Chapter 6

Identification and Analysis of Flood Problems

CHAPTER 6
IDENTIFICATION AND ANALYSIS OF FLOOD PROBLEMS

In identifying and analyzing the flood problems in the study area, the study team utilized the following survey results:

- Location maps discussed in *Chapter 3* — for locations of manholes and drainage channels and flow directions.
- LATERAL database discussed in *Chapter 3* — for existing conditions and data processing.
- Drainage channel and water surface profiles (**Tables 4.1** and **4.2** and **Figures 4.10** to **4.26**), which are discussed in *Chapter 4* — for longitudinal profiles and for checking the adequacy of flow capacity of drainage channels.
- Runoff and flow capacity tables (**Tables 4.3** and **4.4** for drainage laterals, **Table 4.5** for drainage mains, and **Table 4.6** for open channels) discussed in *Chapter 4* — for checking the adequacy of drainage channels.
- Flood condition database and inundation maps discussed in *Chapters 3 and 5* — for flood data and identification of flood-prone areas and flood depths.

From the inundation map of the September 1999 flood, forty-five (45) critical flood-prone areas (i.e., with flood depths exceeding 0.50 m) were selected for analysis and evaluation of flood problems. **Table 6.1** lists the findings and presents possible countermeasures for each flood-prone area identified as critical.

6.1 Analysis of Flood Problems

6.1.1 Regional Flooding

Two seriously affected flood-prone areas were identified as regional in scope and which involved several drainage blocks, namely the eastern part of north Manila (España-Sampaloc area), and the areas of San Andres Bukid, San Antonio, Metropolitan Subdivision, Palanan and San Isidro in South Manila. The flood problems are discussed below.

Northeastern Manila Flood Problem

Because undersized drainage laterals (NL041, NL039, NL043) cannot accommodate the runoff cascading from the relatively steep slopes of Sta. Mesa Heights, the unaccommodated or excess runoff spills over the carriageway of existing roads towards the Blumentritt Interceptor (DM01). Since the interceptor is also undersized, the spilling runoff is further directed to the neighboring Vitas drainage block where it develops as flood. As the floodwaters rise and spread, they again cross over to the lower Sampaloc area. The rising floodwaters then result to widespread flooding of the España area, the lowest point of the larger low-lying area of Sampaloc.

Disposal of the floodwaters is made by way of the N. Reyes-Severino Main (DM06) to the Quiapo pumping station where it is ultimately pumped out to the Pasig River.

Adding to the floodwaters from the Sta. Mesa Heights is the runoff coming from the gentle slopes of Balic-Balic in Quezon City. The floodwaters enter the Sampaloc area through drainage laterals into the Josefina-Lepanto Main (DM07) thus aggravating further the inundation of the España area.

The floodwaters are disposed of by way of the Lepanto-Gov. Forbes Main (DM30) down to Estero de Sampaloc where they are ultimately pumped out into the Pasig River.

At high flood stage, floodwaters from the respective drainage blocks of Quiapo and Aviles-Sampaloc merge, making the flood problem more complex. Under such condition, more than one pumping station operate, each serving an indistinct drainage system or drainage block.

CHANNEL CODE	NAME	CAUSES OF FLOODING
DM01	**Blumentritt Interceptor**	
NL041	Amoranto-Mayon-Calamba (Right Side)	▪ Inadequate flow capacity of Calamba Creek. ▪ Presence of sediment deposits and other obstructions. *Silts come from construction sites and since the drainage area has steep slope, sand/silts are easily transported to the creek.*
NL039	Andres Bonifacio	▪ Inadequate flow capacity of NL039 and receiving drainage main (DM01). ▪ Presence of sediment deposits and other obstructions. *50% deposit at low point (manhole ii15C2019).*
NL043	Piy Margal (Mayon-M Cuenco)	▪ Inadequate flow capacity of NL043 and receiving drainage main (DM01). ▪ Presence of sediment deposits and other obstructions.
DM06	**N. Reyes–Severino**	
NL031	Laong-Laan-Gov. Forbes-España	▪ Inadequate flow capacity of NL031 and receiving drainage main (DM06). ▪ NL031 has small outlet, hence a choking condition occurs; floodwater coming from northern Sampaloc spills over to España.
NL032	Dimasalang-Gov. Forbes-España	▪ Inadequate flow capacity of NL032 and receiving drainage main (DM06). ▪ Layout of drainage lateral facilitates deposition and clogging of manhole, especially at places with abrupt change of slope direction.
DM07	**Josefina – Lepanto**	
NL036	España (Right Side)	▪ Inadequate flow capacity of NL036 and receiving drainage main (DM07). ▪ Layout of drainage lateral facilitates deposition and clogging of manholes, especially at places with abrupt change of slope direction.

DM08	**Economia**	
NL033	M. Earnshaw-España	▪ Inadequate flow capacity of NL033. ▪ NL033 drains to NL032. ▪ Presence of sediment deposits and other obstructions. *Clogged outlet (ii15C4064) and manhole ii15C4152.* *Choked at ii15C4075.* *Floodwater spills over the Estero de Calubcub.*
NL034 NL035	España (Right Side) España (Left Side)	▪ Inadequate flow capacity of drainage laterals, NL034 and NL035.
EST15	**Estero de San Miguel**	
NL029	M.V. delos Santos (Right Side)	▪ Inadequate flow capacity of NL029. ▪ Presence of sediment deposits and other obstructions.
NL030	M.V. de los Santos (Left Side)	▪ Inadequate flow capacity of NL030. ▪ Presence of sediment deposits and other obstructions. *Drainage lateral has 50 to 100% sand/silt deposition; manhole ii15C4086 and ii15C4051 clogged.*
DM28	**South Antipolo Main**	
NL055	F. Huertas	▪ Inadequate flow capacity of NL055 and receiving drainage main (DM28). *Area served by the lateral is low-lying.*
DM02	**Solis-Tecson**	
NL016	J. Abad Santos (Right Side)	▪ Inadequate flow capacity of NL016 and receiving drainage main (DM02). ▪ Presence of sediment deposits and other obstructions. *Both ends of NL016 have 50% sediment deposition.* *The lateral lies in a low-lying area where flood can persist for a long time. The lateral is located at the upstream end of DM02 where flood takes longer to subside.*
NL017	J. Abad Santos (Left Side)	▪ Inadequate flow capacity of NL017 and receiving drainage main (DM02). ▪ Presence of sediment deposits and other obstructions. *NL017 has 70% uniform deposition; manhole ii15B2209 is clogged.* *The lateral lies in a low-lying area where flood can persist for a long time. The lateral is located at the upstream end of DM02 where flood takes longer to subside.*
DM29	**Tayuman**	
NL025	Oroquieta	▪ Inadequate flow capacity of NL025 and receiving drainage main (DM29). ▪ Saw-tooth profile of drainage lateral. ▪ Presence of sediment deposits and other obstructions *Manhole ii15B3180 is clogged. Sediment deposits at sag point.* ▪ Area serviced by lateral is low-lying.
EST06	**Estero de Magdalena**	
NL018	S. Herrerra	▪ Inadequate flow capacity of NL018 and the receiving Estero de Magdalena (upper reach). ▪ The area is low-lying and floodwaters can stand still easily.
NL019	Tayabas	▪ Inadequate flow capacity of NL019 and the receiving Estero de Magdalena (upper reach). ▪ The area is low-lying and floodwaters can stand still easily.

Southern Manila Flood Problem (San Antonio-Palanan-Pio del Pilar- San Isidro)

Runoff from the San Antonio Village enters the laterals to full capacity. Since the drains are undersized, the unaccommodated excess runoff appears as flood. The floodwater is collected along roadways and led towards the Zobel-Roxas Main (DM23). But because the capacity of this main at its upper reaches is limited, floodwaters cannot be conveyed further. This results to the rising of flood level upstream. Worsening this adverse condition, and because the overflowing Estero de Tripa de Gallina submerges the main's outfall, a further reduction of capacity of the Zobel-Roxas Main occurs at its middle and lower reaches.

The area south of Zobel-Roxas Street is drained by Calatagan Creek. The creek, however, has a very limited flow capacity, and thus facilitates the swelling of floodwaters in the area and its immediate vicinity. The floodwater is conveyed along Calatagan Creek to Estero de Tripa de Gallina, which is also overflowing, hence compounding the flood problem.

The PNR open canal drains the floodwaters east of the existing railroad tracks, but overflows due to its limited capacity. Nevertheless, the floodwaters are discharged either via the Faraday main or toward the Calatagan Creek, which becomes further overloaded. Large scale flooding of the area therefore ensues.

The complexity of this drainage system problem can be brought into clearer view if it is considered that a number of pumping stations, namely, Paco-Pandacan-San Andres-Libertad and Tripa de Gallina pumping stations serve the same Estero de Tripa de Gallina.

CHANNEL CODE	NAME	CAUSES OF FLOODING
Estero de Tripa de Gallina		
DM 23	**Zobel Roxas**	
SL001 SL002 SL022	Primo de Rivera Vito Cruz Ext. Mayapis	▪ Layout of drainage lateral facilitates deposition and clogging of manholes, especially at places with abrupt change of slope direction. *Adverse slope from 0 to 450 and from 580 to 700 of SL001. Surface runoff from headwaters to Tejeron spills over towards areas served by SL001 and SL002 (Primo de Rivera and Pasong Tamo, respectively).* *The general area of San Antonio Village is flat and low-lying and bounded by main streets and the existing railroad track, which is relatively higher than the natural ground. This results in ponding during heavy rains.*
SL032	Sen. Gil Puyat-Dian-DM22	▪ Inadequate flow capacity of SL032. ▪ Drainage profile has saddle. *Chances of sediment filling the saddle are high and fast. Estero de Tripa de Gallina overflowed.*
SL033	Finlandia-Edison-Morse-EST25	▪ ***shares the same causes with SL032***

SL037	Hen. A. Ricarte	▪ Inadequate flow capacity of SL037. ▪ Layout of drainage lateral facilitates deposition and clogging of manholes, especially at places with abrupt change of slope direction. ▪ Presence of sediment deposits and other obstructions.
SL039	Cabrera Protacio Ext.	▪ Inadequate flow capacity of SL039. ▪ Layout of drainage lateral facilitates deposition and clogging of manholes, especially at places with abrupt change of slope direction. *Clogged manhole at upstream end (iii21A1042).* *Overtopping of Estero Tripa de Gallina.*
SL031	Dayap-Dian Calatagan Creek	▪ Inadequate flow capacity of SL031 and receiving creek. *Swelling of flood over Pio del Pilar.* *Overtopping of Estero de Tripa de Gallina.*
SL030	Dian (Outfall)	▪ *Shares the same causes with SL031.*
DM33	**Pasong Tamo**	
SL055	Lumbayao and St. Paul	▪ Inadequate flow capacity of SL055. ▪ Irregular profile of SL055. ▪ Presence of sediment deposits and other obstructions. *Flat area with slow movement of surface runoff.*
SL022	Mayapis	▪ Inadequate flow capacity of SL022. ▪ Presence of sediment deposits and other obstructions. *Drainage lateral is clogged for 350 meters* *Drainage area for lateral is flat.*
	PNR Open Canal	
SL020	Dagonoy	▪ Inadequate flow capacity of SL020 and receiving PNR open canal ▪ Layout of drainage lateral facilitates deposition and clogging of manholes, especially at places with abrupt change of slope direction. ▪ Presence of sediment deposits and other obstructions. *Outlet of the lateral is constricted.* *Drainage profile is irregular. Sand and silt deposits at the saddle section reduce the flow.* *Clogged manhole (iii 16A3158).* *Area north of Zobel-Roxas main has scattered flood-prone portions.*
SL021 SL054	Estrada A Estrada B	▪ Inadequate flow capacity of SL021 and SL054. ▪ Presence of sediment deposits and other obstructions. *SL021 is clogged at manhole iii16A3171 and rest of lateral length has 50 to 75% sand/silt deposition.* *SL054 has a 50% sand deposition over its length.*

6.1.2 Local Flooding

Amply supported and properly managed, certain remedial measures for localized floods can yield immediate benefits. It must be stressed, however, that only by adopting a regional context can more permanent solutions to localized floods be found. Lined up below are drainage channels that are causing localized flood problems, in which urgent works to mitigate flood damage may be implemented.

North Manila (Local Flooding)

CHANNEL CODE	NAME	CAUSES OF FLOODING
NL049	Luzon/Negros	▪ NL049 has steep slope. ▪ Presence of sediment deposits and other obstructions. *Steep slope followed by adverse slope forms a saddle part (potential siltation site).* *70% clogged at saddle (manhole iiiA4197).* *Incoming lateral from Luzon may have inlet problem, such that flooding occurs.*
NL010	Claro M.Recto (Left Side)	▪ Inadequate flow capacity of NL010. *Upstream end of lateral may be small.*
NL026	P. Guevarra	▪ Inadequate flow capacity of NL026. ▪ Irregular drainage profile *(facilitating deposition and clogging of manholes, especially at places with abrupt slope changes).* ▪ Presence of sediment deposits and other obstructions. *Irregular drainage profile.* *Clogged manhole at sag (ii5C3326) and at upstream manhole (ii5C3322).*
NL004	Moriones/ Nolasco/Morga	▪ Inadequate flow capacity of NL004. ▪ Layout of drainage lateral facilitates deposition and clogging of manholes, especially at places with abrupt slope changes. ▪ Presence of sediment deposits and other obstructions. *Drainage profile has a saw-tooth shape; clogged manhole ii15A4037 (sag point).* *Drainage lateral has 80% deposit over its length.*
NL020	North Antipolo Creek	▪ Inadequate flow capacity of North Antipolo Creek. ▪ Presence of sediment deposits and other obstructions. *Outlet manhole (ii5B3194) is clogged.* *Whole length of NL020 has 50% sand/silt deposit.* *Drainage profile is conducive for silt deposition.* *Possible spilling of runoff from upstream of Solis-Tecson Main.*
NL044	Cordillera-Quezon Ave.-D. Tuazon-Data-Matimyas	▪ Inadequate flow capacity of NL044. ▪ Irregular profile of NL044. ▪ Presence of sediment deposits and other obstructions. *Profile undulating; size changes from 76 cm to 46 cm back to 76 cm; constricted drainage pipe at manhole iiiA3186; choked condition.*
NL028	Carlos Palanca-Padilla-Nepomuceno	▪ Inadequate flow capacity of NL028. ▪ Irregular profile of NL028. ▪ Presence of sediment deposits and other obstructions. *Adverse bed slope near outlet/hydraulic behavior changes.* *Deposition at saddle portion.* *Clogging of manhole #20C1025.*
NL054	Old Sta. Mesa-Albina-Altura-R. Magsaysay-Hipodromo-Anonas	▪ Inadequate flow capacity of NL054. ▪ Irregular profile of NL054. ▪ Presence of sediment deposits and other obstructions. *Presence of two choking points.* *Hydraulic behavior changes rapidly due to abrupt change in section area and due to incomplete siphon.* *Clogged manhole due to choking.*

NL045	Matimyas (right side)	▪ Inadequate flow capacity of lateral. ▪ Presence of sediment deposits and other obstructions.
NL046	Matimyas (left side)	▪ *shares the same causes with NL045.* *has 50% deposition at iii1A3209.*

South Manila (Local Flooding)

CHANNEL CODE	NAME	CAUSES OF FLOODING
SL010	Paz Mendoza/ Guanzon	▪ Inadequate flow capacity of SL010. ▪ Irregular profile of SL010. ▪ Presence of sediment deposits and other obstructions. *Drainage line has excessive sag at 0+380 m. The erratic slope greatly reduces flow capacity.* *Drain size is not consistent (larger at the upper end and smaller at the lower end).*
SL035	Rockefeller/ Ford/ Tripa de Gallina	▪ Inadequate flow capacity of SL035. ▪ Road inlets are not provided. ▪ Presence of sediment deposits and other obstructions. *Because the area served by the lateral lies on a flat area, this poor drain capacity results to localized flooding.*
SL047	Victoria	▪ Irregular profile of SL047, particularly at segment 0 to 491 m. ▪ Outfall is submerged by Maricaban Creek during floods.
SL041	Donada/DM14	▪ Inadequate flow capacity of SL041. *Segment 176 to 289 m does not conform with minimum requirement of DPWH.*
SL045	Rodriquez/Apelo Cruz/ C. Jose	▪ Inadequate flow capacity of SL045. ▪ Irregular profile of SL045. *A saddle point is present at upper reach of lateral, where hydraulic behavior abruptly changes; upstream of the lateral is on high ground and inlets to manhole are not adequate.* ▪ Presence of sediment deposits and other obstructions. *The drainage lateral is 25% filled with sediments.*
SL008	T.M. Kalaw/Taft	▪ Inadequate flow capacity of SL008. *Size of drain from 317 to 500 m is below DPWH standard.* *Adverse slope from 0 to 103.* ▪ Presence of sediment deposits and other obstructions. *Curb inlets are clogged with garbage.*
SL009	San Marcelino	▪ High water level at Estero de Balete outfall. *The lateral is affected by high water level of Pasig River.*
SL032	Sen. Gil Puyat/ Dian/DM22	▪ Irregular longitudinal profile of SL032 (saw-tooth) ▪ Presence of sediment deposits and other obstructions. *Manholes are filled with sediment deposits.*
SL033	Finlandia/Edison /Morse/ Tripa de Gallina	▪ ***shares the same causes with SL032.***
SL029	Herrera	▪ Inadequate flow capacity of SL029. ▪ Clogged at outlet.
SL019	E. Pascua	▪ Inadequate flow capacity of SL019 and clogged at outlet. *Affected by tide which causes backwater and reduces flow capacity.*

SL014	Road 9	▪ The outfall is affected by high water level at Tripa de Gallina.
SL015	Road 16/Pedro Gil	▪ Irregular profile of SL015. *Drain size at segment 0 to 50 is a bottleneck.* *Outfall invert is too low.* *An assortment of conduit sizes has been installed inconsistently.*

To summarize, the primary cause of flooding is inadequate flow capacity caused by one or several combinations of the following:

- undersized drainage channels
- unevenly laid longitudinal slope of the channel or conduit
- irregularly shaped channel
- inconsistent drain size, i.e., the line should progressively increase in size as it goes down slope
- clogged manholes
- sediment deposits of varying depth along drainage channel or conduit
- overflowing of esteros
- floodwater spilling to neighboring drainage areas
- submerged crown elevation at the outlet

6.2 Other Related Flood Problems

Flood problems other than those largely resulting from inadequate flow capacity are summarized below.

Encroachment on Esteros and Waterways

Throughout the Metro Manila area, colonies of informal settlers are common sights along esteros/waterways. Shanties are built along waterway easements, over open channels, and under bridges. Most are built of wood and other makeshift materials, but a considerable number are made of GI sheets claddings and other semi-permanent construction materials. Some are even multi-level. The presence of these settlers makes regular maintenance impossible and eliminates the possibility of retrieving the original flood plain width to increase the flow capacity.

One major effect of this illegal occupation may be given. With shanties built inside the esteros banks, plastic materials carried by the flowing water become easily entangled and entrapped on columns or posts, the consequence of which is the retardation of flow and, in some cases, total blockage of the drainage channels. (see **Photo 7**)

The informal settlers are of major concern, not only in regard to the encroachment on waterways but also in compounding the lack of public services such as garbage collection. Where informal settlements are present, it is the prevailing practice to dispose of garbage indiscriminately and directly to waterways, adding to pollution and public health hazards, and making regular maintenance of drainage channels more troublesome.

Uncoordinated Developments

To improve and sustain their services, public utility agencies often have on-going construction and development activities. In so doing, however, and perhaps unwittingly, the practice of giving little weight to the hydraulic requirements of waterways, or even totally disregarding them, becomes ingrained, resulting to numerous obstructions and constrictions that significantly reduce the flow capacity of waterways.

Road crossings, bridges and access roads, whether vehicular or pedestrian, retard the flow of water and, in extreme cases, caused complete blockage of waterways. Typical examples are as follows:

- constricted road crossing (PNR open canal and Vito Cruz) **(Photo 8)**
- road crossing along Estero de San Lazaro at Laguna **(Photo 9)**
- railroad crossing at Estero de Maypajo **(Photo 10)**
- parallel access pedestrian bridge along Estero de Magdalena **(Photo 11)**
- construction and installation of water supply pipes, telephone conduits, telephone poles, and other utilities within drainage channels **(Photo 12 Sewer** line across Estero de Calubcub)

Garbage, Trash, Construction Materials and Siltation

A substantial portion of the garbage currently generated in the study area is disposed of indiscriminately to streets, vacant lots or other open spaces, street gutters or canals, and waterways. The presence of undulating mounds of garbage and even construction wastes along banks of esteros confirms the above practice **(Photo 13)**. Uncontrolled construction sites, especially those on higher grounds, also give rise to erosion and entry of silt and sediment into the drainage system.

In some cases, trash racks (e.g. Vito Cruz, Estrada, Dian, and Tayuman; **Photo 14)** are provided in open channels to prevent garbage being carried further downstream. However, irregular maintenance or non-removal of garbage contributes to blockage problem and backwater effects.

Percentage distribution of sediment deposition in the surveyed manholes is shown in **Figure 6.1.** The data used came from the LATERAL database. The percent deposition is taken as the ratio of depth of deposit to either depth or diameter of channel. It can be seen in the figure that the pattern of sediment deposition in North Manila drainage lines shows almost no variance from those in South Manila drainage lines. Approximately, twenty per cent (20%) of the total number of surveyed manholes have a 20% sediment deposit, another 20% have 40% sediment deposits, and another 15% have 60% sediment deposit. It is clear therefore that a sizable number of manholes have considerable amount of sediment deposits or have reduced cross-sectional areas, hence further decreasing the carrying capacity of drainage channels.

Increased Runoff in Developed Areas

Many of the drainage mains follow the old natural channels that existed before extensive land development took place. These channels are now inadequate for the following reasons.

- rapid urbanization has reduced the runoff travel time and thereby increased peak discharge.
- the runoff coefficient, C, used in earlier studies and design has become inappropriate.

Chapter 7

Conclusions and Recommendations

CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

As discussed in previous chapters, almost all drainage laterals and a number of drainage mains and esteros have limited flow capacity. Due to this deficiency, the un-accommodated excess storm water swells and inundates large portions of Manila and Suburbs, especially the low-lying areas of España (north of the Pasig River) and the San Antonio-Palanan-Pio Del Pilar area (south of the Pasig River).

The major drainage channels were intended to have the safety level for floods of a 10-year return period. Their actual capacity, however, proved less than the targeted safety level mainly because of the limited rainfall data used in the 1952 drainage plan, and partly because of the increase in runoff brought about by rapid urbanization.

Sediment deposits that have accumulated through the years due to deferred maintenance have also impaired the effectiveness of drainage laterals and mains. The combination of using varying sizes of laterals and presence of adverse slopes has facilitated, too, the settling of sediments, thus resulting to the reduction of the effective flow area of these drainage facilities and further diminishing their flow capacity.

Uncollected solid wastes that find their way into the drainage channels, construction waste materials included, further decrease the channels' flow carrying capacity and eventually block them. Solid wastes appearing in large quantities at the pumping stations also greatly hamper pump operations and reduce as well the detention pond capacity.

The esteros are intended to function both as primary drainage channels and detention ponds for the pumping stations. But accessing these waterways to do channel improvement and maintenance work has become virtually impossible today, given the colonies of informal settlers that have encroached on long stretches of these esteros.

