Generator<br>(kW) | Remarks      |
| A7-001                                | Architectural Power-1                | 1                                     | 80.00                                 | 1                 |                       | 1        | 80.00                    | I                                     | 80.00             |              |
| A7-001                                | Architectural Power-2                |                                       | 30.00                                 | 1                 |                       | I        | 30.00                    | ï                                     | 30.00             |              |
| A7-001                                | Architectural Power-3                |                                       |                                       |                   |                       |          |                          |                                       |                   |              |
| A7-004                                | Generator Panel                      |                                       | 20.00                                 | 1                 |                       | 1        | 20.00                    | 1                                     | 20.00             |              |
| A7-005                                | UPS Power (kVA)                      |                                       | 33.00                                 | I                 |                       | 1        | 33.00                    | 1                                     | 33.00             |              |
| A7-006                                | DC Power for Generator-starter (kVA) |                                       |                                       |                   |                       | <u>-</u> |                          |                                       |                   |              |
|                                       |                                      |                                       |                                       |                   |                       |          |                          |                                       |                   |              |
|                                       |                                      |                                       |                                       |                   |                       |          |                          |                                       |                   |              |
| · · · · · · · · · · · · · · · · · · · |                                      | ·····                                 |                                       |                   |                       |          |                          |                                       |                   |              |
|                                       |                                      | · · · · · · · · · · · · · · · · · · · |                                       |                   |                       |          |                          |                                       |                   |              |
|                                       |                                      | <del></del>                           |                                       |                   |                       |          |                          |                                       |                   |              |
|                                       |                                      |                                       |                                       |                   |                       |          |                          | · · · · · · · · · · · · · · · · · · · |                   |              |
|                                       |                                      |                                       |                                       |                   |                       |          |                          |                                       |                   |              |
|                                       |                                      | • •                                   | · · · · · · · · · · · · · · · · · · · |                   |                       |          |                          |                                       |                   | <u> </u>     |
|                                       |                                      |                                       |                                       | -                 |                       |          | <u> </u>                 | <u> </u>                              |                   |              |
| <del></del>                           | TOTAL                                | kW                                    | ·                                     | 5                 |                       | 5        | 130.00                   | 5                                     |                   | Three Phase  |
|                                       | (Architectural Facility)             | kVA                                   |                                       | 1                 |                       | 1        | 33.00                    | 1                                     |                   | Three Phase  |
|                                       |                                      | kVA                                   |                                       |                   |                       |          |                          |                                       |                   | Single Phase |

## C. WTP [Phase 1]

## 3-1. Capacity Calculation Sheet for Transformer

| [                            | Duty Transformer Name   | Three Phase Load Capa     | city (Σ          | P1) kVA                       | Load Equip | ment (Σ | P2)           | Single    | Phase L       | Single Phase Load Equipment ( $\Sigma$ P3 |       |               |  |  |  |
|------------------------------|---|---------------------------|------------------|-------------------------------|------------|---------|---------------|-----------|---------------|---|-------|---------------|--|--|--|
| ndition                      | Buty Transformer Name   | (kW)                      |                  |                               | ( kVA      | .)      |               | (kVA)     |               |   |       |               |  |  |  |
| ၂ပို                         | NO.1 Power Transformer  | 1142.45                   |                  |                               | 33.00      |         |               |           | 0.00          |   |       |               |  |  |  |
| Calculation Condition        | NO.2 Power Transformer  | 0.00                      | <del></del> .    |                               | 0.00       |         |               |           |               | 0.00                                      |       |               |  |  |  |
|                              | [ Calculation Formula for Power   | Transformer ]             |                  | Transformer                   | Name       | Require | ed Transfor   | mer Ca    | pacity in     | kVA                                       | Re    | marks         |  |  |  |
| ormula                       | $\mathbf{TR} = (\frac{\sum \mathbf{P1}}{\eta \times \phi} + \sum \mathbf{P2} + \sqrt{\mathbf{P2} + \sqrt{\mathbf{P2} + \sqrt{\mathbf{P2} + \mathbf{P2} +$ | Calculation Result        | NO.1-1 Power Tra | nsformer                      | Require    | 16      | 14.25<br>0.00 | pacity in |               | KC  | marks |               |  |  |  |
| lation F                     | $\eta$ : General Efficiency $\phi$ : General Power Factor   | 0.85<br>0.85              | Rate<br>in k     | d capacity of tran<br>A       | sformer    | 10 1    | 5 20 750      |           | 50 75<br>1000 | 100                                       |       | 200 300       |  |  |  |
| Capacity Calculation Formula | lpha: Surplus Factor $eta$ : Demand Factor  | 1                         | NO.              | osed Transformer  Transformer | kVA        | 2000    | Number        | ×1        | Prima         | Rated V                                   |       | ondary<br>415 |  |  |  |
|                              | The upper rated transformer capacity is to  | he moneyed through the co |                  | 2 Transformer                 |            |         |               |           |               |   |       |               |  |  |  |

## C. WTP [Phase 1]

## 3-2. Calculation for Transformer Voltage Regulation (Motor-starting)

| Calculation Fo  | rmula                 |                                  | Calculation Result |          |
|---|-----------------------|----------------------------------|--------------------|----------|
| [ Calculation Formula for Power Transfome   | r Voltage Regulation] | Item                             | 2000kVA            |          |
|   |                       | Max. Load Capacity (kW)          | 280                |          |
| ① Base Load Capacity (kVA)  |                       | 1. Base Load Capacity (kVA)      | 1612.46            |          |
| K1 =Max. Load Capacity - Motor Cap  | pacity (kVA)          | 2. Starting Load Capacity        | 697.58             |          |
|   |                       | 3. Active Power (kW)             | 1649.62            |          |
| ② Starting Load Capacity (kVA)  |                       | 4. Reactive Power                | 1488.75            | <u> </u> |
| K2 =Max. Motor Capacity (kVA) × 3   | Starting Factor       | 5. Total Starting Capacity (kVA) | 2222.08            |          |
|   |                       | 6. Voltage Regulation (%)        | 5.89               |          |
| Active Power (kW)   |                       | Result                           | 10% > 5.89%        |          |
| $P = P1 + P2 = K1\cos\theta \ 1 + K2\cos\theta \ 2$   |                       |                                  | O.K.               |          |
| $Q = Q1 + Q2 = K1\sin\theta \ 1 + K2\sin\theta \ 2$ $\boxed{5} \text{ Total Starting Capacity (kVA)}$ $K = \sqrt{(P^2 + Q^2)}$ $\boxed{6} \text{ Voltage Regulation (\%)}$ $\epsilon = \frac{\text{Total Starting Capacity}}{\text{Transformer Capacity}} \times$ | Transformer Z (%)     |                                  |                    |          |
| 2000kVA   | ·· <b>-</b> ····      |                                  |                    |          |
| η : General Efficien 0.85   |                       |                                  |                    |          |
| $\cos \theta$ 1 :Power Factor 0.85  | (at steady)           |                                  |                    |          |
| $\cos \theta$ 2 :Power Factor 0.40  | (at motor starting)   |                                  |                    |          |
| Starting Factor 1.80  |                       |                                  |                    |          |
| Transfomer Z (%) 5.30   |                       |                                  |                    |          |
| Voltage Ragulation 10%≧   |                       |                                  |                    |          |