With these conditions obtaining in the drainage system of Manila and Suburbs, what comes to fore is a pressing need for concerned agencies to come up with a new and comprehensive drainage master plan, one that can provide a lasting solution to Metro Manila's recurring floods.

7.1 Master Plan and Feasibility Study

As shown by this study, the present flow capacities of drainage channels are inadequate for draining floodwaters brought by a 10-year return period flood. Unaccommodated floodwaters in particular drainage blocks spill over to neighboring drainage blocks and result to wide-scale flooding of low-lying areas. As the flooding is regional in scope, involving several closely connected drainage blocks, drainage mains, esteros, and pumping stations, comprehensive drainage planning should be undertaken through a master plan study.

Areas identified for the master plan study are the Sampaloc area of North Manila and the San Antonio-Palanan-Pio del Pilar-San Isidro area of South Manila, which are described as follows.

For North Manila. Flooding of the large low-lying Sampaloc area comes from the runoff contributions of part of Sunog Apog drainage block, Vitas drainage block, Aviles-Samplaoc drainage block and Quiapo drainage block. In the event of flood, the Vitas drainage area and the Binondo-Escolta drainage block share the same estero, and this is the Estero dela Reina. In like manner, the Quiapo drainage block and Aviles-Sampaloc drainage block may share the same estero, the Estero de San Miguel. This arrangement places stress or puts pressure on some of the pumping stations.

For South Manila. The habitual flooding areas are along Calatagan Creek and PNR open canal. Both canals flow to the overflowing Estero de Tripa de Gallina. But also connected to this estero are other drainage blocks such as Pandacan, Paco, San Andres and Libertad. The estero system (network) for south Manila is more complex because several pumping stations operate on the same estero, the Estero de Tripa de Gallina. This arrangement, as previously said, stresses pumping stations.

In proposing flood abatement or mitigation measures, the master plan should consider not only structural measures but also nonstructural ones. The structural measures could include:

- construction of additional drainage channels;
- improvement of esteros;
- rehabilitation and improvement of existing drainage mains;
- rerouting of flows to less stressed lines;
- compartmentalization of drainage blocks to reduce problem areas into manageable levels; or possibly,
- redesign or reconstruction of the whole drainage system altogether.

Nonstructural measures should include IEC and advocacy programs so that effective garbage collection and disposal, and effective removal and relocation of informal settlers may be achieved.

Given that a number of esteros are provided with pumping stations and are interconnected, note be taken that the simple assumption on free surface condition is unattainable in the field. Other flow combinations such as pressure flow at the lower reaches and open channel at upper reaches may occur. An operation model for effective pump operation, particularly during stormy conditions, is an option that should be considered in the master plan study.

For determining the technical, institutional, financial, social and environmental aspects of drainage system improvements, feasibility studies should be conducted for projects identified as priorities in the master plan.

7.2 Implementation of Urgent Works

In addition to the above, the Study Team has identified some urgent works for immediate implementation, as follows:

North Manila Watershed: Regional

CHANNEL CODE	NAME	MEASURES
DM01	**Blumentritt Interceptor**	
NL041	Amoranto/Mayon/ Calamba (Right Side)	▪ Increase lateral/main capacity, reduce run-off peak or provide additional line if space allows ▪ Desilting/Declogging of drainage channel ▪ Develop/implement solid waste management plan to include non-structural measures like IEC and advocacy programs ▪ Inclusion in the overall master planning
NL039	Andres Bonifacio	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Declog/dredge drainage main (DM01) and declog manholes ▪ Inclusion in the overall master planning, being contributor to large scale flooding of Sampaloc area (*diversion channel can be considered in the master planning).*
NL043	Piy Margal (Mayon/M. Cuenco)	▪ Increase lateral/main capacity, or provide additional line if space allows (*flooding problem covers a large area and several drainage areas interact*) ▪ Develop/implement solid waste management plan to include non-structural measures like IEC and advocacy programs ▪ Inclusion in the overall master planning
DM06	**N. Reyes –Severino**	
NL031	Laong-Laan/ Gov. Forbes/España	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Develop guidelines to improve drainage planning, design, construction, operation and maintenance. ▪ Undertake overall master planning and include this lateral (*the drainage basin lies in low-lying area and also involves other interdependent drainage basins)*
NL032	Dimasalang/Gov. Forbes/España	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Clean/declog NL032. ▪ Develop proper drainage planning, design, construction, and operation guidelines so as to put more emphasis on the hydraulic aspect of the problem ▪ Develop/implement solid waste management plan to include non-structural measures like IEC and advocacy programs ▪ Undertake comprehensive drainage master planning and include this lateral for it is part of the large scale flooding of the Sampaloc area.
DM07	**Josefina - Lepanto**	
NL036	España Right Side)	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Develop guidelines on proper drainage planning, design, construction, and operation, with emphasis on the hydraulic aspect of the flooding problem.

		▪ Develop/implement solid waste management plan to include non-structural measures like IEC and advocacy programs ▪ Undertake comprehensive drainage master planning (*This lateral involves a number of interdependent drainage basins including those in low-lying areas.)*
DM08	**Economia**	
NL034 NL035	España (Right Side) España (Left Side)	▪ Increase capacity of NL034 , or provide additional line if space allows ▪ Undertake comprehensive drainage master planning *(The laterals' drainage basin lies in a low-lying area and involves also a number of interdependent drainage basins. Due consideration should be given to the fact that the drainage main (DM08), NL034 and NL035 are in the interior of a large basin.)*
NL033	M. Earnshaw/ España	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Clean clogged manholes from ii15C4064 to ii15C4071. ▪ Enlarge drain size at manhole ii5C4075 ▪ Develop guidelines on proper drainage planning, design, construction and operation, with emphasis on the hydraulic aspect of the flooding problem. ▪ Develop/implement solid waste management plan to include non-structural measures like IEC and advocacy programs ▪ As this is part of the large scale flooding of the Sampaloc area, it should be included in the overall master planning study.
NL029 NL030	M.V. delos Santos (Right Side) M.V. de los Santos (Left Side)	▪ Increase lateral capacity, or provide additional line if space allows ▪ Develop guidelines on proper drainage planning, design, construction, and operation, with emphasis on the hydraulic aspect of the flooding problem. ▪ Undertake comprehensive drainage master planning as this involves a number of interdependent drainage basins and also because these laterals' drainage basin lies in a low-lying area.
DM 28	**South Antipolo Main**	
NL055	F. Huertas	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Dredge South Antipolo Main. ▪ Include in a small basin-wide drainage improvement study (say north Sta. Cruz area).
DM02	**Solis-Tecson**	
NL016 NL017	J. Abad Santos (Right Side) J. Abad Santos (Left Side)	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Declog/desilt NL016 & NL017. ▪ Develop guidelines on proper drainage planning, design, construction, and operation, with emphasis on the hydraulic aspect of the flooding problem ▪ Improve carrying capacity of DM02, preferably through a study on improvement of drainage laterals for small drainage area.
DM29	**Tayuman**	
NL025	Oroquieta	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Develop guidelines on proper drainage planning, design, construction, and operation, with emphasis on the hydraulic aspect of the flooding problem ▪ Declog manholes and dredge Tayuman Main.

		▪ Include in a small basin-wide drainage improvement study (say north Sta. Cruz area).
NL018 NL019	S. Herrerra Tayabas	▪ Increase lateral/main capacity, or provide additional line if space allows ▪ Declog/dredge Estero de Magdalena for immediate impact, ▪ For long range planning, conduct a drainage improvement study of Estero de Magdalena from South Antipolo to Tayuman. It may include the improvement of the drainage laterals under a small basin wide study.

North Manila Watershed: Local

CHANNEL CODE	NAME	MEASURES
NL049	Luzon/Negros	▪ Desilt/declog lateral and manhole iii11A4197. ▪ Improve slope of lateral and check inlet to NL049 from Luzon. ▪ Develop proper drainage planning design, construction, and operation guidelines so as to put more emphasis on the hydraulic aspect of the problem
NL010	Claro M.Recto (Left Side)	▪ Increase lateral capacity, or provide additional drain line, if space allows ▪ Develop proper drainage planning, design, construction, and operation guidelines so as to put more emphasis on the hydraulic aspect of the problem
NL026	P. Guevarra	▪ Increase lateral capacity, or provide additional drain line, if space allows ▪ Declog drainage lateral (NL026). ▪ Develop proper drainage planning, design, construction, and operation guidelines so as to put more emphasis on the hydraulic aspect of the problem.
NL004	Moriones/Nolasco/ Morga	▪ Increase lateral capacity, or provide additional drain line, if space allows ▪ Declog drainage lateral NL004. ▪ Develop proper drainage planning, design, construction, and operation guidelines so as to put more emphasis on the hydraulic aspect of the problem
NL020	North Antipolo Creek (T. Bugallon – Antipolo)	▪ Declog/clean NL020. ▪ Improve downstream of drainage laterals. ▪ Improve flow capacity of North Antipolo Creek. ▪ Include in a small basin-wide drainage improvement study (say north Sta. Cruz area).
NL044	Cordillera/Quezon Ave./D.Tuazon /Data/Matimyas	▪ Study the possibility of replacing drainage lateral from iii11A3186 to iii11A3121 to get rid of the choke. ▪ Develop proper drainage planning, design, construction, and operation guidelines with more emphasis on the hydraulic aspect of the problem ▪ *Design channel with appropriate gradient and flow capacity.*
NL028	C. Palanca/ Padilla/ Nepomuceno	▪ Declog manhole ii20C1025. ▪ Improve drainage profile through proper planning.
NL054	Old Sta. Mesa/ Albina/Altura/ R. Magsaysay/ Hipodromo/Anonas	▪ Declog manhole. ▪ Revise drainage profile through proper drainage planning. ▪ Develop proper drainage planning design, construction, and operation guidelines with more emphasis on the hydraulic aspect of the problem.

NL045 NL046	Matimyas (Right Side) Matimyas (Left Side)	▪ Declog NL045 and desilt NL046 ▪ Improve drainage lateral through proper planning.

South Manila Watershed: Regional

CHANNEL CODE	NAME	MEASURES
	Estero de Tripa de Gallina	▪ Improve channel capacity of Calatagan Creek and Tripa de Gallina.
DM 23	**Zobel Roxas**	
SL001	Primo de Rivera	▪ Re-design SL001 and rectify longitudinal slope. *Constant slope must be maintained throughout the whole length. Verify availability of head from upper end of line to junction with SL044 (Vito Cruz), to DM23 (Zobel Roxas) and ultimately at Tripa de Gallina.*
SL002	Vito Cruz Extension	▪ Do the same for SL002 (north segment of Mayapis).
		▪ Provide auxillary pump at the Tripa de Gallina inlet of Vito Cruz outlfall (DM14). Forced pumping is necessary. ▪ Another alternative is to completely redesign/ reconstruct the drainage system of San Antonio Village. *Compartmentalize the area by providing floodgates on Tripa de Gallina area for the Libertad to prevent external flows. This will ensure a definite influence area for the Libertad Pumping Station plus a new auxiliary force pump which should be provided at inlet of Vito Cruz outfall.*
SL032	*Sen. Gil Puyat Dian-DM22*	▪ Increase lateral capacity, or provide additional line if space allows
SL033	Finlandia-Edison-Morse-EST25	▪ Increase lateral capacity, or provide additional line if space allows
SL037	Hen. A. Ricarte	▪ Increase lateral capacity, or provide additional line if space allows ▪ Declog/desilt drainage lateral.
SL039	Cabrera Protacio Extension	▪ Increase lateral capacity, or provide additional line if space allows ▪ Reconstruct pipe sections to gradual slope. ▪ Declog/clean manhole iii21A1042 and downstream sections.
SL031	Dayap-Dian-Calatagan Creek	▪ Improve capacity of lateral and Calatagan Creek, or provide additional line if space allows
SL030	Dian (Outfall)	▪ Improve capacity of lateral and Calatagan Creek, or provide additional line if space allows
DM33	**Pasong Tamo**	
SL055	Lumbayao and St. Paul	▪ Increase lateral capacity, or provide additional line if space allows
SL022	Mayapis	▪ Increase lateral capacity, or provide additional line if space allows ▪ Declog whole length of drainage lateral
	PNR Open Channel	▪ Dredge PNR open canal.
SL020	Dagonoy	▪ Improve capacity of lateral including the receiving PNR open canal or provide additional line if space allows. ▪ Clean manhole iii16A3158 of sediment deposit.

SL021	Estrada A	▪ Declog/clean the PNR open canal and the drainage lateral as well. ▪ Undertake improvement of the drainage laterals for San Andres Bukid; this can be studied in detail using a small basin-wide approach.
SL054	Estrada B	▪ Do the same for SL054.

South Manila Watershed: Local

CHANNEL CODE	NAME	MEASURES
SL010	Paz Mendoza Guanzon	▪ Reconstruct SL010 and rectify slope. *Verify size of drain line.* ▪ *Flatness of the existing terrain may require closer spacing of street/curb inlets.* ▪ *Drain size must be smaller at the upper end, becoming progressively larger at the lower end.*
SL035	Rockefeller/Ford/ Tripa de Gallina	▪ Declog manhole inlets. ▪ Provide additional curb inlets. ▪ Clean SL035.
SL047	Victoria	▪ Redesign and reconstruct segment 0 to 893 for a steeper slope.
SL041	Donada/DM14	▪ Redesign whole segment and replace with larger RCPs. ▪ Clean SL041. ▪ Develop proper drainage planning, design, construction, and operation guidelines with more emphasis on the hydraulic aspect of the problem
SL045	Rodriquez/Apelo Cruz/ C. Jose	▪ Reconstruct SL045 and rectify slope ▪ Desilt/declog the whole pipe system. ▪ Clean inlets. If necessary, provide additional inlets. ▪ Develop proper drainage planning, design, construction, and operation guidelines so as to put more emphasis on the hydraulic aspect of the problem
SL008	T.M. Kalaw/Taft	▪ Replace SL008 with one that has a bigger capacity or provide additional parallel line if space is available ▪ *Recalculate to determine proper drain size.* ▪ *Rectify longitudinal slope from 0 to 103.* ▪ Clean inlets. ▪ Develop proper drainage planning, design, construction, and operation guidelines with more emphasis on the hydraulic aspect of the problem
SL009	San Marcelino	▪ Provide flap gate or check gate at outfall.
SL032 SL033	Sen. Gil Puyat/Dian/ DM22 Finlandia/Edison/ Morse/Tripa de Gallina	▪ Reconstruct SL032 and SL033 and rectify slope ▪ Desilt/declog manholes ▪ Develop guidelines for proper drainage planning, design, construction, and operation, with emphasis on the hydraulic aspect of the problem
SL029	Herrera	▪ Clean/clear of sediment deposits the whole length of drainage lateral
SL019	E. Pascua	▪ Redesign and reconstruct SL019 from 0 to 167 ▪ Raise outfall invert to El. 11.50 ▪ Desilt/declog SL019
SL014	Road 9	▪ Reconstruct segment from 0 to 50 and raise outfall invert to El. 12. ▪ Increase channel capacity of Tripa de Gallina.

SL015	Road 16/Pedro Gil	▪ Redesign and reconstruct segment from 0 to 328. ▪ Rectify longitudinal slope. ▪ *Drain size must progressively become larger as the lower end is approached.* ▪ Increase channel capacity of Tripa de Gallina.

The study team also recommends the following areas for **pilot projects** as requested for joint implementation by DPWH, MMDA and LGUs:

- Sta. Mesa Heights in Quezon City, involving NL039 (A. Bonifacio), NL041 (Amoranto-Mayon-Calamba), NL043 (Piy Margal, Mayon-M. Cuenco) and DM01 (Blumentritt Interceptor)
- Sta. Cruz, Manila, involving Tayuman Main (DM29), NL018 (S. Hererra), NL019 (Tayabas), NL025 (Oroquieta)
- Metropolitan Subdivision in Makati City, involving SL001 (Primo de Vera), SL002 (Vito Cruz Extension) and DM23 (Zobel-Roxas)
- Manila City Hall, involving SL056 (Aroceros) and SL057 (Concepcion)

7.3 Strengthening of Inter-agency Coordination

A requisite for the effective operation, maintenance, rehabilitation and improvement of drainage facilities is the close coordination between and among the DPWH, the MMDA and the concerned LGUs within Metro Manila. It is suggested that a Technical Working Committee (TWC) composed of representatives of DPWH, MMDA and the different LGUs be created. With a view towards ensuring the effective utilization of the outputs of the present study and improving the management of drainage laterals, the TWC will be responsible for the following:

- Firming up of post-project (study) implementation arrangements particularly in regard to the operation and maintenance of the database system for drainage laterals;

- Coordinating the implementation of pilot projects recommended under this study. These projects are aimed at providing immediate structural and non-structural solutions to the recurrent flood problems;

- Design and implementation of a capacity-building program for concerned staff of member-agencies on drainage system planning, design, construction, operation and maintenance;

- Evaluation of the current practice of planning drainage systems, to include updating of drainage design criteria in coordination with the Bureau of Design of the DPWH; and

- Exploring the possibility of replicating the study, particularly the development of database system for drainage laterals in other critical areas of Metro Manila and in other key urban centers of the country such as Metro Cebu, Metro Davao, Metro Surigao, Butuan City, Naga City, and other urban centers.

7.4 Management of Database System

The potential benefits from the database system for drainage laterals that was developed as part of the study can only be realized through proper system management. To answer this need, an appropriate agency within the TWC should be designated to operate and maintain the database system. This agency should be able to provide a full-time staff and allocate an adequate budget for database system operation and maintenance. Specifically, the designated agency will be involved in:

- Coordination with the other agencies within the TWC regarding the use and updating of database information;
- Conduct of capacity-building and skills transfer activities for concerned personnel of member-agencies of the TWC for them to be able to establish and manage on their own a database system for drainage laterals;
- Preparation of post-project monitoring reports on the utilization status of the database system, to include the status of equipment and materials acquired through the study for submission to JICA.

7.5 Follow-up Study on the Flooding Problem in Metro Manila

The present study was able to identify and analyze specific causes of flood problems in Metro Manila based on the results of the survey of existing conditions of drainage facilities and the inundation survey, and aided by the drainage database system that was developed through the study. It is necessary, however, to do a follow-up study that is focused on existing government policies on flood control and anchored on addressing policy and institutional aspects of the problem of flooding in the metropolis. This proposed follow-up study should, among others, examine existing policies including the allocation of financial resources, review the present roles and functions of various government organizations involved in flood control, and recommend appropriate policy measures and institutional arrangements to mitigate the problem of flooding. The results of the said study would then serve as basis for initiating future executive and legislative actions for providing long-term solution to the recurring and worsening floods in Metro Manila.

Tables

TABLE 2.1 BENCHMARK ELEVATION

No.	BM	MSL (m)	DPWH DATUM (m)
1	BM66	1.832	12.310
2	GM1A	3.799	14.277
3	BM4B	3.015	13.493
4	CGS54	1.916	12.394
5	GMP2a	2.899	13.377
6	CIMA18a	1.980	12.458
7	DLM 17	2.623	13.101
8	DLM 21	2.397	12.875
9	GM6A	2.954	13.432
10	GM8A	2.837	13.315
11	GM9Ab	3.552	14.030
12	GM53a	2.519	12.997
13	GM7H	2.789	13.267
14	DLM 20	4.809	15.287
15	BMQU2	1.802	12.280
16	BMST3	1.968	12.466
17	BMSC2	2.389	12.867
18	BMR 1-3	16.995	27.473
19	GM12F	2.748	13.226
20	DLM 22	8.805	19.283
21	DLM 23	6.514	16.990
22	DLM 19	5.304	15.782
23	DLM 18	8.791	19.269
24	BM6Ba	2.381	12.859
25	GM6E	2.562	13.040
26	DLM 24	3.264	13.742
27	DLM 10	3.466	13.944
28	DLM 9	2.876	13.354
29	DLM 8	5.132	15.610
30	DLM 7	15.337	25.815
31	DLM 6	12.217	22.695
32	DLM 5	3.053	13.531
33	DLM 4	2.931	13.409
34	DLM 3	2.771	13.249
35	DLM 2	3.498	13.976
36	DLM 1	2.745	13.223
37	GM9M	3.532	14.010
38	DLM 16	2.407	12.885
39	DLM 15	3.878	14.356
40	DLM 14	4.347	14.825
41	DLM 13	6.831	17.309
42	DLM 12	17.874	28.352
43	DLM 11	14.993	25.471

NOTE: DLMs are new benchmark established by the Study Team; while others are those under NAMRIA.
BMs elevation is measured from BM66 (1979 NAMRIA data)

Table 3.1 Data File Structure of Manhole Table

Database Table Name : MH_DATA

Field Name	*Description*	*Type*	*Size*	*Remarks*
Mh_code	Manhole code no.	Text	12	Map prefix with + (3) digit number. Code shall not be duplicated
HouseLot	Nearest house lot no.	Text	50	Alpha-numeric
Street	Street	Text	100	Alpha-numeric
Barangay	Barangay code	Text	100	Alpha-numeric
City	City	Text	50	Alpha-numeric
ManDia	Manhole diameter	Single Precision	4	Numeric entry. Units in mm
ManLen	Manhole length	Single Precision	4	Numeric entry. Units in mm
ManWid	Manhole width	Single Precision	4	Numeric entry. Units in mm
ManThick	Manhole thickness	Single Precision	4	Numeric entry. Units in mm
ManDep	Manhole depth	Single Precision	4	Numeric entry. Units in mm
ManCovPcs	Number of manhole cover	Integer	2	Numeric entry. Unitless
ManCovDia	Diameter of manhole cover	Single Precision	4	Numeric entry. Units in mm
ManCovLen	Length of manhole cover	Single Precision	4	Numeric entry. Units in mm
ManCovWid	Width of manhole cover	Single Precision	4	Numeric entry. Units in mm
ManCovThick	Thickness of manhole cover	Single Precision	4	Numeric entry. Units in mm
ManCrack	With manhole crack?	Text	1	Y for Yes, N for No
WaSurface	Distance of water surface from top of manhole cover	Single Precision	4	Numeric entry. Units in mm
WaCon	Water condition	Text	1	N for Normal, S for Stagnant water
DepSurf	Distance of deposition surface from top of manhole cover	Single Precision	4	Numeric entry. Units in mm
DepMat	Deposited materials	Text	20	Alpha-numeric
Obs	With obstacles?	Text	20	Alpha-numeric
CurbInl	With curb inlet?	Text	1	Y for Yes, N for No
CurbInlWid	Curb inlet width	Single Precision	4	Numeric entry. Units in mm
CurbInlHei	Curb inlet height	Single Precision	4	Numeric entry. Units in mm
DBCode	Drainage block code	Text	10	Alpha-numeric
ManTopElev	Manhole top elevation	Double Precision	8	Numeric entry. Units in m
BMCode	Bench mark code used	Text	20	Alpha-numeric
DrEngr	Drainage engineer	Text	50	Name of Engineer
Checker	Checker of datasheet	Text	50	Name of Engineer/Checker
DateTimeInves	Date and time of investigation	Date/Time	8	Date (e.g. 20-Aug-2000)
DateInput	Date of input	Date/Time	8	Date. Defult can be set to current date of computer
Operator	Computer encoder/operator	Text	50	Name of encoder/operator
Remarks	Remarks	Text	50	Alpha-numeric
MapPrefix	Prefix of map code	Text	12	Last 6 characters of Map Code (e.g. Map prefix of 3130-II-15-C4 is "II15C4")
x	x coordinate (casting)	Double Precision	8	Not necessary. Coordinates can be obtained from AutoCAD
y	y coordinate (northing)	Double Precision	8	Not necessary. Coordinates can be obtained from AutoCAD

Table 3.2 Data File Structure of Inlet Drainage Channel Table

Database Table Name : INLET

Field Name	*Description*	*Type*	*Size*	*Remarks*
Mh_code	Manhole code number	Text	12	Automatically encoded when Data Entry Form was used
In_ch	Inlet channel code	Text	10	Automatically encoded when Menu (4) was processed
In_mh	Upstream manhole code	Text	12	Map prefix with + (3) digit number
In_status	Condition of channel	Text	1	N if normal, C if Clogged
In_mat	Composition/made of channel	Text	10	C for concrete, S for steel, P for Pvc, M for masonry, R for riprap
In_shp	Shape of channel	Text	5	R for rectangle, C for circular, T for trapezoidal
In_dia_wid	Diameter if Circular or top width if Rectangular or Trapezoidal	Single Precision	4	Numeric entry. Units in mm
In_dep	Channel depth for Rectangular and Trapezoidal only	Single Precision	4	Numeric entry. Units in mm
In_bot_wid	Bottom width. Applicable only in Trapezoidal	Single Precision	4	Numeric entry. Units in mm
In_cell	Number of cells	Integer	2	Numeric entry. Unitless
In_bot	Distance of invert from top of manhole cover	Single Precision	4	Numeric entry. Units in mm
In_ovb	Distance of top of channel from top of manhole cover	Single Precision	4	Numeric entry. Units in mm
In_ch_len	Distance from upstream manhole specified in 'In_mh' field	Single Precision	4	Numeric entry. Units in m

Table 3.3 Data File Structure of Outlet Drainage Channel Table

Database Table Name : OUTLET

Field Name	*Description*	*Type*	*Size*	*Remarks*
Mh_code	Manhole code number	Text	12	Automatically encoded when Data Entry Form was used
Out_ch	Outlet channel code	Text	10	Automatically encoded when Menu (4) was processed
Out_mh	Downstream manhole code	Text	12	Map prefix with + (3) digit number
Out_status	Condition of channel	Text	1	N if normal, C if Clogged
Out_mat	Composition/made of channel	Text	10	C for concrete, S for steel, P for Pvc, M for masonry, R for riprap
Out_shp	Shape of channel	Text	5	R for rectangle, C for circular, T for trapezoidal
Out_dia_wid	Diameter if Circular or top width if Rectangular or Trapezoidal	Single Precision	4	Numeric entry. Units in mm
Out_dep	Channel depth for Rectangular and Trapezoidal only	Single Precision	4	Numeric entry. Units in mm
Out_bot_wid	Bottom width. Applicable only in Trapezoidal	Single Precision	4	Numeric entry. Units in mm
Out_cell	Number of cells	Integer	2	Numeric entry. Unitless
Out_bot	Distance of invert from top of manhole cover	Single Precision	4	Numeric entry. Units in mm
Out_ovb	Distance of top of channel from top of manhole cover	Single Precision	4	Numeric entry. Units in mm
Out_ch_len	Distance from downstream manhole specified in 'Out_mh' field	Single Precision	4	Numeric entry. Units in m

Table 3.4 Data File Structure of Manhole Sequence Table

Database Table Name : CHANNEL

Field Name	*Description*	*Type*	*Size*	*Remarks*
ID	Autonumber	Long Integer	4	Automatically encoded when Menu (4) was processed
Mh_code	Manhole code number	Text	10	Automatically encoded when Menu (4) was processed
Ch_code	Channel code	Text	10	Automatically encoded when Menu (4) was processed
Inlet_MH_code	Upstream manhole code	Text	10	Automatically encoded when Menu (4) was processed
Outlet_MH_code	Downstream manhole code	Text	10	Automatically encoded when Menu (4) was processed

Table 3.5 Data File Structure of Drainage Channel Names Table

Database Table Name : NAMES

Field Name	*Description*	*Type*	*Size*	*Remarks*
Drain_code	Channel Code	Text	10	Automatically encoded when Menu (4) was processed
Drain_name	Channel Name	Text	100	Automatically encoded when Menu (4) was processed

Table 3.6 Contents of Drainage Channel Names Table

Database Table Name : NAMES

DRAIN_CODE	*DRAIN_NAME*
DM 29	TAYUMAN
DM28	SOUTH ANTIPOLO
DM15-A	BUENDIA OUTFALL, PASAY CITY
DM08	ECONOMIA MAIN
DM17-A	EDSA OUTFALL, PASAY CITY
DM24	EDSA -LUMBANG
DM20	ESTRADA
DM22-A	FARADAY (RIGHT SIDE)
DM05	FUGOSO
DM07	JOSEPHINA - LEPANTO
DM32	G. PERFECTO
DM04	LAKANDULA
DM31	KABULUSAN OUTFALL
DM16	LIBERTAD OUTFALL
DM18	MAKATI HEAD RACE - I
DM19	MAKATI HEAD RACE - II
DM06	NICANOR SEVERINO REYES

Table 3.7 Contents of Manhole Sequence Table

Database Table Name : CHANNEL

ID	*MH_CODE*	*CH_CODE*	*INLET_MH_CODE*	*OUTLET_MH_CODE*
1	II15B4258	DM05	II15B4099	END
2	II15B4099	DM05	II15B4100	II15B4258
3	II15B4100	DM05	II15B4172	II15B4099
4	II15B4172	DM05	II15B4175	II15B4100
5	II15B4175	DM05	II15B4178	II15B4172
6	II15B4178	DM05	II15B4179	II15B4175
7	II15B4179	DM05	START	II15B4178
8	II15C4157	DM06	II15C4029	END
9	II15C4029	DM06	II15C4030	II15C4157
10	II15C4030	DM06	II15C4026	II15C4029
11	II15C4026	DM06	II15C4027	II15C4030
12	II15C4027	DM06	II15C4021	II15C4026
13	II15C4021	DM06	II15C4019	II15C4027
14	II15C4019	DM06	II15C4018	II15C4021
15	II15C4018	DM06	START	II15C4019
16	II15B3204	DM29	II15B3090	END

Table 3.8 SAMPLE OF ERROR MANHOLE SEQUENCE TABLE

DM02 (SOLIS - TECSON)

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15B2016	IN	2	2.20	2.20	1.50	101.39		11.55	10.54	10.54	8.85	9.04	(0.19)
II15B2015	OUT	2	2.00	2.00	1.46		101.39	11.63	10.24	10.24	9.58	8.78	0.80
	IN	2	2.00	2.00	1.46	46.06	101.39	11.63	10.24	10.24	9.58	8.78	0.80
II15B2014	OUT												
	IN												
II15B2013	OUT	2	2.00	2.00	1.45			11.86	10.81	10.71	9.85	9.36	0.49
	IN	2	2.00	2.00	1.45	213.4		11.86	10.81	10.71	9.85	9.36	0.49
II15B2012	OUT	2	2.00	2.00	1.48		213.40	12.10	11.07	10.92	9.95	9.59	0.36
	IN	2	2.00	2.00	1.48	21.23	213.40	12.10	11.07	10.92	9.95	9.59	0.36
II15B2011	OUT	2	1.96	1.96	1.53		234.63	12.28	11.17	11.10	10.38	9.64	0.74
	IN	2	1.96	1.96	1.53	187.58	234.63	12.28	11.17	11.10	10.38	9.64	0.74
II15B2010	OUT	2	2.00	2.00	1.48		422.21	11.93	11.31	10.99	10.13	9.83	0.30
	IN	2	2.00	2.00	1.49	78.64	422.21	11.93	11.32	10.99	10.13	9.83	0.30
II15B2009	OUT	2	1.50	1.50	1.27		500.85	12.14	11.24	10.71	10.29	9.97	0.32
	IN	2	1.50	1.50	1.27	110.72	500.85	12.14	11.24	10.71	10.29	9.97	0.32
II15B2008	OUT	2	1.50	1.50	1.47		611.57	12.16	11.57	10.86	10.63	10.10	0.53
	IN	2	1.50	1.50	1.46	85.89	611.57	12.16	11.56	10.86	10.63	10.10	0.53
II15B2007	OUT												
	IN												
II15B2006	OUT	1	2.00	2.00	1.23			12.19	11.59	10.97	10.93	10.36	0.57
	IN	1	2.00	2.00	1.23	52.64		12.19	11.59	10.97	10.93	10.36	0.57
II15B2005	OUT	1	2.00	2.00	1.25		52.64	12.21	11.61	11.10	11.03	10.36	0.67
	IN	1	2.00	2.00	1.22	44.37	52.64	12.21	11.58	11.10	11.03	10.36	0.67
II15B2004	OUT	1	2.00	2.00	1.39		97.01	12.14	11.58	10.99	11.03	10.19	0.84
	IN	1	2.00	2.00	1.48	59.77	97.01	12.14	11.67	10.99	11.03	10.19	0.84
II15B2003	OUT	1	2.00	2.00	1.00		156.78	12.22	11.47	11.09	11.11	10.47	0.64
	IN	1	2.00	2.00	1.15	164.86	156.78	12.22	11.62	11.09	11.11	10.47	0.64
II15B2002	OUT	1			1.02		321.64	12.85	11.85	11.29	11.23	10.83	0.40
	IN	1			1.02	66.01	321.64	12.85	11.85	11.29	11.23	10.83	0.40
II15B2001	OUT	1			1.02		387.65	12.85	12.02	11.48	11.47	11.00	0.47

Table 3.9 Data File Structure of Flood Condition Table

Field Name	*Description*	*Type*	*Size*	*Remarks*
Drainage Block	Drainage Block	Text	50	Alpha-numeric
CodeNo	Location of interview	Text	10	Alpha-numeric
Street	Location of interview	Text	50	Alpha-numeric
Area	Location of interview	Text	50	Alpha-numeric
City	Location of interview	Text	50	Alpha-numeric
Duration	Duration of flooding	Double Precision	4	Numeric entry. Units in hours
MaxDepth	Maximum depth	Double Precision	4	Numeric entry. Units in meter
Overbanking	Name of river	Text	50	Alpha-numeric
PoorDrainageSystem	Problems in drainage system	Text	50	Alpha-numeric
OtherCause		Text	50	
FloodFrequency	Frequency (Time/Year)	Long Integer	4	Numeric entry. Units in number of times per year
AveDepth	Average depth	Double Precision	4	Numeric entry. Units in meter
OtherInformation		Text	50	Alpha-numeric
DateEncoded		Tme/Date	8	Date (e.g. 10-Aug-2000)

LIST OF DRAINAGE CHANNEL PROFILE
DRAINAGE MAINS

NO.	DRAINAGE MAINS	
	Code	Name
1	DM01-A	BLUMENTRITT INTERCEPTOR-LEFT
2	DM01-B	BLUMENTRITT INTERCEPTOR-RIGHT
3	DM02	SOLIS - TECSON
4	DM04	LAKANDULA
5	DM05	FUGOSO
6	DM06	N. REYES - SEVERINO
7	DM07	JOSEFINA - LEPANTO
8	DM08	ECONOMIA
9	DM09	MARGAL
10	DM10	VISAYAS
11	DM11	PADRE FAURA
12	DM12	REMEDIOS
13	DM13	ONYX
14	DM14	VITO CRUZ
15	DM15-A	BUENDIA OUTFALL-RIGHT
16	DM15-B	BUENDIA OUTFALL-LEFT
17	DM16	LIBERTAD OUTFALL
18	DM17-A	EDSA OUTFALL-LEFT
19	DM17-B	EDSA OUTFALL-RIGHT
20	DM18	MAKATI HEAD RACE-I
21	DM19	MAKATI HEAD RACE-II
22	DM20	ESTRADA
23	DM21	ZOBEL ORBIT
24	DM22-A	FARADAY - RIGHT
25	DM22-B	FARADAY - LEFT
26	DM23	ZOBEL ROXAS
27	DM24	EDSA LUMBANG
28	DM25	ZARAGOSA SUBMAIN
29	DM26	PAMPANGA-EARNSHAW
30	DM27	BUENDIA
31	DM28	SOUTH ANTIPOLO
32	DM29	TAYUMAN
33	DM30	LEPANTO - GOV. FORBES
34	DM32	G. PERFECTO
35	DM33	PASONG TAMO

Table 4.1 DRAINAGE CHANNEL PROFILE (1 OF 35)
DRAINAGE MAINS

DM01-A BLUMENTRITT INTERCEPTOR - LEFT

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	DEPOSITION DEPTH
III5B2235	IN	1	2.62	2.62	2.58	111.51		12.59	10.52	10.52	8.35	7.94	0.41
III5B2300	OUT	1	2.10	2.10	2.58		111.51	12.88	10.56	10.56	8.30	7.98	0.32
	IN	1	2.10	2.10	2.58	213.62	111.51	12.88	10.56	10.56	8.30	7.98	0.32
III5B2299	OUT	1	1.80	1.80	2.28		325.13	13.35	10.33	10.33	8.23	8.05	0.18
	IN	1	1.80	1.80	2.28	177.67	325.13	13.35	10.33	10.33	8.23	8.05	0.18
III5B2215	OUT	1	1.35	1.35	2.00		502.80	13.38	10.88	10.88	10.88	8.88	2.00
	IN	1	1.35	1.35	2.00	204.06	502.80	13.38	10.88	10.88	10.88	8.88	2.00
III5B2298	OUT	1	1.70	1.70	2.63		706.86	13.40	10.88	10.88	8.53	8.25	0.28
	IN	1	1.70	1.70	2.63	157.26	706.86	13.40	10.88	10.88	8.53	8.25	0.28
III5B2297	OUT	1	1.72	1.72	2.12		864.12	13.14	10.89	10.89	9.14	8.77	0.37
	IN	1	1.72	1.72	2.12	107.47	861.12	13.14	10.89	10.89	9.14	8.77	0.37
III5B2216	OUT	1	1.20	1.20	2.40		971.59	12.83	10.48	10.48	10.43	8.08	2.35
	IN	1	1.20	1.20	2.40	155.24	971.59	12.83	10.48	10.48	10.43	8.08	2.35
III5C2002	OUT	1	2.03	2.03	2.00		1126.83	12.70	10.19	10.19	9.43	8.19	1.24
	IN	1	2.03	2.03	2.00	159.61	1126.83	12.70	10.19	10.19	9.43	8.19	1.24
III5C2007	OUT	1	2.00	2.00	2.50		1286.44	12.93	11.06	11.06	10.08	8.56	1.52
	IN	1	2.00	2.00	2.50	107.65	1286.44	12.93	11.06	11.06	10.08	8.56	1.52
III5C2009	OUT	1	1.65	1.65	2.50		1394.29	13.16	11.11	11.11	9.04	8.61	0.43
	IN	1	1.65	1.65	2.54	715.55	1394.29	13.16	11.15	11.15	9.04	8.61	0.43
III5C3371	OUT	1	2.15	2.15	2.03		2109.84	13.21	11.45	11.45	10.23	9.42	0.81
	IN	1	2.15	2.15	2.08	171.45	2109.84	13.21	11.50	11.50	10.23	9.42	0.81
III5C3372	OUT	1	2.15	2.15	1.71		2281.29	13.42	11.73	11.73	11.73	10.02	1.71
	IN	1	2.15	2.15	1.77	65.39	2281.29	13.42	11.79	11.79	11.73	10.02	1.71
III5C3373	OUT	1	1.70	1.70	2.40		2316.68	13.27	12.17	12.17	11.85	9.77	2.08
	IN	1	1.70	1.70	2.40	96.33	2315.68	13.27	12.17	12.17	11.85	9.77	2.08
III5C3374	OUT	1	1.80	1.80	2.16		2443.01	13.66	12.20	12.20	12.04	10.04	2.00
	IN	1	1.80	1.80	2.16	164.76	2443.01	13.66	12.20	12.20	12.04	10.04	2.00
III5C3375	OUT	1	1.40	1.40	2.25		2607.77	14.86	12.39	12.10	11.71	10.14	1.57
	IN	1	1.40	1.40	2.25	65.16	2607.77	14.86	12.39	12.10	11.71	10.14	1.57
III5C3376	OUT	1	1.75	1.75	1.57		2672.93	15.11	11.93	11.93	11.93	10.36	1.57

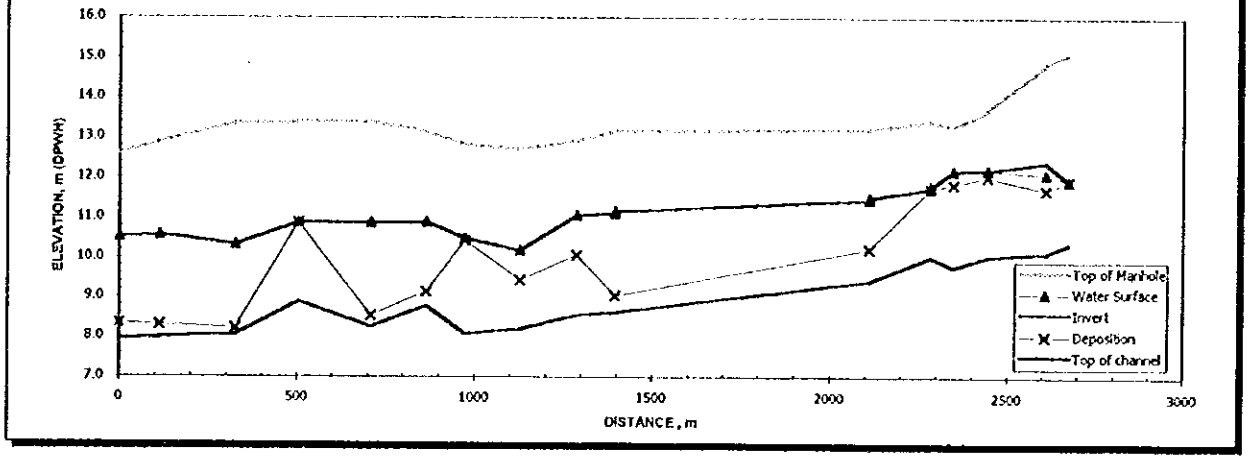


Table 4.1 DRAINAGE CHANNEL PROFILE (2 OF 35)
DRAINAGE MAINS

DM01-B BLUMENTRITT INTERCEPTOR - RIGHT

MANHOLE CODE NO.	DIRECTION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	DEPOSITION DEPTH
III582315	IN	1	2.62	2.62	2.58	111.51		17.59	10.52	10.52	8.35	7.94	0.41
III582316	OUT	1	2.10	2.10	2.58		111.51	12.88	10.56	10.56	8.30	7.98	0.32
	IN	1	2.10	2.10	2.58	213.62	111.51	12.88	10.56	10.56	8.30	7.98	0.32
III582317	OUT	1	1.80	1.80	2.28		325.13	13.35	10.33	10.33	8.23	8.05	0.18
	IN	1	1.80	1.80	2.28	177.67	325.13	13.35	10.33	10.33	8.23	8.05	0.18
III582318	OUT	1	2.80	2.80	2.00		502.80	13.38	10.88	10.88	10.88	8.88	2.00
	IN	1	2.80	2.80	2.00	201.06	502.80	13.38	10.88	10.88	10.88	8.88	2.00
III582319	OUT	1	1.70	1.70	2.63		706.86	13.40	10.88	10.88	8.53	8.25	0.28
	IN	1	1.70	1.70	2.63	157.26	706.86	13.40	10.88	10.88	8.53	8.25	0.28
III582320	OUT	1	2.50	2.50	2.12		864.12	13.14	10.89	10.89	9.14	8.77	0.37
	IN	1	2.50	2.50	2.12	107.47	864.12	13.14	10.89	10.89	9.14	8.77	0.37
III582321	OUT	1	3.00	3.00	2.40		971.59	12.83	10.48	10.48	10.43	8.08	2.35
	IN	1	3.00	3.00	2.40	155.24	971.59	12.83	10.48	10.48	10.43	8.08	2.35
III5C2223	OUT	1	2.03	2.03	2.00		1126.83	12.70	10.19	10.19	9.43	8.19	1.24
	IN	1	2.03	2.03	2.00	159.61	1126.83	12.70	10.19	10.19	9.43	8.19	1.24
III5C2224	OUT	1	2.00	2.00	2.50		1286.44	12.93	11.06	11.06	10.08	8.56	1.52
	IN	1	2.00	2.00	2.50	107.85	1286.44	12.93	11.06	11.06	10.08	8.56	1.52
III5C2225	OUT	1	1.85	1.85	2.50		1391.29	13.16	11.11	11.11	9.04	8.61	0.43
	IN	1	1.85	1.85	2.54	715.55	1391.29	13.16	11.15	11.15	9.04	8.61	0.43
III5C3486	OUT	1	2.15	2.15	2.03		2109.84	13.21	11.45	11.45	10.23	9.42	0.81
	IN	1	2.15	2.15	2.08	171.45	2109.84	13.21	11.50	11.50	10.23	9.42	0.81
III5C3487	OUT	1	2.15	2.15	1.71		2281.29	13.42	11.73	11.73	11.73	10.02	1.71
	IN	1	2.15	2.15	1.77	65.39	2281.29	13.42	11.79	11.79	11.73	10.02	1.71
III5C3488	OUT	1	1.70	1.70	2.40		2346.68	13.27	12.17	12.17	11.85	9.77	2.08
	IN	1	1.70	1.70	2.40	96.33	2346.68	13.27	12.17	12.17	11.85	9.77	2.08
III5C3489	OUT	1	1.80	1.80	2.16		2443.01	13.66	12.20	12.20	12.04	10.04	2.00
	IN	1	1.80	1.80	2.16	164.76	2443.01	13.66	12.20	12.20	12.04	10.04	2.00
III5C3490	OUT	1	1.40	1.40	2.25		2607.77	14.86	12.39	12.10	11.71	10.14	1.57
	IN	1	1.40	1.40	2.25	65.16	2607.77	14.86	12.39	12.10	11.71	10.14	1.57
III5C3491	OUT	1	1.75	1.75	1.57		2672.93	15.11	11.93	11.93	11.93	10.36	1.57