C. WTP [Phase 1]
4. Calculation Sheet for Static Capacitor (SC)

|                                     |                    |                    | ity Load for | SC |  |          |                                      |                               |                   |           |           | •              |           |                |      |
|-------------------------------------|--------------------|--------------------|--------------|----|--|----------|--------------------------------------|-------------------------------|-------------------|-----------|-----------|----------------|-----------|----------------|------|
| Equipment Name                      | For SC (1)<br>(kW) | For SC (2)<br>(kW) |              |    |  |          |                                      | Calculation Form              | ula               |           |           |                |           |                |      |
| 1. Flocculation & Sedimentation Bas | 5.00               | 0.00               |              |    | <br>[Formula]  |          | ·                                    | <del></del>                   | <del></del>       |           |           |                |           |                |      |
| 2.Filter Units                      | 154.90             | 0.00               |              |    | $Q = \frac{P \times \beta}{n}$   | $\times$ | $\sqrt{\frac{1}{(\cos \theta)}}$     |                               | 1 (000 0)         |           | · - 1     | +              | ΣΤ        | ï×γΤ           | Γ.   |
| 3.Clear Water Pump Station          | 15.10              | 0.00               |              |    |  |          |                                      |                               | (COST.            | ۷)        |           | j              |           |                |      |
| 4.Chemical Building                 | 17.45              |                    |              |    | P: Duty Load η: Efficiency   | l Outpi  | Capacitor Capacity in<br>it in kW    | 0.85                          | ΣT: Cap           | acity (   | of Trans  | sformer        | (kVA)     |                | 2000 |
| 5.Backwash Recovery Facility        | 30.00              |                    |              |    | $\beta$ : Demand F COS $\theta$ 1: Power Fac COS $\theta$ 2: Power Fac | tor wit  |                                      | 0.7~ 0.8<br>0.85<br>0.95      | γT: Tra           | nsform    | ier Exci  | iting Fa       | etor      | 0.01~          | 0.0  |
|                                     |                    |                    |              |    |  | Result   | SC (1) (For NO.1<br>SC (2) (For NO.2 |                               | 7                 | 3.32      |           | ~              |           | 120.94         |      |
|                                     |                    |                    |              |    |  |          | SC (1)                               | NO.1 SC<br>NO.2 SC<br>NO.3 SC |                   |           |           | 50<br>25<br>15 |           | kV<br>kV       |      |
|                                     |                    |                    |              |    |  | Capacity | SC (2)                               | NO.1 SC<br>NO.2 SC<br>NO.3 SC |                   |           |           |                | ·         | kV<br>kV<br>kV | ar   |
|                                     |                    |                    |              |    |  | Proposed |                                      |                               |                   |           |           |                |           |                |      |
|                                     |                    |                    |              |    |  |          |                                      |                               |                   |           |           |                |           |                |      |
|                                     |                    |                    |              |    |  |          | Rated Capacity<br>(JIS - C - 4902)   |                               | 10<br>150<br>1000 | 15<br>200 | 20<br>250 | 25<br>300      | 30<br>400 | 50<br>500      | 75   |
| Total                               | 222.45             | 0.00               |              |    | <br>Note: 1. SC is to be installed 2. SC(5) is to be install           |          |                                      |                               |                   |           |           |                |           |                |      |

### C. WTP [Phase 1]

#### 5. Capacity Calculation of Alternator

|                       |   | Descrip  | ption  | Value          |   |                    |   | Value   | Remarks   |   | Rated A | lternator Ca                                 | apacity |      |
|-----------------------|---|--|--|----------------|---|--------------------|---|---|---|---|---------|--|---------|------|
| Calculation Condition | ΣΡΟ   | Load Capacity Covere   | ed by Alt. (kW)  |                | 1172.15   | <u>+</u>           | PG 1  | 1551.38   |   | 20  | 37.5    | 50   | 62.5    | 75   |
| Į <del>į</del>        |   |  | Load Name  | Raw Water Pump |   | [ns                | PG 2  | 607.50  |   | 100   | 150     | 200  | 250     | 300  |
| <u>5</u>              | Pm  | Max. Motor   | Starting Method  | SOFT STERTER   | •   | ٦.                 | PG 3  | 1082.72   |   | 375   | 500     | 625  | 750     | 875  |
| l g                   |   |  | kW   |                | 450.00  | tior               | PG 4  | 13.33   |   | 1000  | 1250    | 1500   | 2000    | 2500 |
| lati                  | R   | Harmonic wave gener  | ating load   |                | 0.00  | ırıla              | PG max  | 1551.38   |   | 3125  | ĺ       |  |         |      |
| lon l                 |   |  | A (kW)   |                | 4.00  | Calculation Result | го шах  | 1331.36   |   |   | J       | EM-1354                                      |         |      |
| రొ                    | Unbalan   | ced load capacity  | B_ (kW)  |                | 4.00  | ~                  | Selected  | 2000  |   |   |         |  |         |      |
|                       |   |  | C (kW)   |                | 4.00  |                    | (kVA)   | ×1set   | Diesel-engin  | ne , Radiato  | r type  |  |         |      |
|                       | a. Requi  PG1 =  b. Requi  PG2 =  c. Requi  PG3 =  d. Requi | red for all load operation $\frac{\Sigma P0}{\eta L \times \phi L} \times \alpha \times \frac{\Sigma P0}{\eta L \times \phi L} \times \alpha \times \frac{\Sigma P0}{\eta L \times \phi L} \times \alpha \times \frac{\Sigma P0}{\eta L \times \phi L} \times \frac{\Sigma P0}{\eta L} \times \frac$ | Sf  Eage drop PG2 [kVA] $ \frac{1-\Delta E}{\Delta E} $ . motor lastly PG3 [kVA] $ \times \frac{\alpha}{\eta L \times \phi m} + Pm \times \beta \times C $ active phase current PG4 [kV $ \frac{(2)^2 + (1.23 \Delta P)^2 \times (1-3U+4)}{(1-3U+4)^2} \times (1-3U+4) $ ency or $ \frac{(0.85)}{(0.90)} \times (0.90) $ otor $\frac{(0.90)}{(0.25)} \times (0.25)$ active covered by generator in | A]             | d-by) Note  | β C K R A Δ U fv   | ing calculation: Starting: Motor's G4: Factor of Total ha P: Total si Where A Single p 1: Decrease alue of decrease alue of Pole  2P Over 4P 2P Over 4P | kVA for max. n starter factor due to allowable armonic wave ge ngle phase unbal A≥ B≥ C, Δ P shase unbalance se factor of load s ase factor of load | notor per kW megative pha- merating load ance capacity = A+B-2C factor U starting $\Sigma P0$ $0.9$ $0.9$ $1$ $0.85$ $0.85$ $0.95$ $0.95$ | se current i in kW y in kW $J = \frac{A-C}{\Delta P}$ Remar $PG3, fvI$ $PE2-2, fv$ $PE2-1, fvZ$ | ks 3    | 7.20<br>0.25<br>0.15<br>0.00<br>0.00<br>0.95 |         |      |
|                       |   | ΔE : Allowable vol   | city for momentary overload o  | ,              | $ \begin{array}{c c}                                    $ |                    | 00.1  |   |   | ·   |         |  |         |      |

Note1: To exchange kVA load into kW, single phase load to be multiplied by 0.8, rectifier to be calculated as multiplying of rated Dc voltage and DC current, UPS to be calculated as multiplying of rated output in kVA and 0.9, and these exchanged value to be added to three phase load capacity in kW.