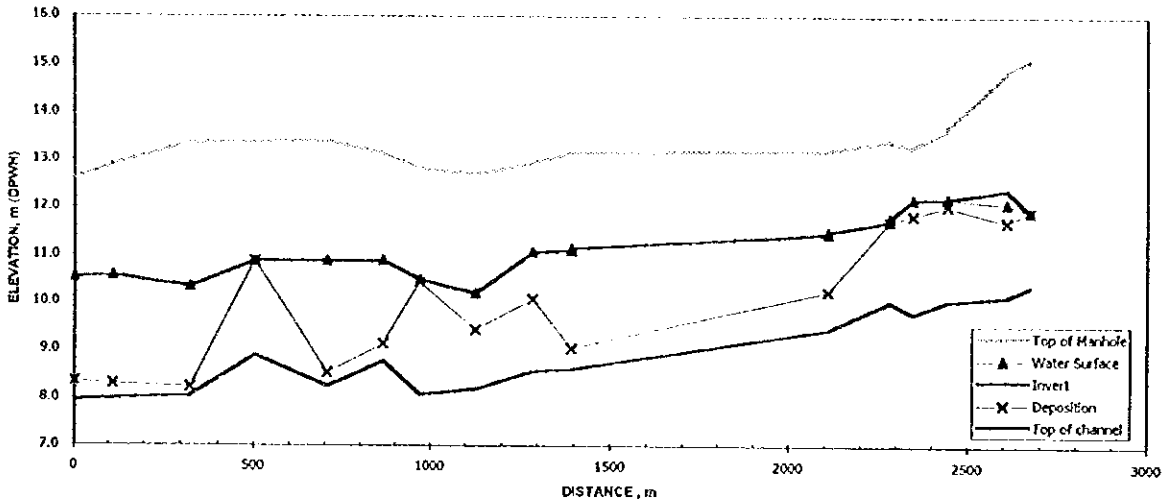


Table 4.1 DRAINAGE CHANNEL PROFILE (3 OF 35)
DRAINAGE MAINS

DM02 SOLIS - TECSON

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	DEPOSITION DEPTH
III582016	IN	2	2.20	2.20	1.50	101.39		11.55	10.54	10.54	9.04	9.04	
III582015	OUT	2	2.00	2.00	1.46		101.39	11.63	10.24	10.24	9.58	8.78	0.80
	IN	2	2.00	2.00	1.46	45.06	101.39	11.63	10.24	10.24	9.58	8.78	0.80
III582014	OUT	2	2.00	2.00	1.14		147.45	11.83	10.27	10.27	9.77	9.13	0.64
	IN	2	2.00	2.00	1.09	92.29	147.45	11.83	10.22	10.22	9.77	9.13	0.64
III582013	OUT	2	2.00	2.00	1.45		239.74	11.86	10.81	10.71	9.85	9.36	0.49
	IN	2	2.00	2.00	1.45	213.40	239.74	11.86	10.81	10.71	9.85	9.36	0.49
III582012	OUT	2	2.00	2.00	1.48		453.14	12.10	11.07	10.92	9.95	9.59	0.36
	IN	2	2.00	2.00	1.48	21.23	453.14	12.10	11.07	10.92	9.95	9.59	0.36
III582011	OUT	2	1.96	1.96	1.53		474.37	12.28	11.17	11.10	10.38	9.64	0.74
	IN	2	1.96	1.96	1.53	187.58	474.37	12.28	11.17	11.10	10.38	9.64	0.74
III582010	OUT	2	2.00	2.00	1.48		661.95	11.93	11.31	10.99	10.13	9.83	0.30
	IN	2	2.00	2.00	1.49	78.61	661.95	11.93	11.32	10.99	10.13	9.83	0.30
III582009	OUT	2	1.50	1.50	1.27		749.59	12.14	11.24	10.71	10.29	9.97	0.32
	IN	2	1.50	1.50	1.27	110.72	749.59	12.14	11.24	10.71	10.29	9.97	0.32
III582008	OUT	2	1.50	1.50	1.47		851.31	12.16	11.57	10.86	10.63	10.10	0.53
	IN	2	1.50	1.50	1.46	85.89	851.31	12.16	11.56	10.86	10.63	10.10	0.53
III582007	OUT	2	1.50	1.50	1.37		937.20	12.17	11.52	10.93	10.72	10.15	0.57
	IN	1	1.97	1.97	1.28	30.38	937.20	12.17	11.57	10.93	10.72	10.29	0.43
III582006	OUT	1	2.00	2.00	1.23		967.58	12.19	11.59	10.97	10.93	10.36	0.57
	IN	1	2.00	2.00	1.23	52.64	967.58	12.19	11.59	10.97	10.93	10.36	0.57
III582005	OUT	1	2.00	2.00	1.25		1020.22	12.21	11.61	11.10	11.03	10.36	0.67
	IN	1	2.00	2.00	1.22	44.37	1020.22	12.21	11.58	11.10	11.03	10.36	0.67
III582004	OUT	1	2.00	2.00	1.33		1064.59	12.14	11.58	10.99	11.03	10.19	0.84
	IN	1	2.00	2.00	1.48	59.77	1064.59	12.14	11.67	10.99	11.03	10.19	0.84
III582003	OUT	1	2.00	2.00	1.00		1124.36	12.22	11.47	11.09	11.11	10.47	0.64
	IN	1	2.00	2.00	1.15	164.86	1124.36	12.22	11.62	11.09	11.11	10.47	0.64
III582002	OUT	1			1.02		1289.22	12.85	11.85	11.29	11.23	10.83	0.40
	IN	1			1.02	66.01	1289.22	12.85	11.85	11.29	11.23	10.83	0.40
III582001	OUT	1			1.02		1355.23	12.65	12.02	11.48	11.47	11.00	0.47

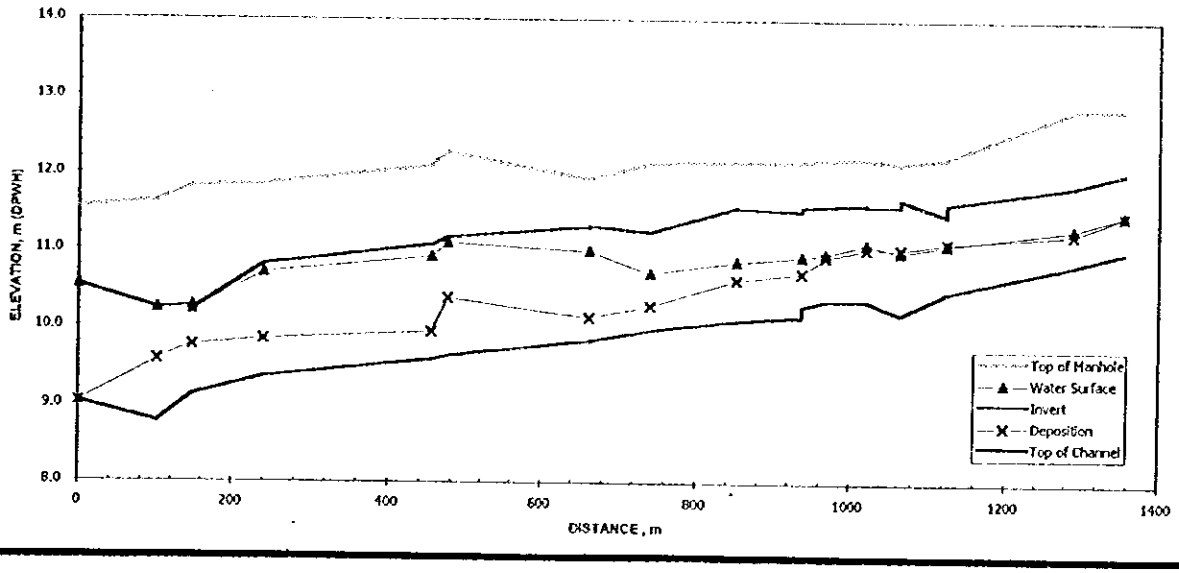


Table 4.1 DRAINAGE CHANNEL PROFILE (4 OF 35)
DRAINAGE MAINS

DM04 LAKANDULA

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15A4099	IN	1	3.84	3.84	2.62	214.40		12.52	11.50	10.77	10.52	8.88	1.64
II15A4028	OUT	1	4.20	4.20	2.01		214.40	13.19	11.24	11.24	11.09	9.23	1.86
	IN	1	4.20	4.20	2.01	462.92	214.40	13.19	11.29	11.29	11.09	9.28	1.81
II15A4045	OUT	1			1.07		677.32	12.72	10.95	10.95	10.52	9.88	0.64
	IN	1			1.07	131.30	677.32	12.72	11.41	11.41	10.52	10.34	0.18
II15A4044	OUT	1			1.07		808.62	12.61	11.40	11.30	10.51	10.33	0.18

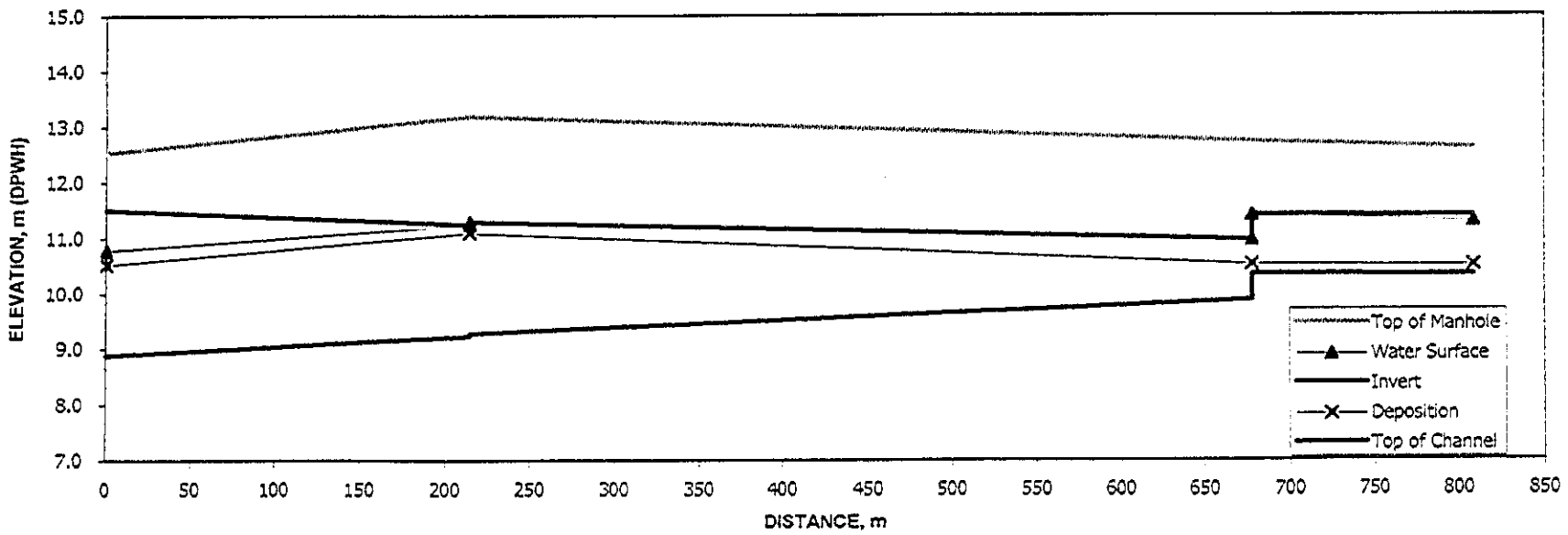


Table 4.1 DRAINAGE CHANNEL PROFILE (5 OF 35)
DRAINAGE MAINS

DM05 FUGOSO

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15B4258	IN	2	2.20	2.20	2.87	33.50		12.13	11.13	11.13	8.92	8.26	0.66
II15B4099	OUT	2	2.20	2.20	2.87		33.50	11.94	11.41	11.15	9.19	8.54	0.65
	IN	2	2.20	2.20	2.87	86.46	33.50	11.94	11.41	11.15	9.19	8.54	0.65
II15B4100	OUT	2	2.20	2.20	2.33		119.96	12.15	10.98	10.98	9.31	8.65	0.66
	IN	2	2.20	2.20	2.38	156.91	119.96	12.15	11.03	11.03	9.31	8.65	0.66
II15B4172	OUT	2	2.20	2.20	1.84		276.87	12.38	10.53	10.53	9.34	8.69	0.65
	IN	2	2.20	2.20	1.84	94.82	276.87	12.38	10.80	10.80	9.34	8.96	0.38
II15B4175	OUT	2	2.00	2.00	1.63		371.69	12.32	11.20	11.00	10.35	9.57	0.78
	IN	2	2.00	2.00	1.58	103.68	371.69	12.32	11.12	11.00	10.35	9.54	0.81
II15B4178	OUT	1	3.00	3.00	1.50		475.37	12.49	10.94	10.94	10.02	9.44	0.58
	IN	1	3.00	3.00	1.50	76.28	475.37	12.49	10.97	10.97	10.02	9.47	0.55
II15B4179	OUT	1	2.80	2.80	1.50		551.65	12.25	10.99	10.99	9.84	9.49	0.35

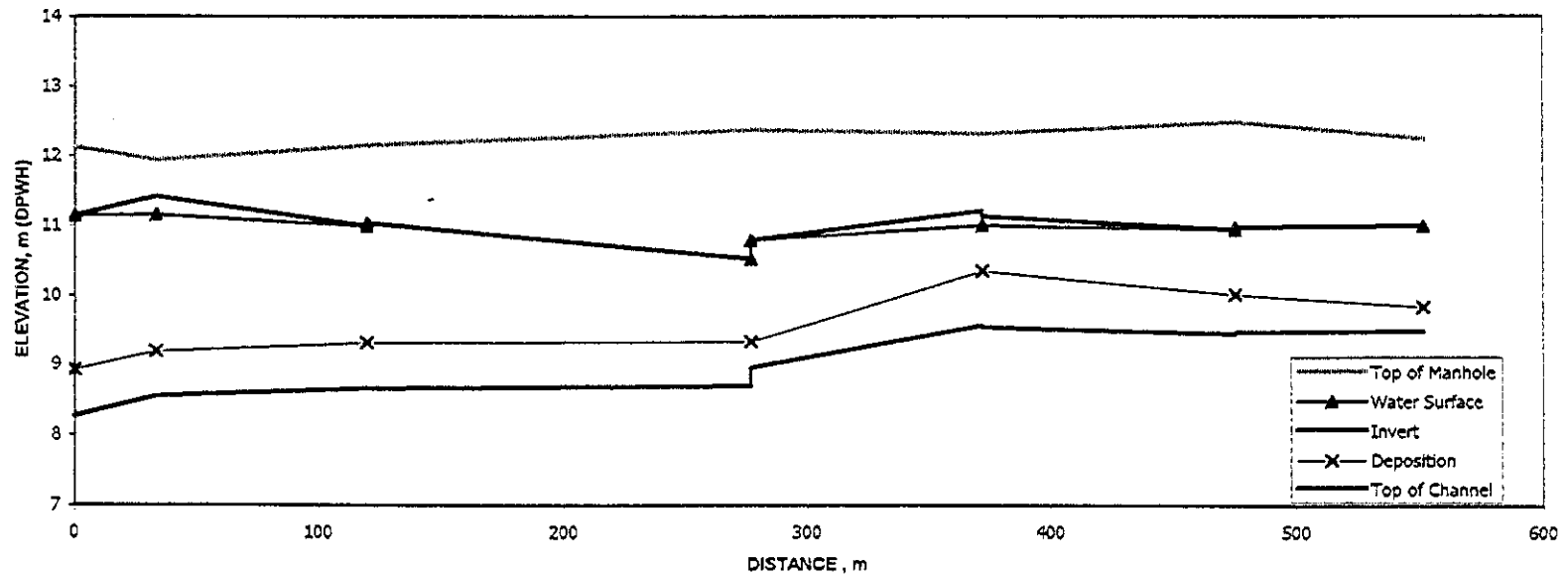


Table 4.1 DRAINAGE CHANNEL PROFILE (6 OF 35)
DRAINAGE MAINS

DM06 N. REYES - SEVERINO

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15C4157	IN	1	3.10	3.10	1.60	23.27		12.05	10.45	10.45	9.17	8.85	0.32
II15C4029	OUT	1	3.20	3.20	1.60		23.27	12.18	10.88	10.88	9.30	9.28	0.02
	IN	1	3.20	3.20	1.60	33.02	23.27	12.18	10.88	10.88	9.30	9.28	0.02
II15C4030	OUT	1	3.20	3.20	1.60		56.29	12.28	10.88	10.85	9.28	9.28	
	IN	1	3.20	3.20	1.60	149.25	56.29	12.28	10.88	10.85	9.28	9.28	
II15C4026	OUT	1	3.20	3.20	1.60		205.54	12.45	10.85	10.72	9.48	9.25	0.23
	IN	1	3.20	3.20	1.60	116.77	205.54	12.45	10.85	10.72	9.48	9.25	0.23
II15C4027	OUT	1	3.20	3.20	1.60		322.31	12.04	10.64	10.64	9.04	9.04	
	IN	1	3.20	3.20	1.60	267.69	322.31	12.04	10.64	10.64	9.04	9.04	
II15C4021	OUT	1	3.20	3.20	1.60		590.00	12.21	11.31	10.81	10.04	9.71	0.33
	IN	1	3.20	3.20	1.60	33.08	590.00	12.21	11.31	10.81	10.04	9.71	0.33
II15C4019	OUT	1	3.20	3.20	1.60		623.08	12.06	11.74	10.73	10.46	10.14	0.32
	IN	1	3.20	3.20	1.60	9.43	623.08	12.06	11.74	10.73	10.46	10.14	0.32
II15C4018	OUT	1	2.65	2.65	1.77		632.51	12.06	11.78	10.81	10.50	10.01	0.49

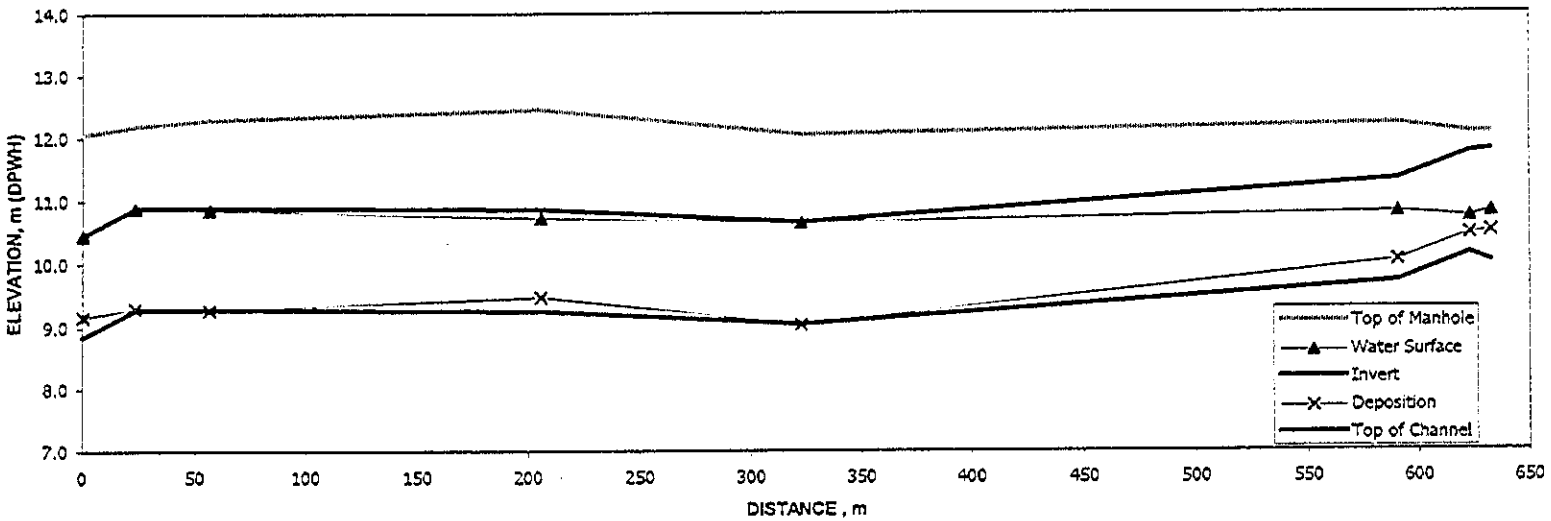


Table 4.1 DRAINAGE CHANNEL PROFILE (7 OF 35)
DRAINAGE MAINS

DM07 JOSEFINA - LEPANTO

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15C4092	IN	3	3.40	3.40	2.25	132.17		12.15	11.20	10.48	9.45	8.95	0.50
II15C3311	OUT	2	2.12	2.12	2.24		132.17	12.26	11.70	11.68	9.84	9.46	0.38
	IN	2	2.12	2.12	2.24	98.61	132.17	12.26	11.70	11.68	9.84	9.46	0.38
II15C3297	OUT	2	2.00	2.00	2.00		230.78	12.44	11.49	11.49	9.84	9.49	0.35
	IN	2	2.00	2.00	2.00	549.86	230.78	12.44	11.49	11.49	9.84	9.49	0.35
II15C3312	OUT	1	4.30	4.30	3.24		780.64	13.81	13.30	11.06	10.21	10.06	0.15
	IN	1	4.30	4.30	3.24	101.38	780.64	13.81	13.30	11.06	10.21	10.06	0.15
II15C3275	OUT	1	4.10	4.10	3.00		882.02	13.28	12.76	10.78	10.27	9.76	0.51

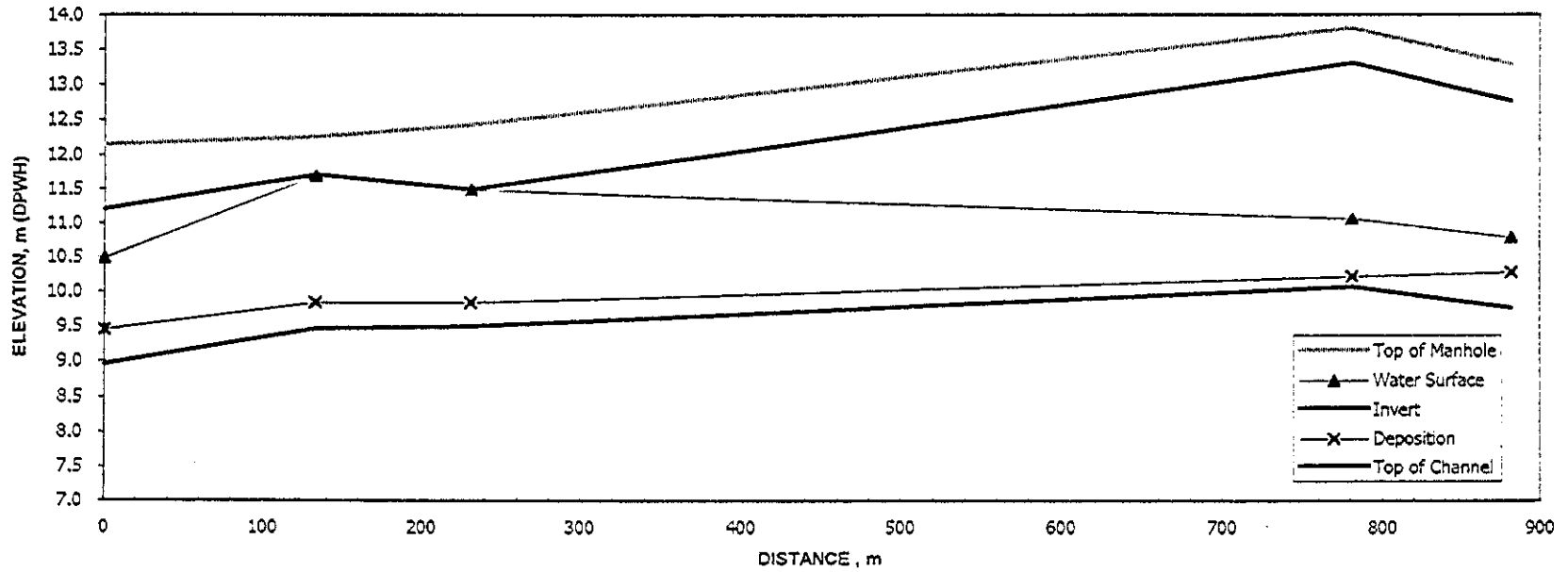


Table 4.1 DRAINAGE CHANNEL PROFILE (8 OF 35)
DRAINAGE MAINS

DM08 ECONOMIA

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH	SLOPE (%)
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET		
II15C4092	IN	3	3.40	3.40	2.25	159.68	0.00	12.15	11.20	10.48	9.45	8.95	0.50	-0.238%
II15C3159	OUT	3	2.46	2.46	2.75		159.68	12.38	12.08	11.72	9.82	9.33	0.49	
	IN	3	2.46	2.46	2.75	66.70	159.68	12.38	12.08	11.72	9.82	9.33	0.49	-0.330%
II15C3296	OUT	3	2.30	2.30	2.70		226.38	12.55	12.25	11.65	10.25	9.55	0.70	
	IN	3	2.30	2.30	2.70	322.14	226.38	12.55	12.25	11.65	10.25	9.55	0.70	-0.019%
II15C3285	OUT	1	1.40	1.40	2.70		548.52	12.57	12.31	11.39	10.61	9.61	1.00	
	IN	1	1.40	1.40	2.70	141.14	548.52	12.57	12.31	11.39	10.61	9.61	1.00	-0.376%
II15C3284	OUT	1	1.53	1.53	2.20		689.66	12.56	12.34	11.29	10.62	10.14	0.48	

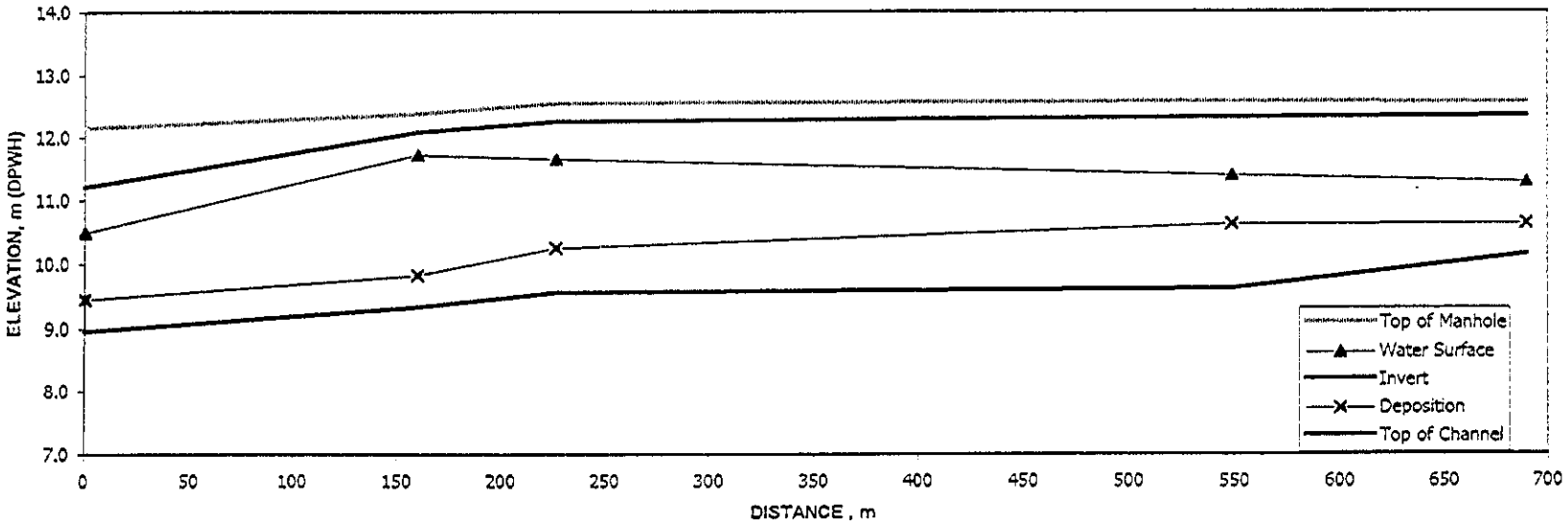


Table 4.1 DRAINAGE CHANNEL PROFILE (9 OF 35)
DRAINAGE MAINS

DM09 MARGAL

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15C3098	IN	1	2.80	2.80	2.37	31.73	0.00	11.97	11.32	11.22	9.52	8.95	0.57
II15C3099	OUT	1	2.80	2.80	2.48		31.73	12.10	11.46	11.20	9.60	8.98	0.62
	IN	1	2.80	2.80	2.48	79.57	31.73	12.10	11.46	11.20	9.60	8.98	0.62
II15C3100	OUT	1	2.80	2.80	2.40		111.30	12.29	11.40	10.74	10.61	9.00	1.61
	IN	1	2.80	2.80	2.40	38.44	111.30	12.29	11.40	10.74	10.61	9.00	1.61
II15C3101	OUT	1	2.80	2.80	2.40		149.74	12.28	11.42	10.74	10.68	9.02	1.66

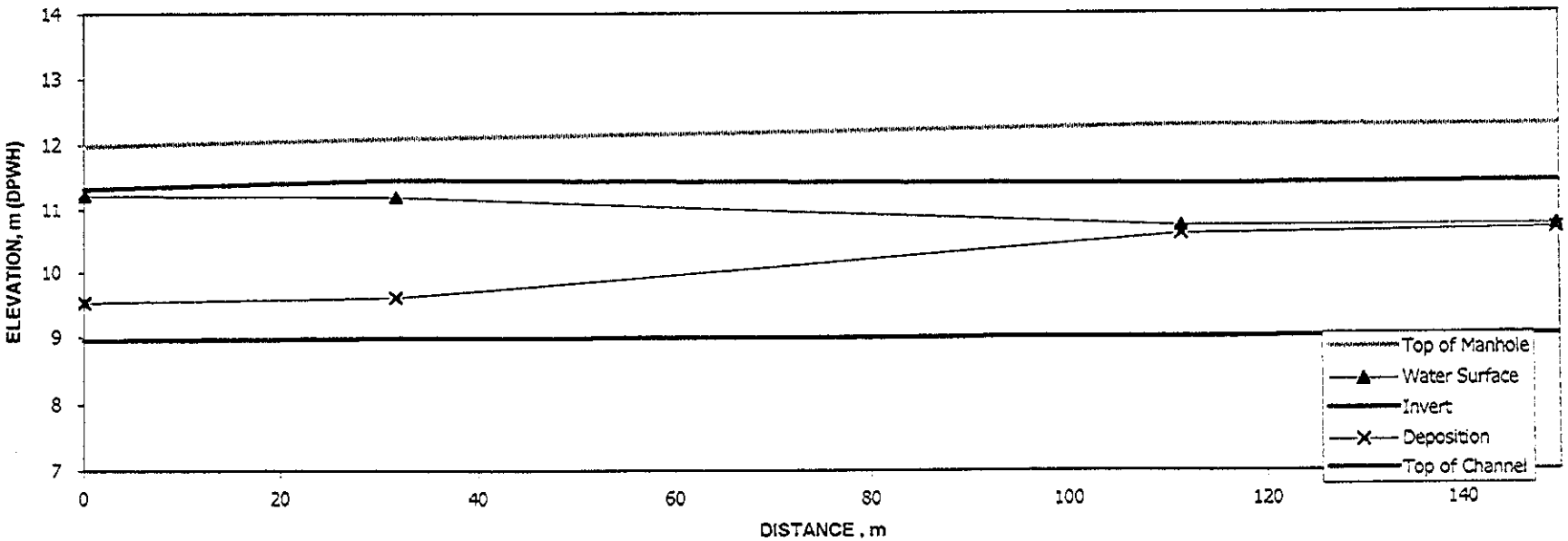


Table 4.1 DRAINAGE CHANNEL PROFILE (10 OF 35)
DRAINAGE MAINS

DM10 VISAYAS

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH	SLOPE (%)
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET		
MH11A4193	IN	2	2.00	2.00	2.00	84.00		12.80	11.60	11.60	10.40	9.60	0.80	0.024%
MH11A4044	OUT	2	2.00	2.00	2.00		84.00	12.82	11.58	11.58	10.03	9.58	0.45	
	IN	2	2.00	2.00	2.00	81.16	84.00	12.82	11.58	11.58	10.03	9.58	0.45	-0.283%
MH11A4051	OUT	2	2.00	2.00	2.00		165.16	12.61	11.81	11.61	9.98	9.81	0.17	
	IN	2	2.00	2.00	2.00	76.30	165.16	12.61	11.81	11.61	9.98	9.81	0.17	0.118%
MH11A4056	OUT	2	2.00	2.00	2.00		241.46	12.72	11.72	11.57	10.42	9.72	0.70	
	IN	2	2.00	2.00	2.00	73.33	241.46	12.72	11.72	11.57	10.42	9.72	0.70	-0.450%
MH11A4063	OUT	2	2.00	2.00	2.00		314.79	12.95	12.05	11.50	10.40	10.05	0.35	
	IN	2	2.00	2.00	2.00	82.90	314.79	12.95	12.05	11.50	10.40	10.05	0.35	-0.724%
MH11A4068	OUT	2	1.70	1.70	1.70		397.69	13.15	12.35	11.75	11.19	10.65	0.54	
	IN	2	1.70	1.70	1.70	75.69	397.69	13.15	12.35	11.75	11.19	10.65	0.54	-0.159%
MH11A4074	OUT	2	1.70	1.70	1.70		473.38	13.37	12.47	11.47	11.12	10.77	0.35	
	IN	2	1.70	1.70	1.70	95.61	473.38	13.37	12.47	11.47	11.12	10.77	0.35	0.084%
MH11A4081	OUT	2	1.70	1.70	1.70		568.99	13.39	12.39	11.49	11.09	10.69	0.40	
	IN	2	1.70	1.70	1.70	92.81	568.99	13.39	12.39	11.49	11.09	10.69	0.40	-0.172%
MH11A4094	OUT	1	2.90	2.90	1.60		661.80	13.45	12.45	11.65	11.28	10.85	0.43	

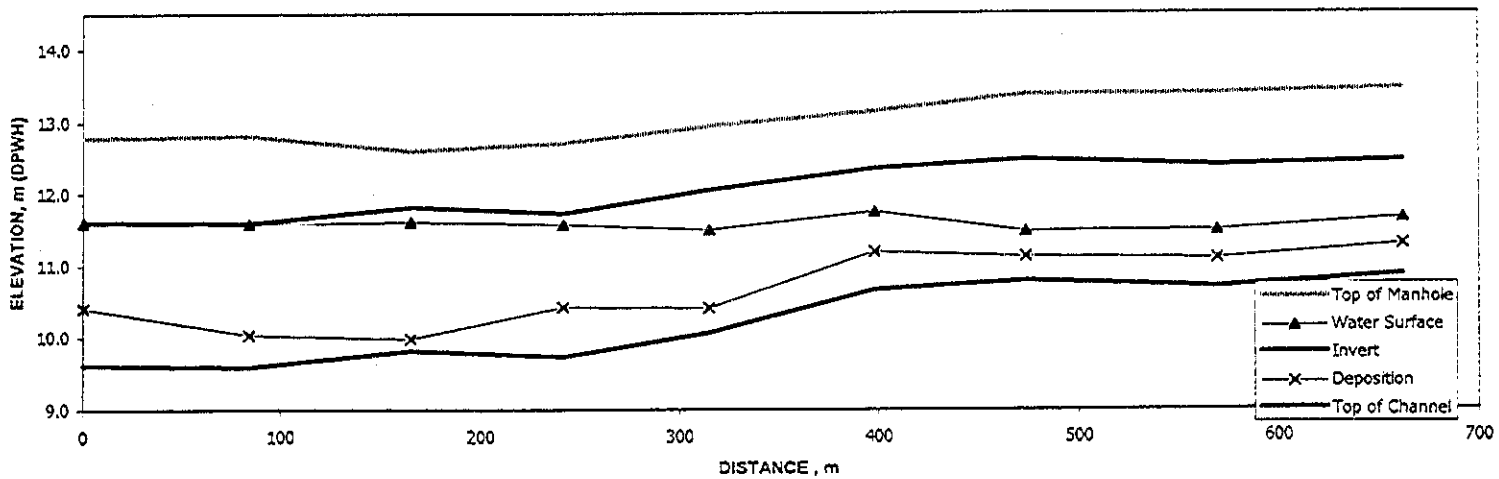


Table 4.1 DRAINAGE CHANNEL PROFILE (11 OF 35)
DRAINAGE MAINS

DM11 PADRE FAURA

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II20B2156	IN	1	3.47	3.47	2.70	160.00		13.49	12.64	11.14	10.09	9.94	0.15
II20B2201	OUT	1	3.40	3.40	2.30		160.00	12.64	12.04	11.22	9.74	9.74	
	IN	1	3.40	3.40	2.30	220.00	160.00	12.64	12.04	11.22	9.74	9.74	
II20B2205	OUT	1	3.30	3.30	2.45		380.00	12.92	12.28	11.48	10.43	9.83	0.60
	IN	1	3.30	3.30	2.51	200.00	380.00	12.92	12.34	11.48	10.43	9.83	0.60
II20B2204	OUT	1	2.70	2.70	1.97		580.00	13.11	11.92	11.79	10.38	9.95	0.43
	IN	1	2.70	2.70	2.03	82.00	580.00	13.11	12.04	11.79	10.38	10.01	0.37
II20B2203	OUT	1	2.20	2.20	2.28		662.00	13.06	12.24	11.69	10.28	9.96	0.32
	IN	1	2.20	2.20	2.37	335.00	662.00	13.06	12.33	11.69	10.28	9.96	0.32
II20B2202	OUT	1	2.20	2.20	1.88		997.00	13.04	12.39	11.58	10.99	10.51	0.48
	IN	1	2.20	2.20	1.88	88.00	997.00	13.04	12.39	11.58	10.99	10.51	0.48
II20C2290	OUT	1	2.20	2.20	1.33		1085.00	12.80	12.00	11.37	10.95	10.67	0.28

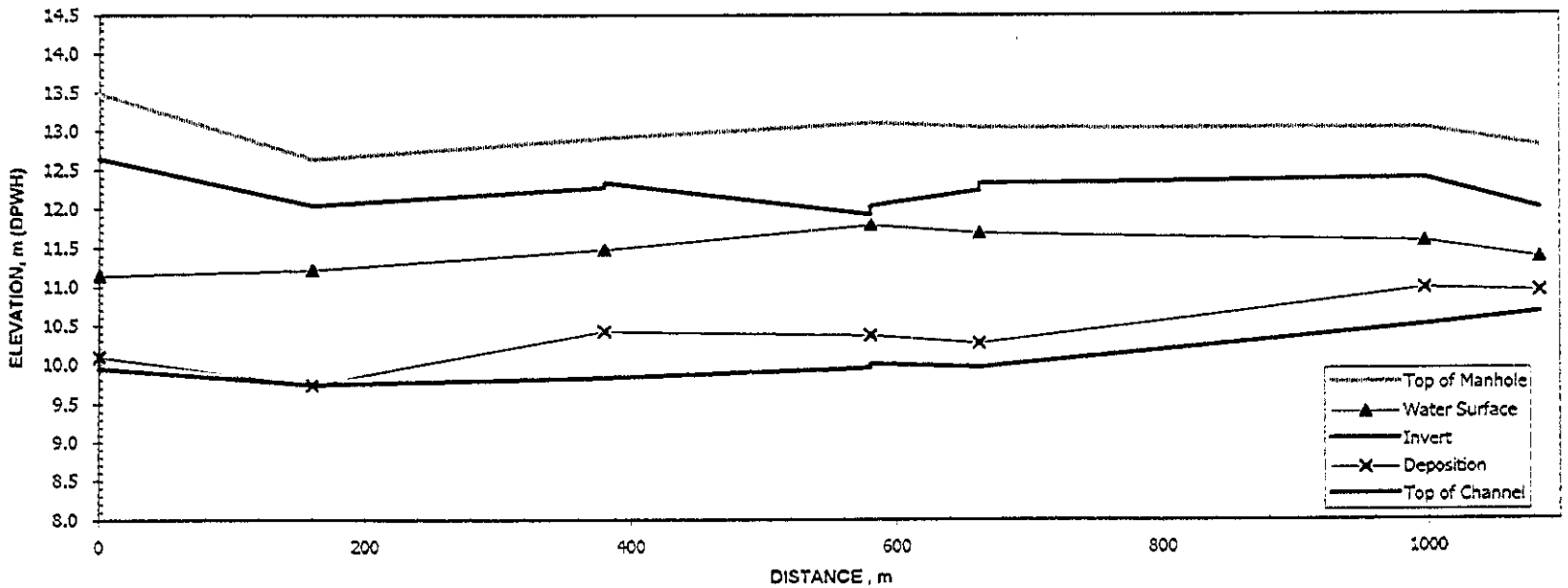


Table 4.1 DRAINAGE CHANNEL PROFILE (12 OF 35)
DRAINAGE MAINS

DM12 REMEDIOS

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II20C3362	IN	1	4.40	4.40	3.20	215.00		13.37	12.87	12.37	10.87	9.67	1.20
II20C3363	OUT	1	4.40	4.40	3.20		215.00	13.15	12.75	11.80	9.98	9.55	0.43
	IN	1	4.40	4.40	3.20	155.00	215.00	13.15	12.75	11.80	9.98	9.55	0.43
II20C3277	OUT	1	4.40	4.40	2.50		370.00	13.47	12.91	12.42	11.27	10.41	0.86
	IN	1	4.40	4.40	2.50	50.00	370.00	13.47	12.91	12.42	11.27	10.41	0.86
II20C3364	OUT	1	4.40	4.40	2.20		420.00	13.44	12.74	12.74	11.24	10.54	0.70
	IN	1	4.40	4.40	2.26	675.00	420.00	13.44	12.80	12.80	11.24	10.54	0.70
II20C3365	OUT	1	2.60	2.60	1.33		1095.00	12.53	11.71	11.71	10.93	10.38	0.55
	IN	1	2.60	2.60	1.28	260.00	1095.00	12.53	11.66	11.66	10.93	10.38	0.55
II20C2289	OUT	1			1.22		1355.00	12.80	11.80	11.50	11.14	10.58	0.56

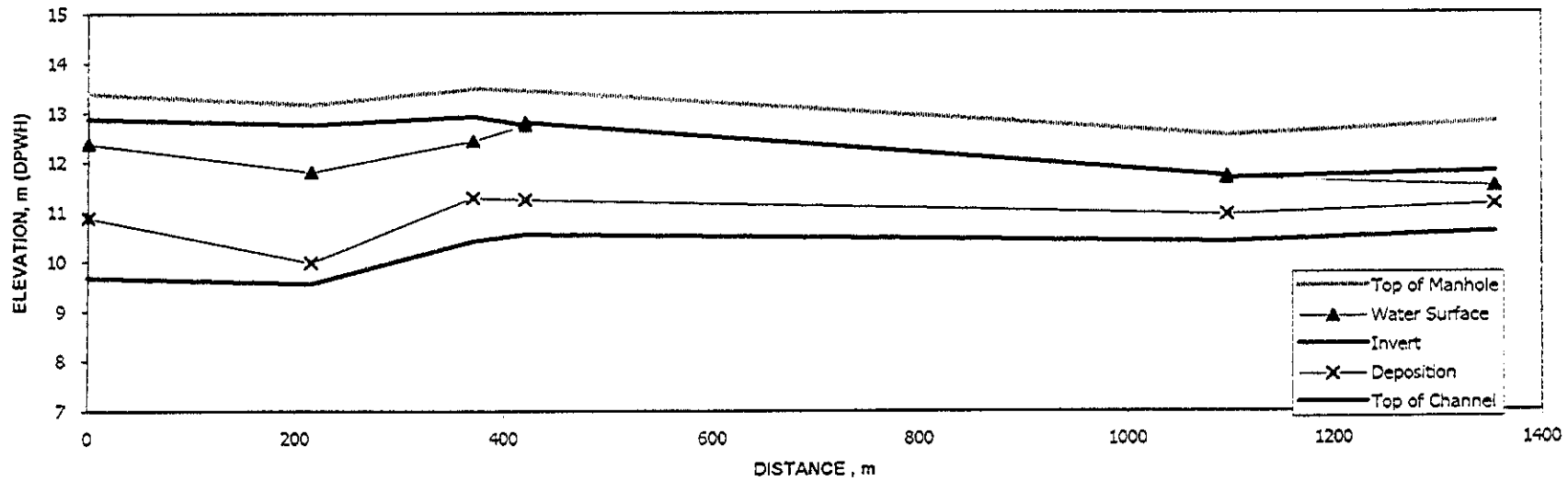


Table 4.1 DRAINAGE CHANNEL PROFILE (13 OF 35)
DRAINAGE MAINS

DM13 ONYX

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III16A2178	IN	1	2.60	2.60	2.00	33.99		13.43	12.93	11.23	11.03	10.93	0.10
III16A2175	OUT	1	2.60	2.60	2.00		33.99	13.74	12.54	11.24	11.04	10.54	0.50
	IN	1	2.50	2.50	2.15	221.41	33.99	13.74	12.69	11.24	11.04	10.54	0.50
III16A2176	OUT	1	2.50	2.50	2.15		255.40	13.01	12.51	11.24	10.67	10.36	0.31
	IN	1	2.50	2.50	2.15	156.71	255.40	13.01	12.51	11.24	10.67	10.36	0.31
III16A2177	OUT	1	2.50	2.50	1.30		412.11	12.83	12.30	11.95	11.80	11.00	0.80

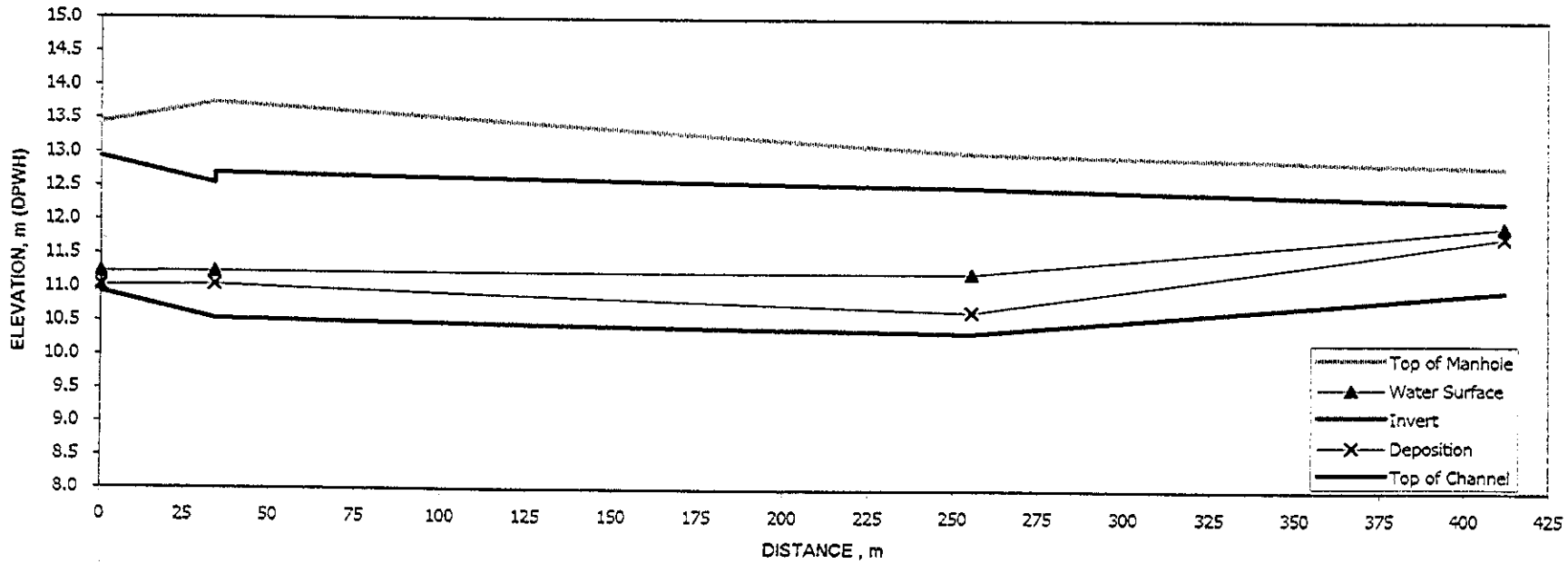


Table 4.1 DRAINAGE CHANNEL PROFILE (14 OF 35)
DRAINAGE MAINS

DM14 VITO CRUZ

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II20C4053	IN	1	1.52	1.52	1.50	135.00		13.07	11.57	10.96	10.20	10.07	0.13
II20C4214	OUT	1	2.00	2.00	1.52		135.00	12.94	11.46	11.04	10.29	9.94	0.35
	IN	1	2.00	2.00	1.57	175.00	135.00	12.94	11.51	11.04	10.29	9.94	0.35
II20C4213	OUT	1	2.00	2.00	1.58		310.00	13.08	11.58	11.33	10.17	10.00	0.17
	IN	1	2.00	2.00	1.63	195.00	310.00	13.08	11.63	11.33	10.17	10.00	0.17
II20C4212	OUT	1	2.00	2.00	1.42		505.00	12.97	11.37	11.32	10.60	9.95	0.65
	IN	1	2.00	2.00	1.30	247.00	505.00	12.97	11.25	11.32	10.60	9.95	0.65
II20C3279	OUT	1	1.54	1.54	1.40		752.00	13.19	12.47	11.79	11.13	11.07	0.06