## C. WTP [Phase 1] 6. Capacity Calculation of Engine

|                       | Description   |  | Value                |                    |               | Value       | Remarks   | Ger   | nerator eff | iciency      |
|-----------------------|---|--|----------------------|--------------------|---------------|-------------|---|-------|-------------|--------------|
| ion                   | PG Generator Output in 1  | :VA  | 2000                 | <u>+</u>           | PE 1          | 2367.79     |   | Rate  | ηG          | effi. (%)    |
| Calculation Condition |   | Load name  | Raw Water Pump       | Calculation Result | PE 2-1        | 601.34      |   | kVA   | 2~8P        | 10∼18P       |
| į                     | Pm Maximum Motor  | Starting Method                                  | SOFT STERTER         | R.                 | PE 2-2        | 621.03      |   | 20    | 79.0        | -            |
| ğ                     |   | kW   | 450                  | tioi               |               |             |   | 37.5  | 82.5        | -            |
| latic                 | ΣP0 Load Capacity Cove  | red by Alt. (kW)                                 | 586.075              | Πa.                | PE max        | 2367.79     |   | 50    | 84.3        | -            |
| lcu.                  |   |  |                      | )alc               | FE max        | 2307.79     |   | 62.5  | 85.2        | -            |
| రో                    |   |  |                      | 0                  | Selected      |             |   | 75    | 85.7        | -            |
|                       |   |  |                      |                    | (PS)          |             | Diesel-engine generator, Radiator type                      | 100   | 86.7        |              |
|                       | Maximum value or over am  |  |                      | as eng             | ine capacity. |             |   | 125   | 87.6        | -            |
| 1                     | a. PE1 in PS is to be derived   | I from requirement for ful                       | load running         |                    |               |             |   | 150   | 88.1        | -            |
|                       |   |  |                      |                    |               |             |   | 200   | 88.9        | -            |
|                       | $PE1 = \frac{PG \times \phi G}{\pi G} \times 1.$                            | 26× 1/11   |                      |                    |               |             |   | 250   | 89.5        |              |
|                       | $\eta G$  | 50~#11   |                      |                    |               |             |   | 300   | 90.0        | -            |
|                       |   |  |                      |                    |               |             |   | 375   | 90.6        | -            |
|                       | b. PE2 in PS is to be derived   |  |                      |                    |               |             |   | 500   | 91.3        |              |
|                       | D PE2-1 is to be derived fr   | om based on allowable loa                        | nd starting factor   |                    |               |             |   | 625   | 91.9        | <del>-</del> |
|                       | _   |  |                      |                    |               |             |   | 750   | 92.3        | 91.7         |
|                       | $PE2-1 = fv2 \begin{cases} 0.75 \times \frac{1}{\eta} \end{cases}$          | $\frac{1}{1}$ x $(\Sigma P0-Pm)$ x $\frac{C}{1}$ | <u> </u>             | xPmx               | RxCxAs        | ×1 36×Λ H   |   | 875   | 92.5        | 92.0         |
|                       | η   | 'G η   | L ε×η G              | 111                | .р.челфа      | J           |   | 1000  | 92.8        | 92.3         |
|                       |   |  |                      |                    |               |             |   | 1250  | 93.2        | 92.8         |
|                       | PE2-2 is to be derived fr   | om tolerant capacity for m                       | omentary overload    |                    |               |             |   | 1500  | 93.4        | 93.1         |
| αş                    |   |  |                      |                    |               |             |   | 2000  | 93.8        | 93.5         |
| Ē                     | $PE2-2 = \frac{\text{fv3}}{n \text{ 'G} \times v \text{ E}} \times \left\{$ | $(\Sigma P0-Pm)x = \frac{\alpha}{} +$            | Pm× 8 ×C× d s        | ļ,                 | ×1 36× Л Н    |             |   | 2500  | 93.9        | 93.7         |
| Ö                     | $\eta G \times \gamma E$  | ηL   | 1111 p Q q b         | J                  | 1,50 =11      |             |   | 3125  | 94.0        | 93.8         |
| l g                   |   |  |                      |                    |               |             |   |       |             |              |
| Calculation Formula   | ****  |  |                      |                    |               |             |   |       |             |              |
| <u> </u>              | Where   |  |                      |                    |               |             | Starting method   |       |             |              |
| Ca                    |   | capacity covered by gener                        | rator in kW          |                    |               | <del></del> | β×C Starter Name  | e     |             |              |
|                       | η L : General E   |  |                      |                    |               | 0.85        | 7.2×1 Direct on-line  |       |             |              |
|                       | φL: General Po  |  |                      |                    |               | 0.8         | 7.2×2 / 3 Star - delta                                      |       |             |              |
|                       | α : Demand F  |  |                      |                    |               | 0.8         | 7.2×1 / 3 Star - delta with resi                            | stor  |             |              |
|                       | φG : Generator  |  |                      |                    |               | 0.8         | 1.2 VVVF  |       |             |              |
|                       |   | apacity for momentary over                       |                      |                    |               | 1.1         | 1.2 Wound - rotor type                                      |       |             |              |
|                       |   | /A for max. motor of per l                       | cW                   |                    |               | 7.2         | 7.2×0.5 Reactor 50%   |       |             |              |
|                       | C : Motor star  |  |                      |                    |               | 0.25        | 7.2×0.65 Reactor 65%  |       |             |              |
|                       |   | ting Power Factor for max                        | . motor starting kVA | , Squii            | rel cage      | 0.4         | 7.2×0.8 Reactor 80%   | *60.4 |             |              |
|                       | η G : Generator   |  |                      |                    |               | 0.919       | 7.2×0.25 Auto - transformer 5                               |       |             |              |
|                       |   | overload efficiency                              | _                    |                    |               | 0.855       | 7.2×0.42 Auto - transformer 6 7.2×0.64 Auto - transformer 8 |       |             |              |
| 1                     |   | factor due to motor starting                     | •                    |                    |               | 0.9         | 7.2×0.04 Auto - transformer 8                               | U70   |             |              |
|                       |   | factor due to motor startir                      |                      |                    |               | 1.0         |   |       |             |              |
|                       |   | apacity due to non-motor s                       | tarting of Engine    |                    |               | 1.0         |   |       |             |              |
| L                     | ΔH : Altitude co  | inpensation                                      |                      |                    |               | 1.0         | <del></del>   |       |             |              |

## C. WTP [Phase 1] 7. Fuel Calculation

| _                     | · · · · · · · · · · · · · · · · · · ·   |                              |                    |  |  |         |
|-----------------------|---|------------------------------|--------------------|--|--|---------|
| 덜                     | Description   | Value, Type                  |                    | Description  | Value  | Remarks |
| Calculation Condition | PG Generator output in kVA  | 2000                         | Calculation Result | Fuel tank  | 15140.2 → 16000 L × 1 sets                       |         |
| l d                   | P Engineoutput in PS  | 2400                         | [es                |  |  |         |
| ి                     | Engine Type   | Diesel-engine, Radiator type | n R                |  |  |         |
| l ĕ                   | Fuel Type   | Light oil                    | ioi                |  |  |         |
| ਜ਼ੁੱ                  |   |                              | lai                |  |  | -       |
| ] #                   |   |                              | ಶ                  | •  |  |         |
| ਰ                     |   | •                            | చొ                 |  |  |         |
| 10                    |   |                              |                    |  | <del>                                     </del> |         |
| Calculation Formula   | a. Q [m3] Fuel Tank Volume  Q = P × be × H d  be : Fuel consumption factor [ Output (PS) Diesel (C) 30 or less 0.23 over 30 and 250 or less over 250 and 450 or less over 450 and 750 or less over 750 0.17 | unit: kg/PS·h] Gas turbine   | be<br>H<br>d       | : Fuel consumption factor : Running hour : Fuel density (A heavy oil 850kg/m3) (Light oil 830kg/m3) (Kerosine 790kg/m3) : Surplus Factor | 0.17 kg/PS·h 28 hours 830 kg/m3                  | ,       |