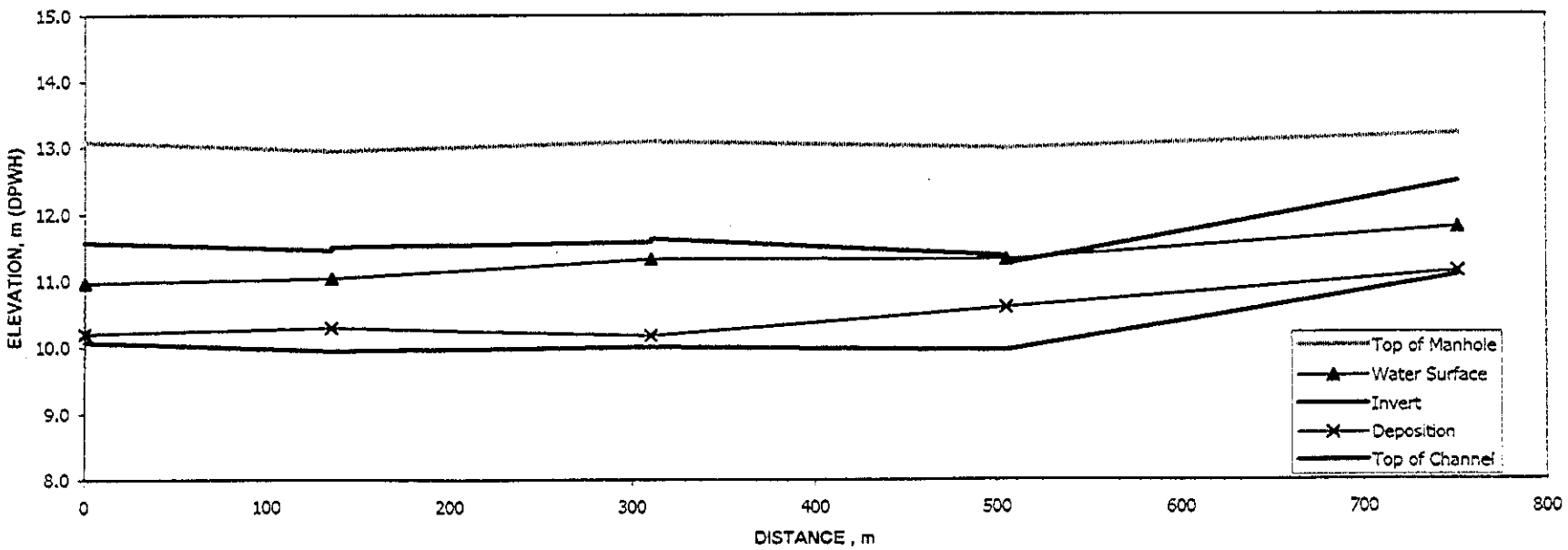


Table 4.1 DRAINAGE CHANNEL PROFILE (15 OF 35)
DRAINAGE MAINS

DM15-A BUENDIA OUTFALL - RIGHT

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II25C1113	IN	1	3.60	3.60	2.50	770.00		13.22	10.93	9.74	8.78	8.43	0.35
II20C4211	OUT	1	3.60	3.60	3.05		770.00	12.65	10.95	9.77	8.21	7.90	0.31
	IN	1	3.60	3.60	3.05	70.00	770.00	12.65	10.95	9.77	8.21	7.90	0.31
II20C4210	OUT	1	3.50	3.50	2.99		840.00	13.73	11.43	9.93	8.49	8.44	0.05
	IN	1	3.50	3.50	2.99	260.00	840.00	13.73	11.43	9.93	8.49	8.44	0.05
II20C4177	OUT	1	3.80	3.80	3.10		1100.00	14.64	11.74	10.14	10.18	8.64	1.54
	IN	1	3.80	3.80	3.00	975.00	1100.00	14.64	11.64	10.14	10.18	8.64	1.54
II20C4209	OUT	1	3.60	3.60	3.90		2075.00	14.07	13.57	10.47	9.67	9.67	-

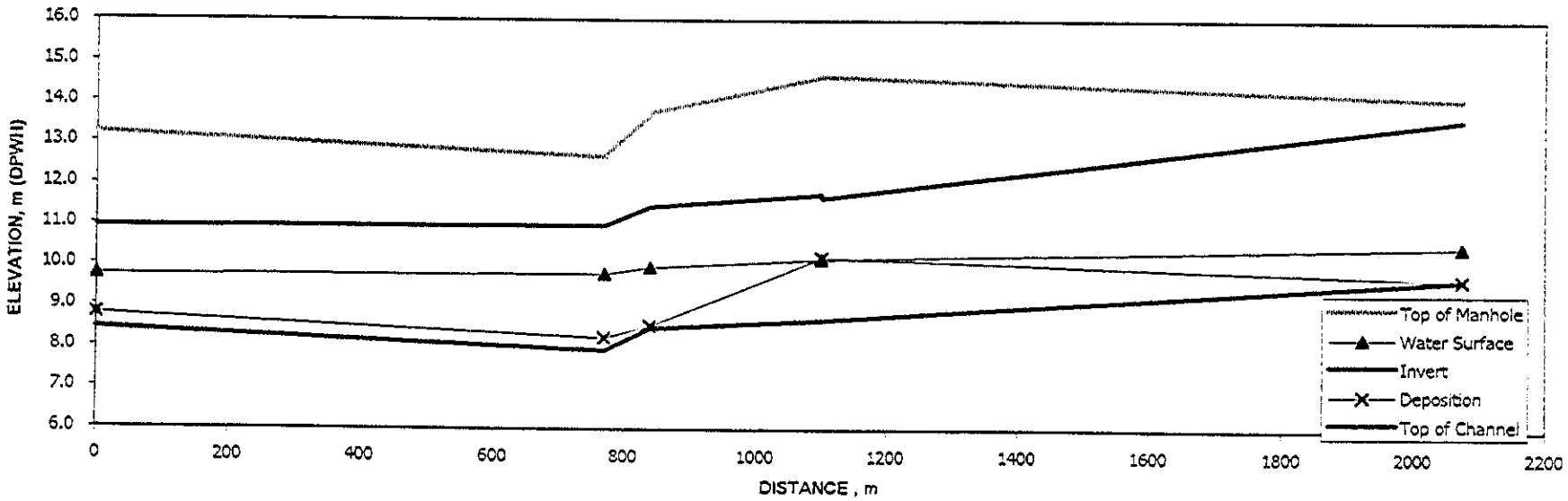


Table 4.1 DRAINAGE CHANNEL PROFILE (16 OF 35)
DRAINAGE MAINS

DM15-B BUENDIA OUTFALL - LEFT

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II25C1111	IN	1	3.60	3.60	2.50	265.00		13.22	10.93	9.74	8.78	8.43	0.35
II25C1133	OUT	1	3.60	3.60	3.00		265.00	12.80	11.10	9.69	8.69	8.10	0.59
	IN	1	3.60	3.60	3.00	25.00	265.00	12.80	11.10	9.69	8.69	8.10	0.59
II25C1135	OUT	1	3.60	3.60	3.00		290.00	12.78	11.28	9.77	8.39	8.28	0.11
	IN	1	3.60	3.60	3.00	528.00	290.00	12.78	11.28	9.77	8.39	8.28	0.11
II20C4180	OUT	1	3.70	3.70	3.26		818.00	13.64	11.39	10.50	9.04	8.13	0.91
	IN	1	3.70	3.70	3.26	265.00	818.00	13.64	11.39	10.50	9.04	8.13	0.91
II20C4179	OUT	1	3.80	3.80	3.25		1083.00	14.42	11.67	10.08	8.96	8.42	0.54
	IN	1	3.80	3.80	3.25	888.00	1083.00	14.42	11.67	10.08	8.96	8.42	0.54
II20C4178	OUT	1	3.60	3.60	3.90		1971.00	14.07	13.57	10.47	9.67	9.67	-

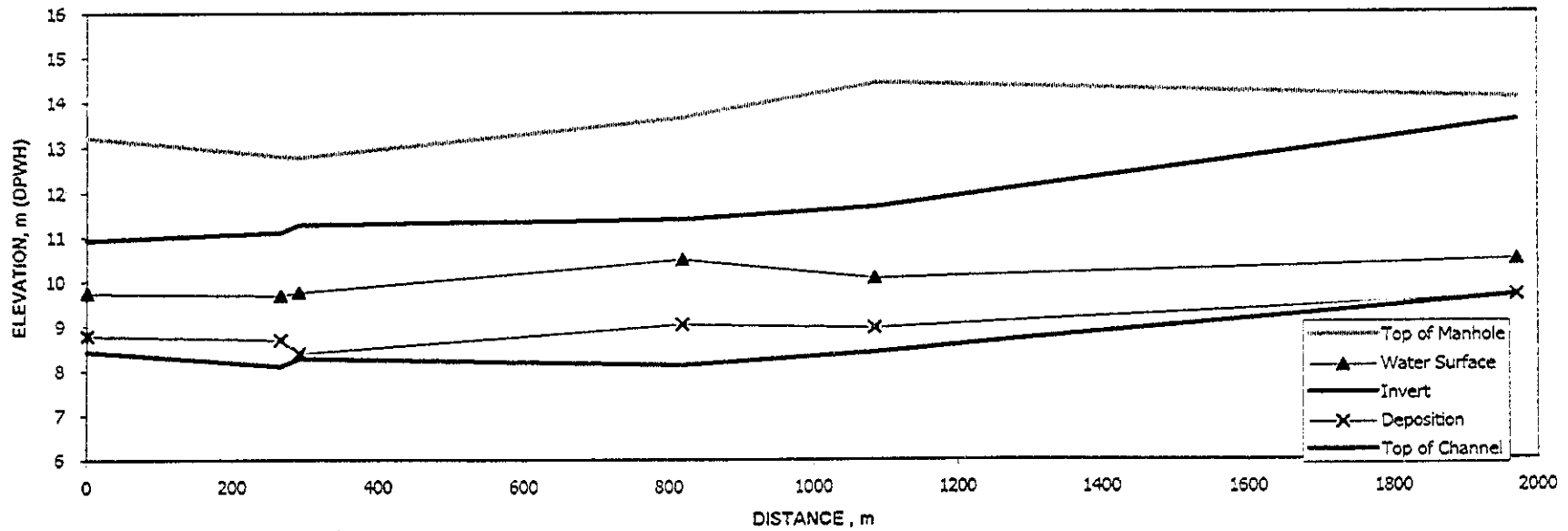


Table 4.1 DRAINAGE CHANNEL PROFILE (17 OF 35)
DRAINAGE MAINS

DM16 LIBERTAD OUTFALL

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II25C1122	IN	1	4.80	4.80	3.13	120.00		13.22	12.35	9.72	9.22	9.22	-
II25C1121	OUT	1	4.70	4.70	3.29		120.00	13.25	12.60	10.20	9.67	9.31	0.36
	IN	1	4.70	4.70	3.27	1030.00	120.00	13.25	12.58	10.20	9.67	9.31	0.36
II25C1120	OUT	1	3.00	3.00	2.35		1150.00	13.17	12.52	11.44	10.82	10.17	0.65
	IN	1	3.00	3.00	2.35	610.00	1150.00	13.17	12.52	11.44	10.82	10.17	0.65
III16A4424	OUT	1	4.00	4.00	2.60		1760.00	13.48	12.81	10.96	10.46	10.21	0.25

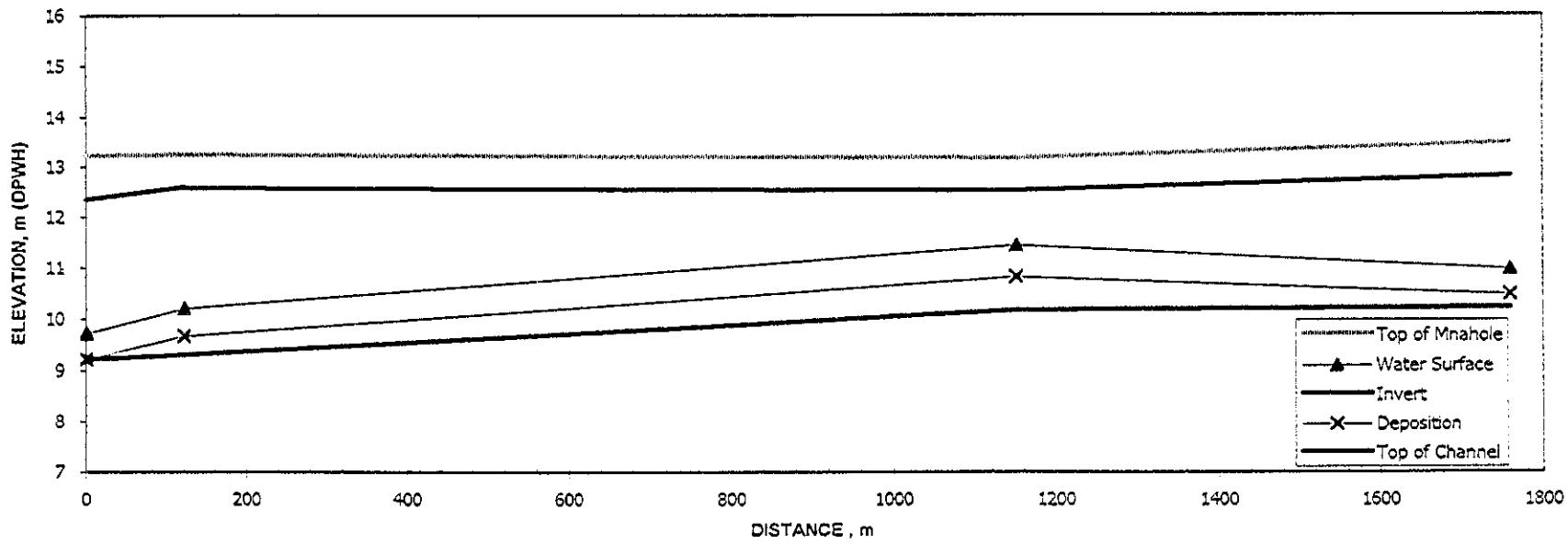


Table 4.1 DRAINAGE CHANNEL PROFILE (18 OF 35)
DRAINAGE MAINS

DM17-A EDSA OUTFALL-LEFT

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II25C1119	IN	1	4.20	4.20	2.50	375.00		12.34	10.51	9.79	8.79	8.01	0.78
II25C1117	OUT	1	4.25	4.25	2.43		375.00	13.65	11.15	10.65	10.35	8.72	1.63
	IN	1	4.25	4.25	2.43	510.00	375.00	13.65	11.15	10.65	10.35	8.72	1.63
II25C1114	OUT	1	4.95	4.95	3.09		885.00	12.82	11.62	10.55	9.42	8.53	0.89

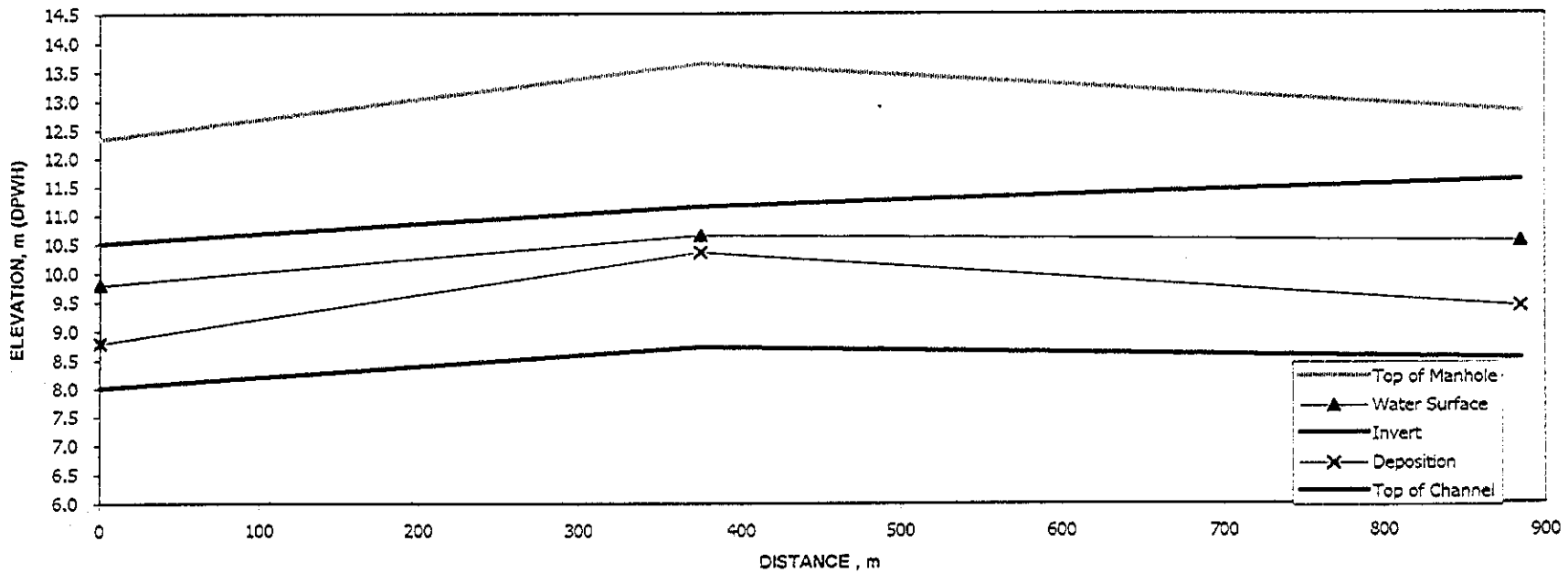


Table 4.1 DRAINAGE CHANNEL PROFILE (19 OF 35)
DRAINAGE MAINS

DM17-B EDSA OUTFALL-RIGHT

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II25C1118	IN	1	4.30	4.30	2.50	375.00		12.30	10.60	9.96	8.60	8.10	0.50
II25C1116	OUT	1	4.25	4.25	2.45		375.00	13.59	11.09	10.49	9.04	8.64	0.40
	IN	1	4.25	4.25	2.45	295.00	375.00	13.59	11.14	10.49	9.04	8.69	0.35
II25C1115	OUT	1	4.26	4.26	2.99		670.00	14.11	11.41	10.45	9.42	8.42	1.00

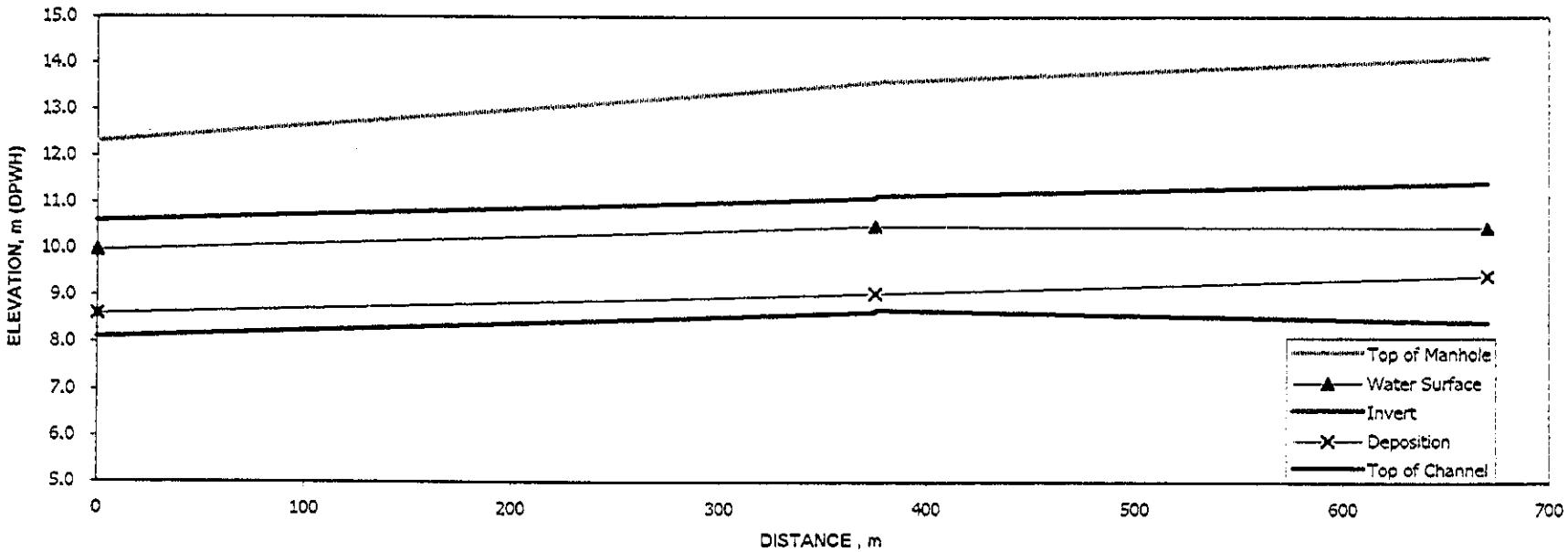


Table 4.1 DRAINAGE CHANNEL PROFILE (20 OF 35)
DRAINAGE MAINS

DM18 MAKATI HEAD RACE-I

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III16B3508	IN	1	5.20	5.20	2.50	233.24		14.39	12.00	11.69	9.80	9.50	0.30
III16B3319	OUT	1	5.03	5.03	2.50		233.24	14.08	12.10	11.69	10.48	9.60	0.88
	IN	1	5.03	5.03	2.49	212.43	233.24	14.08	12.09	11.69	10.48	9.60	0.88
III16B2016	OUT	1	4.06	4.06	2.32		445.67	12.69	12.06	11.39	10.64	9.74	0.90
	IN	1	4.06	4.06	2.32	175.20	445.67	12.69	12.08	11.39	10.64	9.76	0.88
III16B2015	OUT	1	4.06	4.06	2.30		620.87	12.64	12.30	11.62	11.13	10.00	1.13

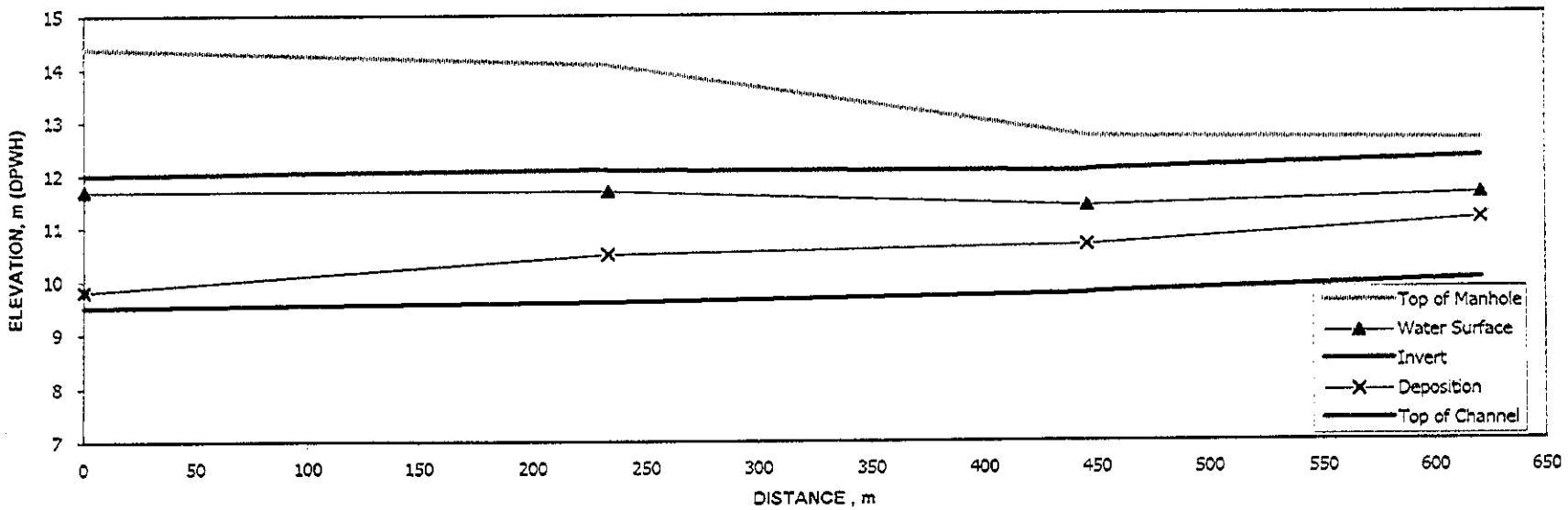


Table 4.1 DRAINAGE CHANNEL PROFILE (21 OF 35)
DRAINAGE MAINS

DM19 MAKATI HEAD RACE-II

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III16B3485	IN	1	3.25	3.25	2.03	90.00		14.14	10.67	10.67	10.67	8.64	2.03
III16B3324	OUT	1	4.90	4.90	3.00		90.00	14.29	13.42	11.71	10.75	10.42	0.33
	IN	1	4.90	4.90	3.00	300.00	90.00	14.29	13.62	11.71	10.75	10.62	0.13
III16B3323	OUT	1	4.00	4.00	1.95		390.00	14.36	12.76	11.61	10.88	10.81	0.07
	IN	1	3.54	3.54	1.95	236.00	390.00	14.36	12.76	11.61	10.88	10.81	0.07
III16B3364	OUT	1	2.97	2.97	2.63		626.00	14.80	13.45	11.61	11.65	10.82	0.83

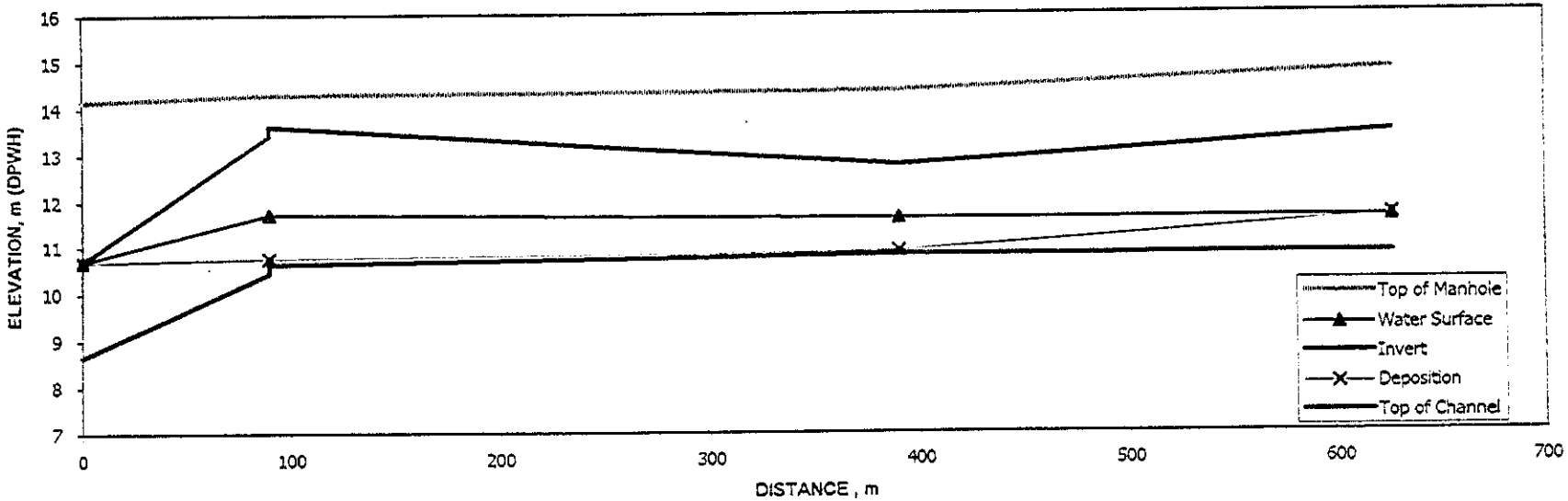


Table 4.1 DRAINAGE CHANNEL PROFILE (22 OF 35)
DRAINAGE MAINS

DM20 ESTRADA

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II20C3360	IN	1	2.50	2.50	1.67	72.04		12.42	11.74	11.74	11.57	10.07	1.50
II20C3366	OUT	1	2.50	2.50	1.20		72.04	12.43	11.43	11.43	10.66	10.23	0.43
	IN	1	2.50	2.50	1.20	194.45	72.04	12.43	11.43	11.43	10.66	10.23	0.43
II20C3357	OUT	1	2.85	2.85	1.52		266.49	12.59	11.36	11.36	10.40	9.84	0.56
	IN	1	2.85	2.85	1.62	72.25	266.49	12.59	11.48	11.48	10.40	9.86	0.54
II20C3356	OUT	1	2.83	2.83	1.64		338.74	12.67	11.63	11.63	10.97	9.99	0.98
	IN	1	2.83	2.83	1.66	79.46	338.74	12.67	11.63	11.63	10.97	9.97	1.00
II20C3355	OUT	1			1.25		418.20	12.71	11.93	11.61	11.41	10.68	0.73

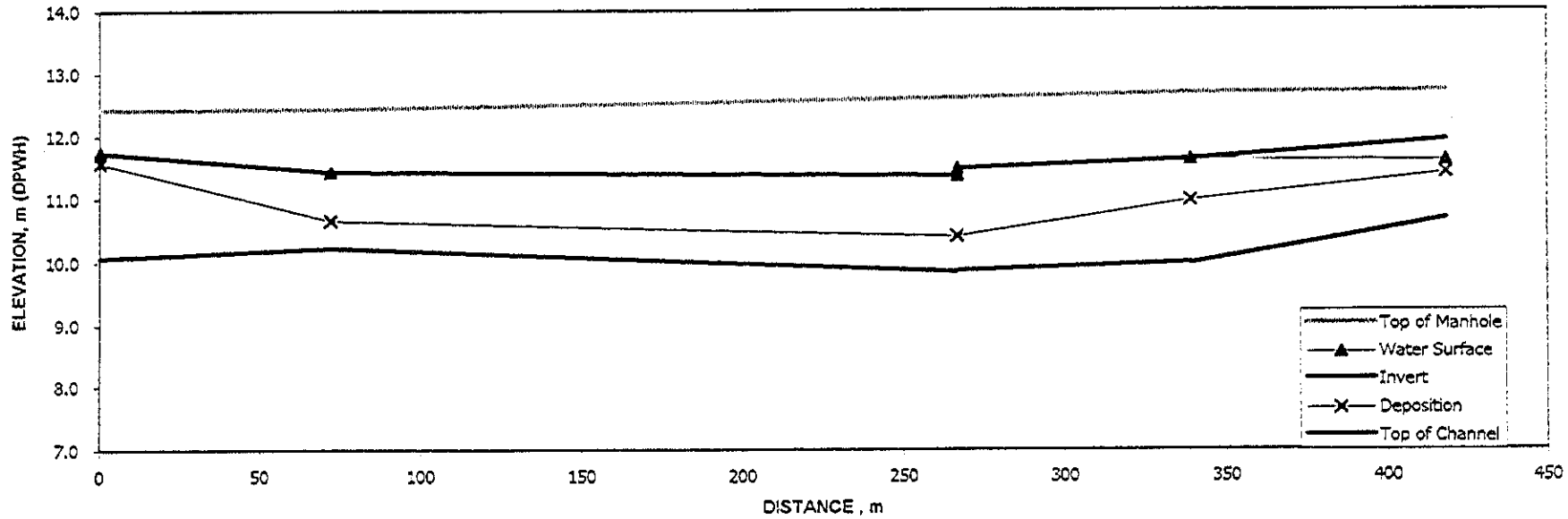


Table 4.1 DRAINAGE CHANNEL PROFILE (23 OF 35)
DRAINAGE MAINS

DM21 ZOBEL ORBIT

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III16B3509	IN	1	5.18	5.18	3.10	43.00		14.78	12.38	11.88	9.38	9.28	0.10
III16B3406	OUT	1	4.90	4.90	2.99		43.00	13.89	13.41	11.57	10.69	10.42	0.27
	IN	1	4.90	4.90	2.97	150.00	43.00	13.89	13.39	11.57	10.69	10.42	0.27
III16B3388	OUT	1	5.02	5.02	2.97		193.00	14.60	13.67	11.72	10.85	10.70	0.15

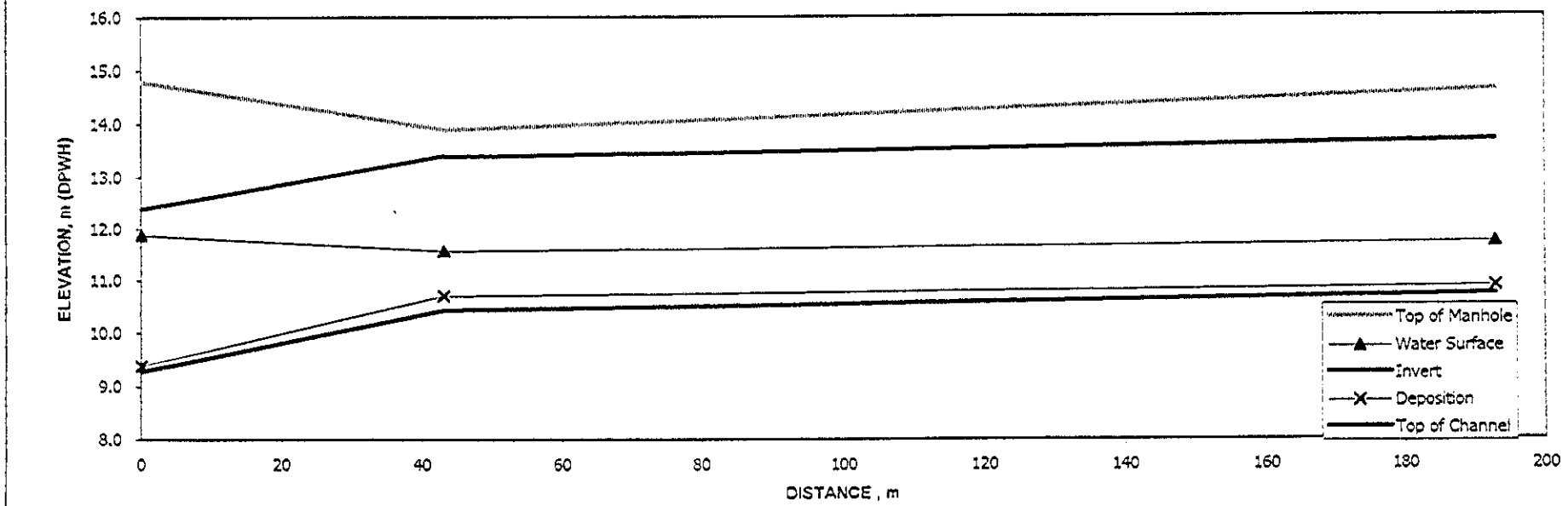


Table 4.1 DRAINAGE CHANNEL PROFILE (24 OF 35)
DRAINAGE MAINS

DM22-A FARADAY-RIGHT

MANHOLE CODE NO.	Location	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III6A4001	IN	1			1.20	57.00		12.71	11.71	11.65	10.51	10.51	-
III6A4002	OUT	1	1.52	1.52	1.16		57.00	12.77	11.65	11.65	10.49	10.49	-
	IN	1	1.50	1.50	1.25	142.00	57.00	12.77	11.74	11.74	10.49	10.49	-
III6A4003	OUT	1	1.54	1.54	1.31		199.00	12.81	11.88	- 11.41	10.70	10.57	0.13
	IN	1	1.59	1.59	1.29	55.00	199.00	12.81	11.87	11.41	10.70	10.58	0.12
III6A4004	OUT	1	1.60	1.60	1.04		254.00	12.81	11.86	11.05	10.86	10.82	0.04
	IN	1	1.56	1.56	1.03	48.00	254.00	12.81	11.89	11.05	10.86	10.86	-
III6A4005	OUT	1	1.58	1.58	1.22		302.00	12.79	11.94	11.06	10.72	10.72	-
	IN	1	1.57	1.57	1.25	56.00	302.00	12.79	11.94	11.06	10.71	10.69	0.02
III6A4006	OUT	1	1.60	1.60	1.10		358.00	12.70	12.06	11.18	10.96	10.96	-
	IN	1	1.59	1.59	1.12	150.00	358.00	12.70	12.10	11.18	10.98	10.98	-
III6A4013	OUT	1			1.07		508.00	13.37	12.38	11.71	11.49	11.31	0.18
	IN	1			1.07	170.00	508.00	13.37	12.42	11.71	11.49	11.35	0.14
III6A4086	OUT	1			1.07		678.00	13.47	12.57	12.10	11.72	11.50	0.22
	IN	1			1.07	113.00	678.00	13.47	12.50	12.10	11.72	11.43	0.29
III6A4087	OUT	1			0.91		791.00	12.87	12.33	12.29	11.82	11.42	0.40
	IN	1			0.91	42.00	791.00	12.87	12.43	12.29	11.82	11.52	0.30
III6A4321	OUT	1			0.60		833.00	13.52	12.67	12.47	12.07	12.07	-

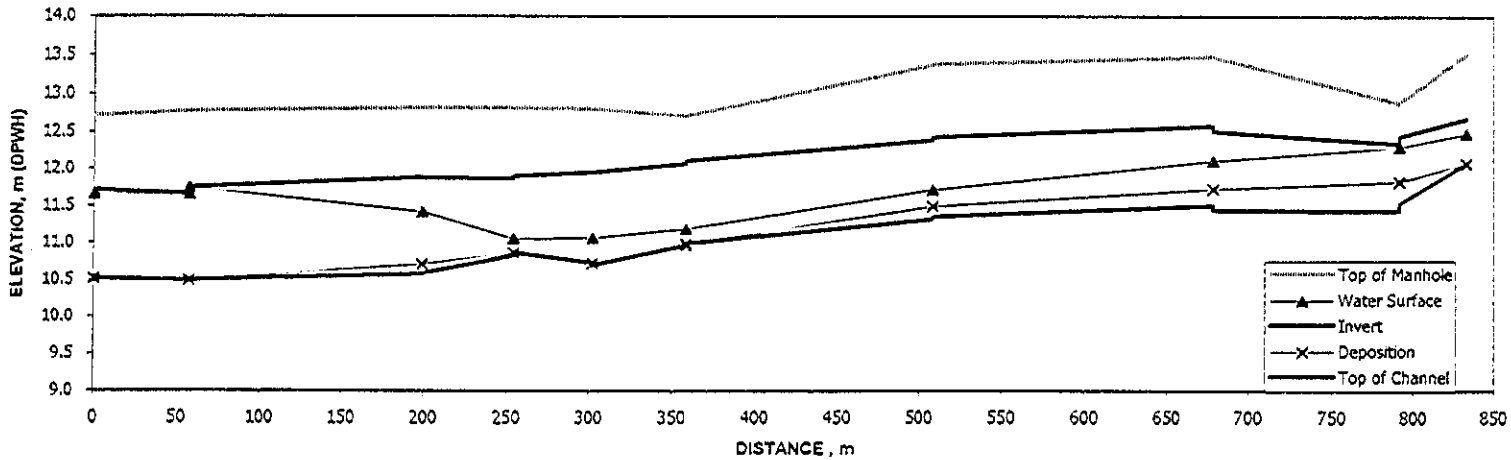


Table 4.1 DRAINAGE CHANNEL PROFILE (25 OF 35)
DRAINAGE MAINS

DM22-B FARADAY - LEFT

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III16A4007	IN	1			1.20	56.00		12.68	11.64	11.69	10.51	10.44	0.07
III16A4008	OUT	1	1.49	1.49	1.27		56.00	12.78	11.72	11.73	10.56	10.45	0.11
	IN	1	1.52	1.52	1.33	145.00	56.00	12.78	11.71	11.73	10.56	10.38	0.18
III16A4009	OUT	1	1.55	1.55	1.36		201.00	12.79	11.92	11.35	10.62	10.56	0.06
	IN	1	1.61	1.61	1.31	113.00	201.00	12.79	11.88	11.35	10.62	10.57	0.05
III16A4010	OUT	1	1.60	1.60	1.16		314.00	12.77	11.91	11.03	10.75	10.75	-
	IN	1	1.55	1.55	1.19	60.00	314.00	12.77	11.91	11.03	10.73	10.72	0.01
III16A4011	OUT	1	1.60	1.60	1.07		374.00	12.69	12.08	11.25	11.01	11.01	-
	IN	1	1.60	1.60	1.01	50.00	374.00	12.69	12.07	11.25	11.06	11.06	-
III16A4012	OUT	1	1.96	1.96	0.91		424.00	12.87	12.17	11.36	11.27	11.26	0.01
	IN	1	1.99	1.99	0.88	116.00	424.00	12.87	12.12	11.36	11.27	11.24	0.03
III16A4056	OUT	1	2.15	2.15	0.82		540.00	13.44	12.48	11.67	11.66	11.66	-
	IN	1	1.30	1.30	0.92	150.00	540.00	13.44	12.62	11.67	11.70	11.70	-
III16A4188	OUT	1	0.94	0.94	0.85		690.00	13.40	12.85	12.02	12.00	12.00	-
	IN	1			0.90	100.00	690.00	13.40	12.83	12.02	11.95	11.93	0.02
III16A4187	OUT	1			0.90		790.00	12.93	12.40	12.06	11.77	11.50	0.27
	IN	1			0.90	42.00	790.00	12.93	12.43	12.06	11.77	11.53	0.24
III16A4406	OUT	1			0.60		832.00	13.52	12.67	12.47	12.07	12.07	-

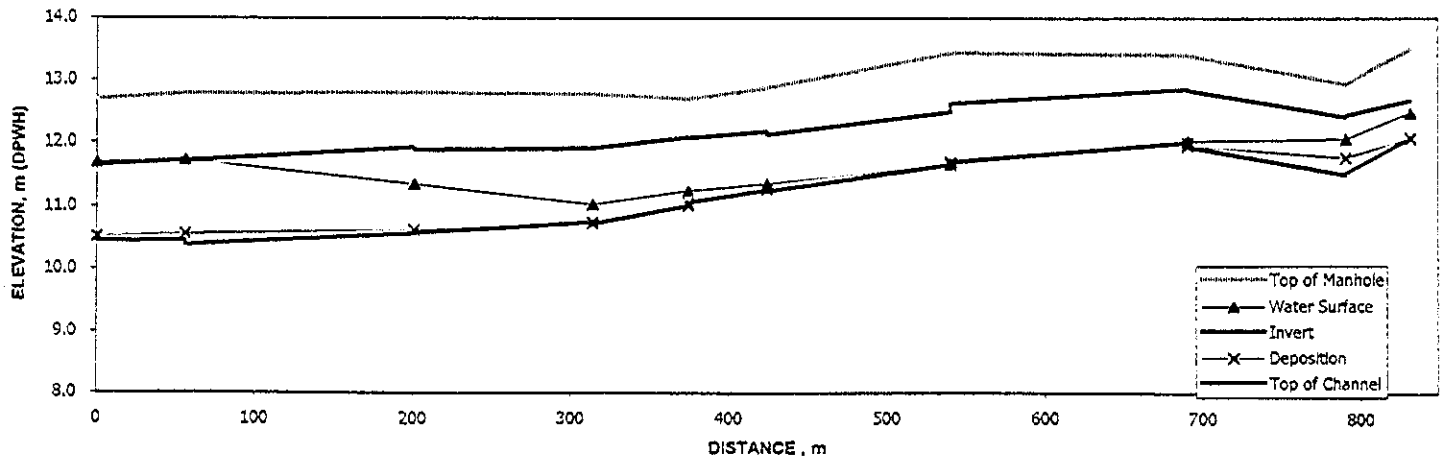


Table 4.1 DRAINAGE CHANNEL PROFILE (26 OF 35)
DRAINAGE MAINS

DM23 ZOBEL ROXAS

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II20C3361	IN	1	4.40	4.40	2.02	100.00		13.00	12.50	11.47	11.12	10.48	0.64
II20C3359	OUT	1	4.40	4.40	2.60		100.00	13.23	12.58	11.57	10.83	9.98	0.85
	IN	1	4.40	4.40	2.52	275.00	100.00	13.23	12.65	11.57	10.83	10.13	0.70
II20C3358	OUT	1	4.33	4.33	2.51		375.00	13.19	12.64	11.41	11.38	10.13	1.25
	IN	1	4.30	4.30	2.48	45.00	375.00	13.19	12.61	11.41	11.38	10.13	1.25
III16A3258	OUT	1	2.84	2.84	2.52		420.00	13.32	12.84	11.45	10.77	10.32	0.45
	IN	1	2.84	2.84	2.33	215.00	420.00	13.32	12.65	11.45	10.77	10.32	0.45
III16A3339	OUT	1	2.90	2.90	2.34		635.00	13.17	12.61	11.47	10.89	10.27	0.62
	IN	1	2.90	2.90	2.26	90.00	635.00	13.17	12.53	11.47	10.89	10.27	0.62
III16A3338	OUT	1	2.80	2.80	2.25		725.00	13.43	12.68	11.48	10.58	10.43	0.15
	IN	1	2.80	2.80	2.25	37.00	725.00	13.43	12.68	11.48	10.58	10.43	0.15
III16A3337	OUT	1			1.22		762.00	13.19	12.42	11.54	11.20	11.20	-
	IN	1			1.22	395.00	762.00	13.19	12.37	11.54	11.15	11.15	-
III16A3336	OUT	1			1.22		1157.00	13.19	12.67	12.19	11.94	11.45	0.49