D. WTP [Phase 3]

## 1. LOAD LIST FOR ELECTRICAL WORKS

#### SUMMARY SHEET

| Facility name | Equipment name                         |             | Numbers<br>(Duty)                            | Numbers<br>(Stand-by) |    | Commer. Power (kW) | Generator<br>(Nummbers) | Generator<br>(kW) | Remark           |
|---------------|--|-------------|--|-----------------------|----|--------------------|-------------------------|-------------------|------------------|
|               |  |             |  |                       | ·  |                    |                         |                   |                  |
|               | 1. Flocculation & Sedimentation Basins |             | 37   | 0                     | 37 | 14.20              | 40                      | 14.20             |                  |
|               |  |             |  |                       |    | 5.00               | <u></u>                 |                   | NO.1Tr           |
|               |  |             | <u> </u>                                     |                       |    | 9.20               |                         |                   | NO.2Tr           |
|               | 2.Filter Units                         |             | 67   | 5                     | 72 | 112.60             | 68                      | 167.60            |                  |
|               |  |             |  |                       |    | 154.90             |                         |                   | NO.1Tr           |
|               |  |             |  |                       | _  | 12.70              |                         |                   | NO.2Tr           |
|               | 3.Clear Water Pump Station             |             | 19   | 10                    | 29 | 2456.10            | 19                      | 2456.10           |                  |
|               |  |             |  |                       |    | 1055.30            |                         |                   | NO.1Tr           |
|               |  |             |  |                       |    | 1400.80            |                         |                   | NO.2Tr           |
|               | 4.Chemical Building                    |             | 20   | 3                     | 23 | 37.45              | 20                      | 37.45             |                  |
|               |  |             |  |                       |    | 37.45              |                         |                   | NO.1Tr           |
|               |  |             |  |                       |    |                    |                         |                   | NO.2Tr           |
|               | 5.Backwash Recovery Facility           |             | 1  | 1                     | 2  | 30.00              | 1                       | 30.00             |                  |
|               |  |             |  |                       |    | 30.00              |                         |                   | NO ITr           |
|               |  | _           |  |                       |    |                    |                         |                   | NO.2Tr           |
|               | 8. Architectural and others            |             |  |                       |    | <del></del>        |                         | -                 |                  |
|               | Architectural (1)                      | kW          | 1  |                       | 1  | 80.00              | 1                       | 80.00             | NO.1Tr           |
|               | Architectural (2)                      | kW          | 1  |                       | i  | 30.00              | 1                       |                   | NO.1Tr           |
|               | Architectural (3)                      | kW          | 1  |                       | 1  | 30.00              | 1                       |                   | NO.2Tr           |
|               | Generator-1                            | kW          | 1  |                       | 1  | 20.00              | 1                       |                   | NO.1Tr           |
|               | Generator-1                            | kW          | 1  |                       | 1  | 20.00              | 1                       |                   | NO.2Tr           |
|               | UPS                                    | kVA         | 1  |                       | i  | 33.00              | 1                       |                   | NO.1Tr           |
|               |  | kW          | i i  |                       |    | 1412.65            |                         |                   | Σ1, Three Phase  |
|               | Total (NO.1 Transformer)               | kVA         |  |                       | •  | 33.00              |                         |                   | Σ2, Three Phase  |
|               |  | kVA         |  |                       |    |                    |                         |                   | Σ3, Single Phase |
|               |  | kW          |  |                       |    | 1472.70            |                         |                   | Σ1, Three Phase  |
|               | Total (NO.2 Transformer)               | kVA         | <u>                                     </u> |                       |    |                    | <del></del>             |                   | Σ2, Three Phase  |
|               |  | kVA         |  |                       |    |                    |                         |                   | Σ3, Single Phase |
|               |  |             |  |                       |    |                    |                         |                   | ,                |
|               |  |             | <u> </u>                                     |                       |    | -                  |                         |                   |                  |
|               | Total                                  | <del></del> | <del> </del>                                 |                       |    | 2915.05            |                         | 2915.05           |                  |

Total(kW)= $\Sigma$ 1+ $\Sigma$ 2×0.9+ $\Sigma$ 3×0.8

### 2. LOAD LIST FOR ELECTRICAL WORKS

1. Flocculation & Sedimentation Basins

↓ Not including stand-by

|              | Scamentation Dasius                                 |               |                   |                       |                    |                    | uding stand-o          | ,  |                              |
|--------------|---|---------------|-------------------|-----------------------|--------------------|--------------------|------------------------|--|------------------------------|
| Load tag No. | Load name   | Power<br>(kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer. Power (kW) | Generator<br>(Numbers) | Generator<br>(kW)                              | Remarks                      |
| 06 SC 11/21  | Sludge Collector                                    | 0.75          | 12                |                       | 12                 | 9.00               | 12                     | 9.00   |                              |
| 06 MV 11to24 | De-sludge Valve                                     | 0.20          | 24                |                       | 24                 | 4.80               | 24                     | 4.80   |                              |
|              |   |               |                   |                       |                    |                    | 3                      |  |                              |
| 06 SP 01     | Sampling Pump                                       | 0.40          | 1                 |                       | 1                  | 0.40               | İ                      | 0.40   |                              |
|              |   |               |                   |                       |                    |                    |                        |  |                              |
|              |   |               |                   |                       |                    |                    |                        |  |                              |
|              |   |               |                   |                       |                    |                    | _                      |  |                              |
|              |   |               |                   |                       |                    |                    |                        | ·  |                              |
|              |   |               |                   |                       |                    |                    |                        | · · · <u>- · · · · · · · · · · · · · · · ·</u> |                              |
|              |   |               |                   |                       |                    |                    |                        |  |                              |
|              |   |               |                   |                       |                    |                    |                        |  |                              |
|              |   |               |                   |                       |                    |                    |                        |  |                              |
|              |   |               |                   |                       |                    |                    |                        |  |                              |
|              |   |               |                   |                       |                    |                    |                        |  |                              |
|              |   |               |                   |                       |                    |                    |                        |  | Duty load for SC (1)<br>5.00 |
|              | TOTAL (Distribution Tank and Grit Chamber Facility) | kW<br>kVA     | 37                |                       | 37                 | 14.20              | 40                     | 14.20  | Duty load for SC (2)<br>9.20 |
|              |   |               |                   |                       |                    |                    |                        |  |                              |

. \* \*

2.Filter Units

| 2.Filter Units                          | <del></del>   |            |                   | <del>,</del>          | ,                  |                          | uding stand-b          | у                 |                                |
|---|---|------------|-------------------|-----------------------|--------------------|--------------------------|------------------------|-------------------|--------------------------------|
| Load tag No.                            | Load name   | Power (kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks                        |
| 07 MG 11to41                            | Inflow Gate   | 0.40       | 12                |                       | 12                 | 4.80                     | 12                     | 4.80              | <u> </u>                       |
| 07 MG 12 to 42                          | Backwash Drainage Gate                              | 0.40       | 12                |                       | 12                 | 4.80                     | 12                     | 4.80              |                                |
| 07 MV 11to41                            | Effluent Valve                                      | 0.20       | 12                |                       | 12                 | 2.40                     | 12                     | 2.40              |                                |
| 07 MV 12to42                            | Backwash Valve                                      | 0.20       | 12                |                       | 12                 | 2.40                     | 12                     | 2.40              |                                |
| 07 MV 13to43                            | Air Scour Valve                                     | 0.20       | 12                |                       | 12                 | 2.40                     | 12                     | 2.40              |                                |
| 07 BP 11to31                            | Backwash Pump                                       | 18.50      | 2                 | 1                     | 3                  | 37.00                    | 2                      | 37.00             |                                |
| 07 AB 11to21                            | Air Blower  | 55.00      | 1                 | 1                     | 2                  | 55.00                    | 2                      | 110.00            |                                |
| 07 DP 01/02                             | Sump Drainage Pump                                  | 1.50       | 2                 | 2                     | 4                  | 3.00                     | 2                      | 3.00              |                                |
| 07 MM 11                                | Lime Mixer  | 0.40       | 1                 |                       | 1                  | 0.40                     | 1                      | 0.40              | ·                              |
| 07 LP 11/21                             | Lime Feed Pump                                      | 0.40       | 1                 | 1                     | 2                  | 0.40                     | 1                      | 0.40              |                                |
| · • • • · · · · · · · · · · · · · · · · |   |            |                   |                       |                    |                          |                        |                   |                                |
|   |   |            |                   |                       |                    |                          |                        |                   |                                |
|   |   |            |                   |                       |                    |                          |                        |                   |                                |
|   |   |            |                   |                       |                    |                          |                        |                   | Duty load for SC (1)<br>154.90 |
|   | TOTAL (Distribution Tank and Grit Chamber Facility) | kW<br>kVA  | 67                | 5                     | 72                 | 112.60                   | 68                     | 167.60            | Duty load for SC (2)<br>12.70  |
|   |   |            |                   |                       |                    |                          |                        |                   |                                |

3.Clear Water Pump Station

| 3.Clear water Fi |   |               |                   |                       |                    |                          | uding stand-b          | 7                 | <del>,</del>                        |
|------------------|---|---------------|-------------------|-----------------------|--------------------|--------------------------|------------------------|-------------------|-------------------------------------|
| Load tag No.     | Load name                                     | Power<br>(kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks                             |
| 09 CP 11to14     | Transmission Pump (A-1)                       | 450.00        | 3                 | ī                     | 4                  | 1350.00                  | 3                      | 1350.00           |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   | SC is to be installed at each load. |
| 09 CP 21/22      | Transmission Pump (A-2)                       | 90.00         | 1                 | 1                     | 2                  | 90.00                    | 1                      | 90.00             |                                     |
|                  |   |               |                   | _                     |                    |                          | <del></del>            |                   | SC is to be installed at each load. |
| 09 CP 31to31     | Transmission Pump (A-3)                       | 250.00        | 3                 |                       | 4                  | 750.00                   | 3                      | 750.00            |                                     |
| 09 CP 41/42      | Transmission Pump (A-4)                       | 250.00        | 1                 |                       | 2                  | 250.00                   | 1                      | 250.00            | SC is to be installed at each load. |
| 09 CF 41/42      | Transmission Fump (A-4)                       | 230.00        | ,                 | 1                     |                    | 230.00                   | ,                      | 230.00            | SC is to be installed at each load. |
| 09 MV 11to14     | Discharge Valve (A-1)                         | 0.20          | 3                 | 1                     | 4                  | 0.60                     | 3                      | 0.60              | Se is to be instance at each road.  |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
| 09 MV 21/22      | Discharge Valve (A-2)                         | 0.20          | 1                 | 1                     | 2                  | 0.20                     | 1                      | 0.20              |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
| 09 MV 31to31     | Discharge Valve (A-3)                         | 0.20          | 3                 | 1                     | 4                  | 0.60                     | 3                      | 0.60              |                                     |
| 09 MV 41/42      | Discharge Valve (A-4)                         |               | 1                 | 1                     |                    | 0.00                     |                        | 0.70              |                                     |
| U9 MIV 41/42     | Discharge varve (A-4)                         | 0.20          | 1                 | 1                     | 2                  | 0.20                     | 1                      | 0.20              |                                     |
| 09 DP 01/02      | Sump Drainage Pump                            | 1.50          | 1                 | 1                     | 2                  | 1,50                     | 1                      | 1.50              |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
| 09 PU 01         | Plant Water Supply Unit                       | 7.50          | 1                 |                       | 1                  | 7.50                     | 1                      | 7.50              |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
| 09 PP 11/21      | Chlorination Booster Pump                     | 5,50          | 1                 | 1                     | 2                  | 5.50                     | 1                      | 5.50              |                                     |
|                  |   |               |                   |                       |                    |                          | -                      |                   |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
|                  |   |               | <del> </del>      | · · · · · · ·         |                    | <del></del>              |                        |                   |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
|                  |   |               | <del> </del>      |                       |                    |                          |                        |                   |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
|                  |   |               |                   |                       |                    |                          |                        |                   | Duty load for SC (1)                |
| <u>.</u>         |   |               |                   |                       |                    |                          |                        |                   | 15.30                               |
|                  | TOTAL   | kW            | 19                | 10                    | 29                 | 2456.10                  | 19                     | 2456.10           | Duty load for SC (1)                |
|                  | (Distribution Tank and Grit Chamber Facility) | kVA           | ļ                 | ļ                     |                    |                          |                        | <u> </u>          | 0.80                                |
|                  |   |               |                   |                       |                    |                          |                        |                   |                                     |
|                  | <u> </u>                                      |               | <u> </u>          | l                     |                    |                          | <u> </u>               |                   | <u> </u>                            |

4.Chemical Building

| 4.Chemical Build                       |   |            | <del></del>       |                       |          |                    | uding Stand-b          | <i>J</i>          | ,                    |
|--|---|------------|-------------------|-----------------------|----------|--------------------|------------------------|-------------------|----------------------|
| Load tag No.                           | Load name   | Power (kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) |          | Commer. Power (kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks              |
| 10 MM 11/21                            | Alum Mixer  | 1.50       | 4                 |                       | 4        | 6.00               | 4                      | 6.00              |                      |
| 10 AP 11/21                            | Alum Pump   | 0.40       | 3                 | 1                     | 4        | 1.20               | 3                      | 1.20              |                      |
| 10 MM 11/21                            | Lime Mixer  | 2.20       | 4                 |                       | 4        | 8.80               | 4                      | 8.80              |                      |
| 0 LP 11/12                             | Lime Pump   | 5.50       | 3                 | 1                     | 4        | 16.50              | 3                      | 16.50             |                      |
| 0 LP 21/22                             | Lime Feed Pump                                      | 0.40       | 3                 | 1                     | 4        | 1.20               | 3                      | 1.20              |                      |
| 0 EF 11                                | Exhaust Fan   | 0.75       | 1                 |                       | 1        | 0.75               | 1                      | 0,75              |                      |
| 0 MC 01                                | Chemical Crane                                      | 1.50       | 1                 |                       | 1        | 1.50               | 1                      | 1.50              |                      |
| 10 MC 02                               | Chemical Crane                                      | 1.50       | 1                 |                       | 1        | 1.50               | 1                      | 1.50              |                      |
|  |   |            |                   |                       |          |                    |                        |                   |                      |
| ·····                                  |   |            |                   |                       |          |                    |                        |                   |                      |
|  |   |            |                   |                       | <u> </u> |                    |                        |                   |                      |
|  |   |            |                   |                       |          |                    |                        |                   |                      |
| ************************************** |   |            |                   |                       |          |                    |                        |                   | Duty load for SC (1) |
|  |   |            |                   |                       |          |                    |                        |                   | 37.45                |
|  | TOTAL (Distribution Tank and Grit Chamber Facility) | kW kVA     | 20                | 3                     | 23       | 37.45              | 20                     | 37.45             | 37.70                |
|  | ,             |            |                   |                       |          |                    |                        |                   |                      |

2. LOAD LIST FOR ELECTRICAL WORKS

5.Backwash Recovery Facility

| Load tag No.                          | Load name                                     | Power (kW) | Numbers<br>(Duty) | Numbers<br>(Stand-by) | Numbers<br>(Total) | Commer. Power (kW) | Generator<br>(Numbers) | Generator<br>(kW) | Remarks  |
|---------------------------------------|---|------------|-------------------|-----------------------|--------------------|--------------------|------------------------|-------------------|--|
| WP 11/21                              | Backwash Recovery Pump                        | 30.00      | 1                 | 1                     | 2                  | 30.00              | 1                      | 30.00             |  |
|                                       |   |            |                   |                       |                    |                    | _                      |                   |  |
|                                       |   |            |                   |                       |                    | <u> </u>           |                        |                   |  |
|                                       |   |            | <u> </u>          |                       |                    |                    |                        |                   |  |
| · · · · · · · · · · · · · · · · · · · |   |            |                   |                       |                    |                    |                        |                   |  |
| ·                                     |   |            |                   |                       |                    |                    |                        |                   |  |
|                                       |   |            |                   |                       |                    |                    |                        | :                 |  |
|                                       |   |            |                   |                       |                    |                    |                        |                   |  |
|                                       |   |            |                   |                       |                    |                    |                        |                   |  |
| · <del> , ·</del> ,,                  |   |            |                   | <u> </u>              |                    |                    |                        |                   |  |
|                                       |   |            |                   |                       | - · · · · - · ·    |                    | <u> </u>               |                   |  |
| <del></del>                           |   |            |                   |                       |                    |                    |                        |                   |  |
|                                       |   |            |                   |                       |                    |                    |                        |                   |  |
|                                       |   |            |                   |                       |                    |                    |                        |                   |  |
|                                       |   |            |                   |                       |                    |                    |                        |                   | <del>-                                    </del> |
|                                       |   |            |                   |                       | <del></del>        |                    | :                      |                   |  |
|                                       |   |            | -                 |                       |                    |                    |                        |                   | Duty load for SC (1)                             |
|                                       |   |            |                   |                       |                    |                    |                        |                   | 30.00  |
|                                       | TOTAL   | kW         | 1                 | 1                     | 2                  | 30.00              | 1                      | 30.00             |  |
|                                       | (Distribution Tank and Grit Chamber Facility) | kVA        | <b> </b>          |                       |                    |                    | <del></del>            |                   |  |

### 6.Architectural and others

| Load tag No. | Load name                            | Power (kW)   | Numbers Numbers (Stand-by)                   | Numbers<br>(Total) | Commer.<br>Power<br>(kW) | Generator<br>(Numbers) | <u> </u> | Remarks                  |
|--------------|--------------------------------------|--------------|--|--------------------|--------------------------|------------------------|----------|--------------------------|
| A7-001       | Architectural Power-1                | 80.00        | 1  | 1                  | 80.00                    | 1                      | 80.00    |                          |
| A7-001       | Architectural Power-2                | 30.00        | 1  | 1                  | 30.00                    | 1                      | 30.00    |                          |
| A7-001       | Architectural Power-3                | 30.00        | 1  | 1                  | 30.00                    | 1                      | 30.00    |                          |
| A7-004       | Generator Panel                      | 20.00        | 2  | 2                  | 40.00                    | 2                      | 40.00    |                          |
| A7-005       | UPS Power (kVA)                      | 33.00        | 1  | 1                  | 33.00                    | 1                      | 33.00    |                          |
| A7-006       | DC Power for Generator-starter (kVA) | ···-         |  |                    | · <u>·</u>               |                        |          |                          |
| <del> </del> |                                      |              |  |                    |                          |                        |          |                          |
|              |                                      |              |  |                    | ·— ·—·                   |                        |          |                          |
|              |                                      |              |  |                    |                          |                        |          |                          |
|              |                                      |              |  |                    |                          |                        |          |                          |
|              |                                      |              | <u>                                     </u> |                    | <del></del>              |                        |          |                          |
|              |                                      |              |  |                    |                          |                        |          |                          |
|              |                                      | <del> </del> |  |                    |                          |                        |          |                          |
|              |                                      |              |  |                    |                          |                        |          |                          |
|              |                                      |              |  |                    |                          | <u> </u>               |          |                          |
|              | TOTAL                                | kW           | 5  | 5                  | 180.00                   | 5                      |          | Three Phase              |
|              | (Architectural Facility)             | kVA<br>kVA   | 1  | 1                  | 33.00                    | 1                      | 33.00    | Three Phase Single Phase |
|              |                                      |              |  |                    |                          |                        |          |                          |

## 3-1. Capacity Calculation Sheet for Transformer

| _                            | Duty Transformer Name  | Three Phase Load Capa  | acity (Σ       | P1) kVA I                                     | Load Equipm            | ent ( $\Sigma$ P | 2) Sing | gle Phase Loa | ad Equ | ipmen         | t (ΣP3)          |  |
|------------------------------|--|--|----------------|---|------------------------|------------------|---------|---------------|--------|---------------|------------------|--|
| Condition                    | Duty Transformer Name  | ( kW )   |                |   | (kVA)                  |                  |         | (kVA)         |        |               |                  |  |
| ညီ                           | NO.1 Power Transformer   | 1412.65  |                |   | 33.00                  |                  |         |               |        |               |                  |  |
| Calculation                  | NO.2 Power Transformer   | 1472.70  |                |   | 0.00                   |                  |         |               | 0.00   |               |                  |  |
| $C_3$                        |  |  |                |   |                        |                  |         |               |        |               |                  |  |
| Capacity Calculation Formula | [ Calculation Formula for Power $\mathbf{TR} = (\frac{\Sigma \mathbf{P1}}{\eta \times \phi} + \Sigma \mathbf{P2} + \sqrt{2})$ $\mathbf{R} : \text{Required Transformer}$ $\Sigma \mathbf{P1} \sim 3 : \text{Total Capacity for each}$ $\eta : \text{General Efficiency}$ | $3 \times \Sigma P3$ ) $\times \alpha \times \beta$ Capacity in kVA  th facility in kW/kVA  0.85 |                | Transformer NO.1-1 Power Tra NO.1-2 Power Tra | ansformer<br>ansformer | 10   15          |         | 50 75         | 100    | 150 2         | marks<br>200 300 |  |
| ulat                         | φ : General Power Factor   | <del></del>  | in k           |   |                        | 500              | 750     | 1000          | 150    | 00            | 2000             |  |
| acity Calo                   | lpha: Surplus Factor $eta$ : Demand Factor   | 0.9  | Prop           | oosed Transformer                             | kVA                    |                  | Number  | R<br>Primary  |        | oltage<br>Sec | ondary           |  |
| Cap                          |  |  | NO.            | 1 Transformer                                 | 2                      | 2000             | 1 set   | 3.            | 3000   |               | 415              |  |
|                              |  |  | NÖ.            | 2 Transformer                                 |                        | 2000             | 1 set   |               |        |               |                  |  |
|                              | The upper rated transformer capacity is to   | o be proposed through the ca   | L<br>apacity o | alculation.                                   |                        |                  |         |               |        |               |                  |  |

## 3-2. Calculation for Transformer Voltage Regulation (Motor-starting)

| Calculation Formula   |                                  | Calculation Result |  |
|---|----------------------------------|--------------------|--|
| [ Calculation Formula for Power Transfomer Voltage Regulation]  | Item                             | 2000kVA            |  |
|   | Max. Load Capacity (kW)          | 280                |  |
| ① Base Load Capacity (kVA)  | Base Load Capacity (kVA)         | 1612.46            |  |
| K1 =Max. Load Capacity - Motor Capacity (kVA)   | 2. Starting Load Capacity        | 697.58             |  |
|   | 3. Active Power (kW)             | 1649.62            |  |
| ② Starting Load Capacity (kVA)  | 4. Reactive Power                | 1488.75            |  |
| K2 =Max. Motor Capacity (kVA) × Starting Factor   | 5. Total Starting Capacity (kVA) | 2222.08            |  |
|   | 6. Voltage Regulation (%)        | 5.89               |  |
| ③ Active Power (kW)   | Result                           | 10% > 5.89%        |  |
| $P = P1 + P2 = K1\cos\theta \ 1 + K2\cos\theta \ 2$   |                                  | O.K.               |  |
| $Q = Q1 + Q2 = K1\sin\theta \ 1 + K2\sin\theta \ 2$ $(5) Total Starting Capacity (kVA)$ $K = \sqrt{(P^2 + Q^2)}$ $(6) Voltage Regulation (%)$ $\varepsilon = \frac{Total Starting Capacity}{Transformer Capacity} \times Transformer Z (%)$ |                                  |                    |  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |                                  |                    |  |

4. Calculation Sheet for Static Capacitor (SC)

|                                     |                    | Du                 | ty Load for S | SC T |          |   |                   |                                    |                                       |                     |             |           |           |             |           |            |
|-------------------------------------|--------------------|--------------------|---------------|------|----------|---|-------------------|------------------------------------|---------------------------------------|---------------------|-------------|-----------|-----------|-------------|-----------|------------|
| Equipment Name                      | For SC (1)<br>(kW) | For SC (2)<br>(kW) |               |      |          |   |                   |                                    | Calculation Form                      | mula                |             |           |           |             |           |            |
| 1. Flocculation & Sedimentation Bas |                    | 9.20               |               |      |          | [ Formula ]   |                   | •                                  |                                       |                     |             |           |           |             |           |            |
| 2.Filter Units                      | 154.90             | 12.70              |               |      |          | $\mathbf{Q} = \frac{\mathbf{P} \times \boldsymbol{\beta}}{n}$ | - × {             | $\sqrt{\frac{1}{(\cos\theta  1)}}$ | - 1 -                                 | \(\int_{\(\cos\)}\) | 1 2 2 2     | 1         | -} +      | Σ           | Γi×γ      | Т          |
| 3.Clear Water Pump Station          | 15.30              | 0.80               |               |      |          |   |                   |                                    |                                       | V (COS              | <i>2</i> )  |           | )         |             |           |            |
| 4.Chemical Building                 | 37.45              |                    |               |      |          | Q: Required P: Duty Loa η: Efficience                         | d Outpi           | Capacitor Capacity in<br>ut in kW  | 0.85                                  | ΣΤ: C               | apacity     | of Tran   | sformer   | (kVA)       |           | 2000       |
| 5.Backwash Recovery Facility        | 30.00              |                    |               |      |          | β: Demand I<br>COS θ 1: Power Fa                              | ctor wit          |                                    | 0.7~ 0.8<br>0.85                      |                     |             |           |           |             |           |            |
|                                     |                    |                    |               |      | <u>.</u> | COS θ 2 : Power Fa  | ctor wit          | h SC at Bus Bar                    | 0.95                                  | γ T : T             | ransforr    | пет Ехс   | iting Fa  | ctor        | 0.01      | ~ 0.03     |
|                                     |                    |                    |               |      |          |   |                   | SC (1) (For NO.1                   | Transformer)                          |                     | 78.16       |           | ~         |             | 126.47    |            |
|                                     |                    | ·                  |               |      |          |   | Result            | SC (2) (For NO.2                   |                                       |                     | 25.44       |           | ~         |             | 66.22     |            |
|                                     |                    |                    |               |      |          |   | Re                |                                    |                                       |                     |             |           |           |             |           |            |
|                                     |                    |                    |               |      |          |   |                   |                                    | NO.1 SC                               |                     | <del></del> |           | 50        | • •         | k         | Var        |
|                                     |                    |                    |               |      |          |   |                   | SC (1)                             | NO.2 SC                               |                     |             |           | 25<br>15  |             |           | Var<br>Var |
|                                     |                    | -                  |               |      |          |   | Ę                 | SC (2)                             | NO.1 SC<br>NO.2 SC                    |                     |             |           | 25<br>20  |             | k         | Var<br>Var |
|                                     |                    |                    |               | -    |          |   | Zapac             | SC (2)                             | NO.3 SC                               |                     |             |           | 10        |             |           | Var<br>Var |
|                                     |                    |                    |               |      |          |   | Proposed Capacity |                                    |                                       |                     |             |           |           | <del></del> |           |            |
|                                     |                    |                    |               |      |          |   | Prop              |                                    |                                       |                     |             |           |           |             |           |            |
|                                     | -                  |                    |               |      |          |   |                   |                                    |                                       |                     |             |           |           |             |           |            |
|                                     |                    |                    |               |      |          |   |                   |                                    |                                       |                     |             |           |           | <del></del> |           |            |
|                                     |                    |                    |               |      |          |   |                   | Rated Capacity                     |                                       | 10<br>150           | 15<br>200   | 20<br>250 | 25<br>300 | 30<br>400   | 50<br>500 | 75<br>750  |
|                                     |                    |                    |               |      |          |   |                   | (JIS - C - 4902)                   | · · · · · · · · · · · · · · · · · · · | 1000                |             | <u></u>   |           | <u> </u>    |           |            |
|                                     | <del></del> -      |                    | -             |      | ,        | Note:   |                   |                                    |                                       |                     |             |           |           |             |           |            |
| Total                               | 242.65             | 22.70              |               |      |          | SC is to be installed     SC(5) is to be installed            |                   |                                    |                                       |                     |             |           |           |             |           |            |

#### 5. Capacity Calculation of Alternator

|                       | Descri                                    | ption   | Value  |   |   |   | Value  | Remarks   |                            | Rated A | Iternator C                                  | apacity |      |
|-----------------------|---|---|--|---|---|---|--|---|----------------------------|---------|--|---------|------|
| .6                    | ΣP0 Load Capacity Cover                   | ed by Alt. (kW)   |  | 2915.05   | <u> </u>  | PG I  | 3858.15  |   | 20                         | 37.5    | 50   | 62.5    | 75   |
| Į ij                  |   | Load Name   | Raw Water Pump   |   | SSIT  | PG 2  | 607.50   |   | 100                        | 150     | 200  | 250     | 300  |
| Calculation Condition | 1   | Starting Method   | SOFT STERTER   |   | 3.  | PG 3  | 2457.75  |   | 375                        | 500     | 625  | 750     | 875  |
|                       |   | kW  |  | 450.00  | tior  | PG 4  | 13.33  |   | 1000                       | 1250    | 1500   | 2000    | 2500 |
|                       | R Harmonic wave generating load 0.00      |   |  |   | Calculation Result                              | DC  | 2050 15  |   | 3125                       |         |  |         |      |
| <u>[</u>              |   | A (kW)  |  |   | ्रह्  | PG max  | 3858.15  |   |                            | j       | IEM-1354                                     |         |      |
| రో                    | Unbalanced load capacity                  | B (kW)  |  |   | 0   | Selected  | 2000   |   |                            |         |  |         |      |
|                       |   | C (kW)  |  |   |   | (kVA)   | $\times 2set$  | Diesel-engin  | e, Radiato                 | r type  |  |         |      |
| Calculation Formula   | Sf : Current increa<br>ΔE : Allowable vol | to be proposed on the basis on PG1 [kVA]  Sf  Itage drop PG2 [kVA] $\frac{1-\Delta E}{\Delta E}$ x. motor lastly PG3 [kVA] $\times \frac{\alpha}{\eta L \times \phi m} + Pm \times \beta \times C$ gative phase current PG4 [k  R) $^2 + (1.23 \Delta P)^2 \times (1-3U-1)$ iency 0.85 or 1.25 or 0.90 ct | vA]  r3U <sup>2</sup> )}  n kW (Excluding Stad load (= 1+0.6×(4) of Alternator | and-by) Not $\Delta P \div \Sigma P0$ 0.25 1.5 0.85 | β C K R A Δ V V V V V V V V V V V V V V V V V V | : Starting : Motor's G4: Factor'd : Total ha P: Total sin Where : Single p 1: Decreas alue of decrea mber of Pole  2P  Over 4P  2P  Over 4P | kVA for max, itarter factor lue to allowable armonic wave gangle phase unbalance of factor of load as factor of load as factor of load as $\frac{Pm}{0}$ 0.8 1 0.95 0.9 0.85 0.9 0.9 | motor per kV negative phase nerating loa lance capacities $A+B-2C$ factor $C$ starting $C$ star | Remarl PG3, fv1 PE2-1, fv2 | ks 3    | 7.20<br>0.25<br>0.15<br>0.00<br>0.00<br>0.95 |         |      |

Note1: To exchange kVA load into kW, single phase load to be multiplied by 0.8, rectifier to be calculated as multiplying of rated Dc voltage and DC current, UPS to be calculated as multiplying of rated output in kVA and 0.9, and these exchanged value to be added to three phase load capacity in kW.

#### 6. Capacity Calculation of Engine

| $\overline{}$         | Description  |  | Value                  | •                  |              | Value                  | Remarks                                | Ger           | nerator eff | iciency   |
|-----------------------|--|--|------------------------|--------------------|--------------|------------------------|--|---------------|-------------|-----------|
| 등                     | PG Generator Output in kVA   |  | 2000                   |                    | PE 1         | 2367.79                |  | Rate          | ηG          | effi. (%) |
| Calculation Condition | - 1  | Load name                                      | Raw Water Pump         | Calculation Result | PE 2-1       | 1481.96                |  | kVA           | 2~8P        | 10~18P    |
| Ę                     | Pm Maximum Motor   | Starting Method                                | SOFT STERTER           | 첫                  | PE 2-2       | 1747.75                |  | 20            | 79.0        | •         |
| G                     |  | kW   | 450                    | tjor               |              | _                      |  | 37.5          | 82.5        | •         |
| at;                   | Σ PO Load Capacity Covered   | by Alt. (kW)                                   | 1457.525               | uļa                | DE           | 2267.70                |  | 50            | 84.3        |           |
| T T T                 |  |  |                        |                    | PE max       | 2367.79                |  | 62.5          | 85.2        | -         |
| ਤੌ                    |  |  |                        | O                  | Selected     |                        |  | 75            | 85.7        | •         |
| 1                     |  |  |                        |                    | (PS)         | 2400                   | Diesel-engine generator, Radiator type | 100           | 86.7        | -         |
| $\vdash$              | Maximum value or over among  | the following calculation                      | on is to be proposed a | s engi             | ne capacity. |                        |  | 125           | 87.6        | -         |
| 1                     | a. PE1 in PS is to be derived from   |  |                        | _                  |              |                        |  | 150           | 88.1        | -         |
| 1                     | [  |  | 200                    | 88.9               | -            |                        |  |               |             |           |
|                       | PG× ø G  |  |                        |                    |              |                        |  |               |             | -         |
| 1                     | $PE1 = \frac{PG \times \phi G}{n G} \times 1.36 \times \Delta H$   |  |                        |                    |              |                        |  |               | 90.0        | •         |
| 1                     |  |  |                        |                    |              |                        |  |               |             |           |
| 1                     | b. PE2 in PS is to be derived from requirement of max. motor starting lastly   |  |                        |                    |              |                        |  |               |             | -         |
| 1                     | (I) PE2-1 is to be derived from  |  |                        |                    |              |                        |  | 625           | 91.9        | -         |
| 1                     |  |  |                        |                    |              |                        |  |               |             | 91.7      |
| ł                     | $\alpha$ 1 |  |                        |                    |              |                        |  |               |             | 92.0      |
|                       | $   PE2-1 = fv2 \left\{ 0.75 \times \frac{1}{\eta'G} \times (\Sigma P0-Pm) \times \frac{\alpha}{\eta L} + \frac{1}{\varepsilon \times \eta'G} \times Pm \times \beta \times C \times \phi s \right\} \times 1.36 \times \Delta H $   |  |                        |                    |              |                        |  |               | 92.8        | 92.3      |
|                       |  |  |                        |                    |              |                        |  |               |             | 92.8      |
|                       | ② PE2-2 is to be derived from tolerant capacity for momentary overload   |  |                        |                    |              |                        |  |               |             | 93.1      |
| ۱ "                   |  |  |                        |                    |              |                        |  |               |             | 93.5      |
| Calculation Formula   | $PE2-2 = \frac{fv3}{n'G \times vE} \times \left\{ (\Sigma P0-Pm) \times \frac{\alpha}{nL} + Pm \times \beta \times C \times \phi \text{ s} \right\} \times 1.36 \times \Delta H$   |  |                        |                    |              |                        |  |               |             | 93.7      |
| l E                   | $PEZ-Z = \frac{1}{\eta'G \times \gamma E} \times \left\{ (2PO-Pm) \times \frac{1}{\eta L} + Pm \times \beta \times C \times \phi \right\} \times 1.36 \times \Delta H$   |  |                        |                    |              |                        |  |               |             | 93.8      |
| Ä                     |  |  |                        |                    |              |                        |  |               |             |           |
| Ęį.                   |  |  |                        |                    |              |                        |  |               |             |           |
| l la                  | Where  |  |                        |                    |              |                        | Starting method                        |               |             |           |
| हि                    | Σ P0 : Total load can  | acity covered by genera                        | tor in kW              |                    |              |                        | β×C Starter Name                       |               |             |           |
| ာ                     | η L : General Effici   |  |                        |                    |              | 0.85                   | 7.2×1 Direct on-line                   |               |             |           |
|                       | φ L : General Powe   | •  |                        |                    |              | 0.8                    | 7.2×2 / 3 Star - delta                 |               |             |           |
|                       | α : Demand Facto   |  |                        |                    |              | 0.8                    | 7.2×1/3 Star - delta with resis        | tor           |             |           |
|                       | φ G : Generator Pov  | <del>-</del>                                   |                        |                    |              | 0.8                    | 1.2 VVVF                               |               |             |           |
|                       | γ E : Tolerant capa  | doed of Engine                                 |                        |                    | 1.1          | 1.2 Wound - rotor type |  |               |             |           |
| 1                     | β Starting kVA   | _  |                        |                    | 7.2          | 7.2×0.5 Reactor 50%    |  |               |             |           |
| 1                     | C Motor starter  | **   |                        |                    | 0.25         | 7.2×0.65 Reactor 65%   |  |               |             |           |
| 1                     | φ s : Motor starting Power Factor for max. motor starting kVA, Squirrel cage 0.4 7.2×0.8 Reactor 80%   |  |                        |                    |              |                        |  |               |             |           |
| 1                     | $\eta$ G : Generator efficiency 0.919 7.2×0.25 Auto - transformer 50   |  |                        |                    |              |                        |  |               |             |           |
| 1                     | η G : Generator em   | •  |                        |                    |              | 0.855                  | 7.2×0.42 Auto - transformer 6.         |               |             |           |
| 1                     |  | erioad erriciency<br>for due to motor starting | •                      |                    |              | 0.833                  | 7.2×0.64 Auto - transformer 80         |               |             |           |
|                       | 1  |  | •                      |                    |              | 1.0                    |  |               |             |           |
|                       | 10   |  |                        |                    |              |                        |  |               |             |           |
| 1                     | $\varepsilon$ : Tolerant capacity due to non-motor starting of Engine 1.0 $\Delta$ H: Altitude compensation 1.0  |  |                        |                    |              |                        |  |               |             |           |
|                       | An Annuae comp   | CHARLON  |                        |                    |              | 1.0                    |  | · · · · · · · |             |           |

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### 7. Fuel Calculation

Calculation Formula

| ū    |    | Description             | Value, Type                  |     | Description | Value                      | Remarks |
|------|----|-------------------------|------------------------------|-----|-------------|----------------------------|---------|
| tio  | PG | Generator output in kVA | 2000                         | Ħ   | Fuel tank   | 15140.2 → 16000 L × 2 sets |         |
| ndi  | P  | Engineoutput in PS      | 2400                         | es  |             |                            |         |
| Ő    |    | Engine Type             | Diesel-engine, Radiator type | n R |             |                            |         |
| go   |    | Fuel Type               | Light oil                    | Ę   |             |                            |         |
| atic |    |                         |                              | ıla |             |                            |         |
| l i  |    |                         |                              | 딜   |             |                            |         |
| ā    |    |                         |                              | Ű   |             |                            |         |
| 1 0  |    |                         |                              |     |             |                            |         |

Fuel Tank Volume is to be derived from the following calculation.

a. Q [m3] Fuel Tank Volume

$$\mathbf{Q} = \frac{\mathbf{P} \times \mathbf{be} \times \mathbf{H}}{\mathbf{d}} \times \alpha$$

| Output (PS)  | Diesel | Gas turbine |  |  |
|--------------|--------|-------------|--|--|
| 30 or less   | 0.23   | -           |  |  |
| over 30 and  | 0.22   | 0.5         |  |  |
| 250 or less  | 0.22   | 0.5         |  |  |
| over 250 and | 0.2    | 0.48        |  |  |
| 450 or less  | 0.2    | 0.40        |  |  |
| over 450 and | 0.18   | 0.43        |  |  |
| 750 or less  | 0.18   |             |  |  |
| over 750     | 0.17   | 0.38        |  |  |

be : Fuel consumption factor 0.17 kg/PS·h

H : Running hour 28 hours

d: Fuel density 830 kg/m3

(A heavy oil 850kg/m3) (Light oil 830kg/m3) (Kerosine 790kg/m3)

 $\alpha$ : Surplus Factor 1.