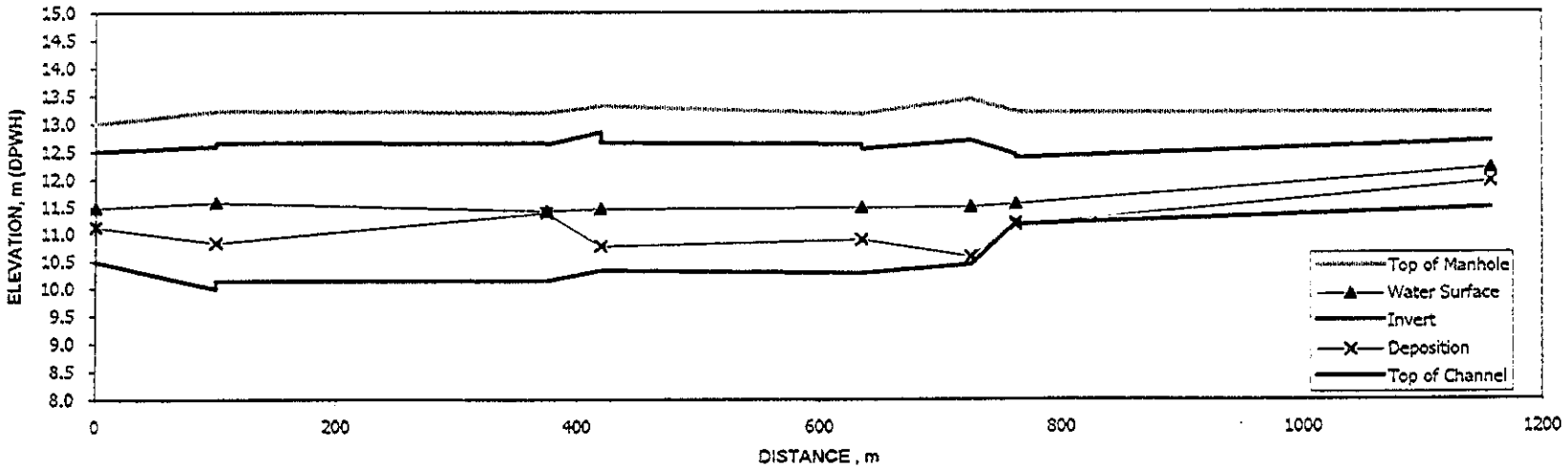


Table 4.1 DRAINAGE CHANNEL PROFILE (27 OF 35)
DRAINAGE MAINS

DM24 EDSA LUMBANG

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III21A1210	IN	1	3.00	3.00	3.70	580.00		12.02	11.72	8.42	8.12	8.02	0.10
III21A1213	OUT	1	3.00	3.00	3.00		580.00	16.36	16.06	13.36	13.11	13.06	0.05
	IN	1	3.00	3.00	3.00	550.00	580.00	16.36	16.06	13.36	13.11	13.06	0.05
III21A1214	OUT	1	5.30	5.30	2.50		1130.00	16.06	15.91	13.41	13.50	13.41	0.09
	IN	1	5.30	5.30	2.50	330.00	1130.00	16.06	15.91	13.41	13.50	13.41	0.09
III21B1061	OUT	2	2.00	2.00	0.95		1460.00	16.94	16.14	15.44	15.37	15.19	0.18
	IN	2	2.00	2.00	0.95	315.00	1460.00	16.94	16.14	15.44	15.37	15.19	0.18
III21B1154	OUT	1	1.50	1.50	0.75		1775.00	18.49	17.19	16.31	16.44	16.44	-
	IN	1			1.07	50.00	1775.00	18.49	17.53	16.31	16.46	16.46	-
III21B1153	OUT	1			1.52		1825.00	18.75	18.10	16.63	16.58	16.58	-
	IN	1			1.52	335.00	1825.00	18.75	18.05	16.63	16.53	16.53	-
III21B1018	OUT	1			1.37		2160.00	20.82	19.77	18.42	18.40	18.40	-

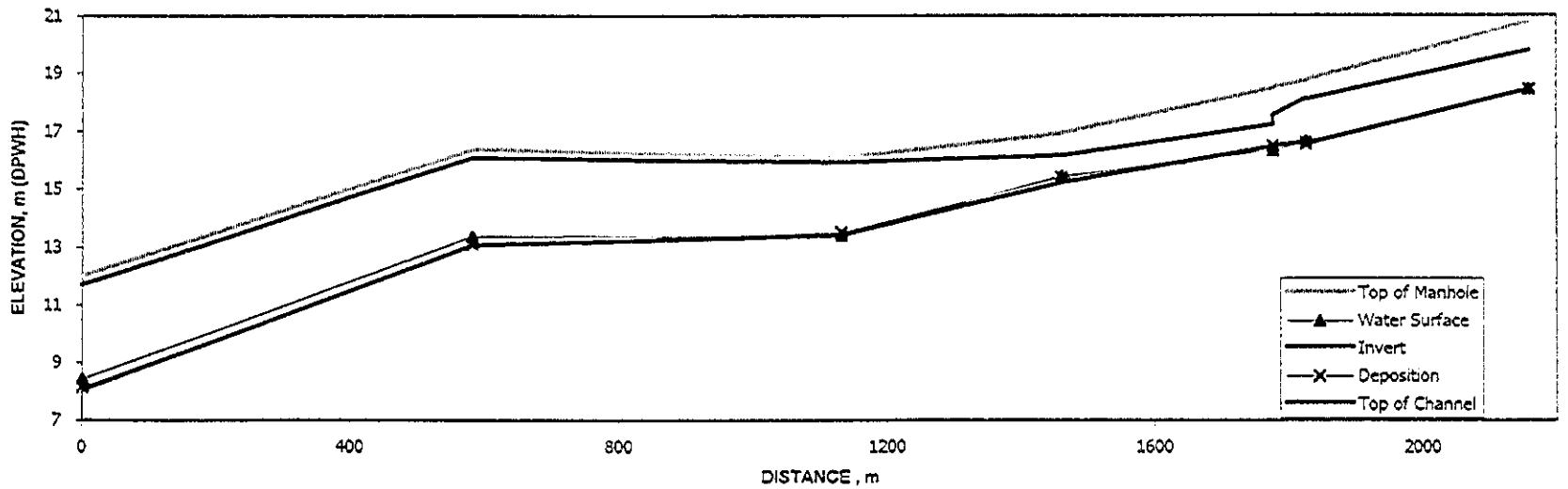


Table 4.1 DRAINAGE CHANNEL PROFILE (28 OF 35)
DRAINAGE MAINS

DM25 ZARAGOSA SUBMAIN

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15A4101	IN	1			0.91	440.00		12.60	10.81	10.81	10.81	9.90	0.91
II15A4075	OUT	1			0.91		440.00	13.32	11.80	11.80	11.80	10.89	0.91

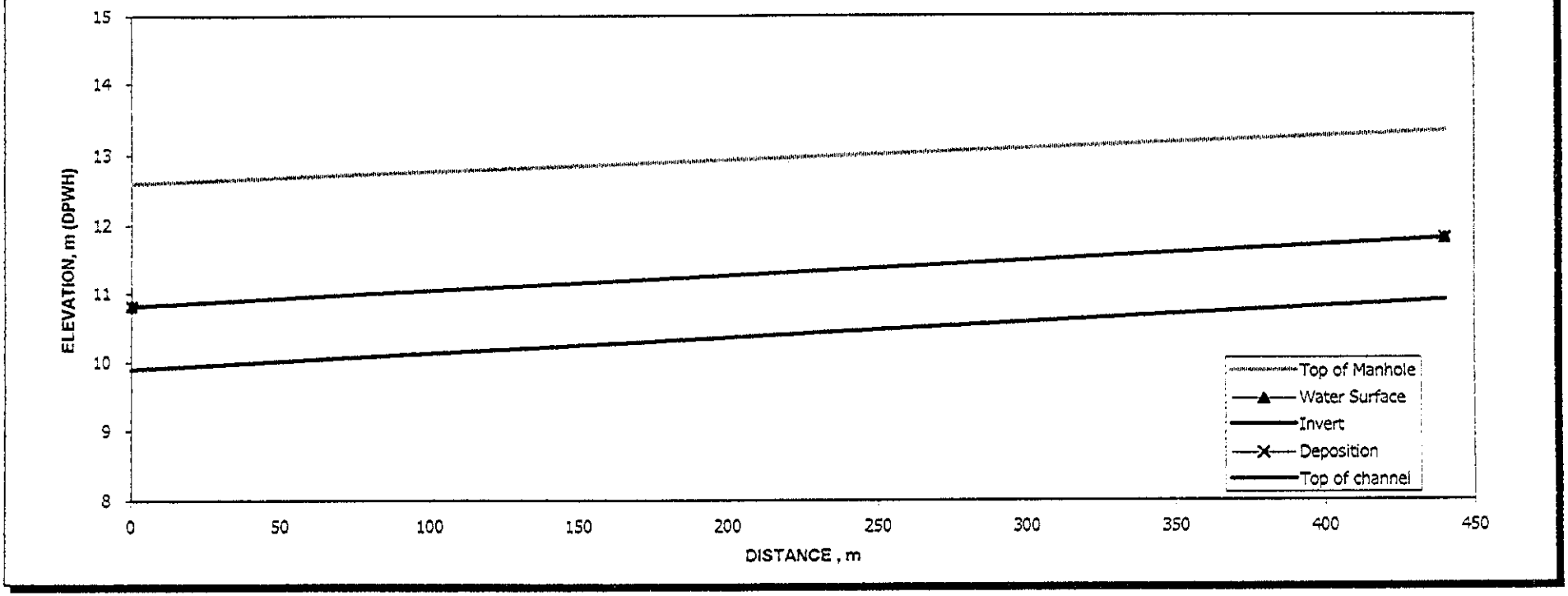


Table 4.1 DRAINAGE CHANNEL PROFILE (29 OF 35)
DRAINAGE MAINS

DM26 PAMPANGA - EARNSHAW

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II1SA2101	IN	2	2.80	2.80	3.36	120.00		12.38	10.58	9.98	8.00	7.22	0.78
II1SA2102	OUT	2	2.80	2.80	2.60		120.00	11.59	10.79	10.53	8.49	8.19	0.30
	IN	2	2.70	2.70	2.50	366.00	120.00	11.59	10.79	10.53	8.49	8.29	0.20
II1SB2020	OUT	2	2.70	2.70	2.50		486.00	11.93	11.18	10.93	8.68	8.68	-
	IN	2	2.60	2.60	2.40	150.00	486.00	11.93	11.18	10.93	8.78	8.78	-
II1SB2016	OUT	2	2.60	2.60	2.40		636.00	11.55	10.60	10.58	8.85	8.20	0.65
	IN	1	3.20	3.20	2.40	10.00	636.00	11.55	10.75	10.58	8.85	8.35	0.50
II1SB2040	OUT	1	3.20	3.20	2.40		646.00	11.58	10.82	10.64	9.15	8.42	0.73
	IN	1	3.20	3.20	2.40	118.00	646.00	11.58	10.81	10.64	9.15	8.41	0.74
II1SB2041	OUT	1	3.20	3.20	2.40		764.00	11.54	10.67	10.69	9.66	8.27	1.39
	IN	1	2.30	2.30	2.20	115.00	764.00	11.54	10.78	10.69	9.66	8.58	1.08
II1SB2042	OUT	1	2.20	2.20	2.20		879.00	11.61	10.95	10.82	9.71	8.75	0.96
	IN	1	2.20	2.20	2.20	52.00	879.00	11.61	10.97	10.82	9.71	8.77	0.94
II1SB2048	OUT	1	2.20	2.20	2.20		931.00	11.67	11.04	10.96	9.84	8.84	1.00
	IN	1	2.20	2.20	2.20	93.00	931.00	11.67	11.04	10.96	9.84	8.84	1.00
II1SB2049	OUT	1	2.20	2.20	2.20		1024.00	11.82	11.04	10.97	10.27	8.84	1.43

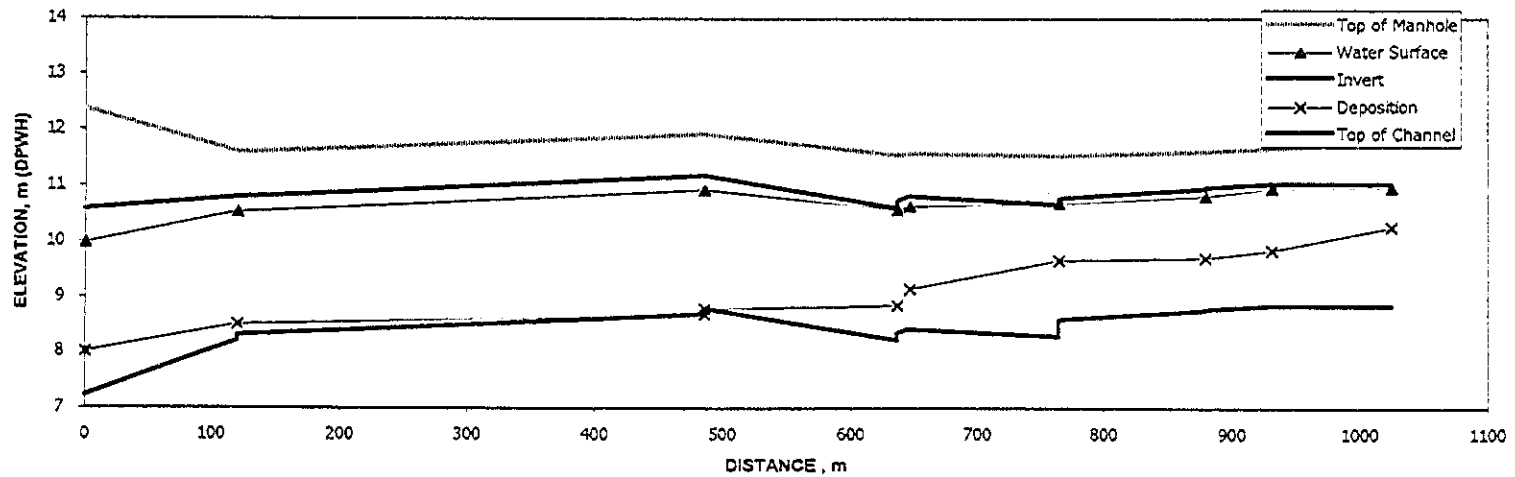


Table 4.1 DRAINAGE CHANNEL PROFILE (30 OF 35)
DRAINAGE MAINS

DM27 BUENDIA

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15B2245	IN	1	3.00	3.00	2.40	30.00		11.86	10.51	9.79	8.20	8.11	0.09
II15B2243	OUT	1	2.50	2.50	2.26		30.00	11.62	10.50	9.69	8.30	8.24	0.06
	IN	1	2.50	2.50	2.20	144.00	30.00	11.62	10.55	9.69	8.35	8.35	-
II15A2063	OUT	1	2.50	2.50	1.93		174.00	11.57	10.35	9.74	9.37	8.42	0.95
	IN	1	2.50	2.50	2.10	145.09	174.00	11.57	10.37	9.74	9.37	8.27	1.10
II15A2053	OUT	1	2.50	2.50	1.67		319.09	11.52	10.32	9.52	9.28	8.65	0.63
	IN	1	2.50	2.50	1.67	71.84	319.09	11.52	10.32	9.52	9.28	8.65	0.63
II15A2036	OUT	1	2.50	2.50	1.70		390.93	12.11	10.27	9.55	9.57	8.57	1.00
	IN	1	2.50	2.50	1.60	10.50	390.93	12.11	10.34	9.55	9.57	8.74	0.83
II15A2033	OUT	1	2.50	2.50	1.70		401.43	12.06	10.30	9.46	9.03	8.60	0.43
	IN	1	2.50	2.50	1.50	151.19	401.43	12.06	10.33	9.46	9.03	8.83	0.20
II15A2051	OUT	1	2.40	2.40	2.10		552.62	11.78	10.38	9.53	8.83	8.28	0.55

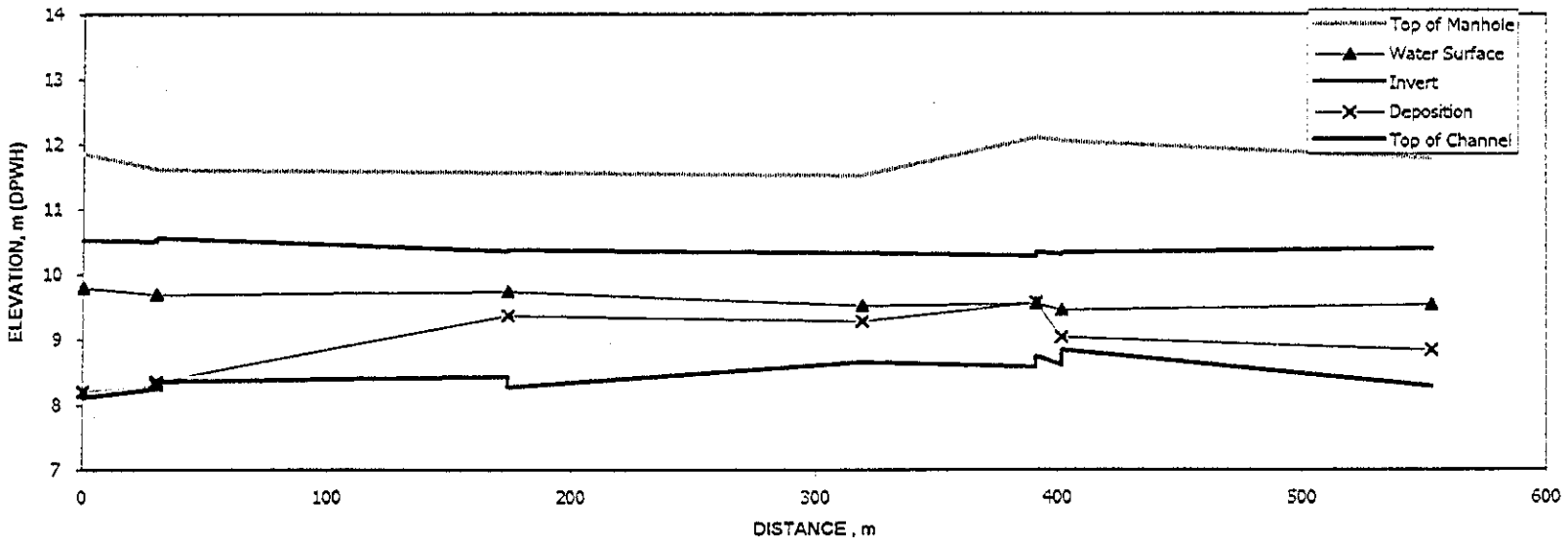


Table 4.1 DRAINAGE CHANNEL PROFILE (31 OF 35)
DRAINAGE MAIN

DM28 SOUTH ANTIPOLO

MANHOLE CODE NO.	SECTION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
III583161	IN	1	4.50	4.50	2.41	83.00		12.89	12.19	11.78	11.99	9.78	2.21
III583168	OUT	1	4.50	4.50	2.28		83.00	13.26	12.36	12.01	12.21	10.08	2.13
	IN	1	4.50	4.50	2.28	92.00	83.00	13.26	12.36	12.01	12.21	10.08	2.13
III5C3001	OUT	1	4.50	4.50	2.17		175.00	13.17	12.37	12.37	11.99	10.20	1.79
	IN	1	4.50	4.50	2.17	88.58	175.00	13.17	12.37	12.37	11.99	10.20	1.79
III5C3002	OUT	1	4.48	4.48	2.00		263.58	12.96	12.26	11.96	11.96	10.26	1.70
	IN	1	4.48	4.48	2.00	176.10	263.58	12.96	12.26	11.96	11.96	10.26	1.70
III5C3003	OUT	1	4.45	4.45	2.60		439.68	12.59	11.69	11.69	10.99	9.09	1.90
	IN	1	4.45	4.45	2.60	11.72	439.68	12.59	11.69	11.69	10.99	9.09	1.90
III5C3004	OUT	1	3.10	3.10	1.85		451.40	12.54	11.54	11.54	10.75	9.69	1.06
	IN	1	4.45	4.45	3.00	36.96	451.40	12.54	11.54	11.54	10.75	8.54	2.21
III5C3005	OUT	1	4.40	4.40	2.25		488.36	12.58	11.81	11.81	10.59	9.56	1.03
	IN	1	4.44	4.44	2.33	7.85	488.36	12.58	11.89	11.89	10.59	9.56	1.03
III5C3006	OUT	1	4.15	4.15	2.29		496.21	12.36	11.53	11.53	10.68	9.24	1.44
	IN	1	4.15	4.15	2.25	39.27	496.21	12.36	11.49	11.49	10.68	9.24	1.44
III5C3007	OUT	1	4.20	4.20	2.38		535.48	12.46	11.54	11.54	10.17	9.16	1.01
	IN	1	4.20	4.20	2.38	45.31	535.48	12.46	11.54	11.54	10.17	9.16	1.01
III5C3008	OUT	1	4.41	4.41	2.32		580.79	12.51	11.54	11.54	10.79	9.22	1.57
	IN	1	4.41	4.41	2.32	43.21	580.79	12.54	11.54	11.54	10.79	9.22	1.57
III5C3009	OUT	1	4.45	4.45	2.05		624.00	12.55	11.60	11.60	10.68	9.55	1.13
	IN	1	4.45	4.45	2.15	41.53	624.00	12.55	11.70	11.70	10.68	9.55	1.13
III5C3010	OUT	1	4.20	4.20	2.67		665.53	12.61	12.06	11.98	10.36	9.39	0.97
	IN	1	4.20	4.20	2.67	47.84	665.53	12.61	12.06	11.98	10.36	9.39	0.97
III5C3352	OUT	1	4.30	4.30	2.38		713.37	12.72	11.57	11.57	10.87	9.19	1.68
	IN	1	4.30	4.30	2.38	145.46	713.37	12.72	11.57	11.57	10.87	9.19	1.68
III5C3281	OUT	1	4.00	4.00	2.10		858.83	12.82	11.72	11.72	10.07	9.62	0.45
	IN	1	4.00	4.00	2.15	36.34	858.83	12.82	11.77	11.77	10.07	9.62	0.45
III5C3353	OUT	1	4.30	4.30	2.80		895.17	12.75	11.85	11.85	10.55	9.05	1.50
	IN	1	4.30	4.30	2.85	43.23	895.17	12.75	11.90	11.90	10.55	9.05	1.50
III5C3354	OUT	1	4.20	4.20	2.40		938.40	12.56	11.96	11.96	10.55	9.56	0.99
	IN	1	4.20	4.20	2.40	61.37	938.40	12.56	11.96	11.96	10.55	9.56	0.99
III5C3282	OUT	1	4.30	4.30	2.28		999.77	12.66	11.56	11.56	10.06	9.28	0.78
	IN	1	4.30	4.30	2.28	169.78	999.77	12.66	11.56	11.56	10.06	9.28	0.78
III5C3289	OUT	1	3.00	3.00	2.34		1169.55	12.58	11.95	11.95	10.29	9.61	0.68
	IN	1	3.00	3.00	2.34	157.28	1169.55	12.58	11.95	11.95	10.29	9.61	0.68
III5C3355	OUT	1	2.00	2.00	2.14		1326.83	12.20	11.54	11.54	10.66	9.40	1.26

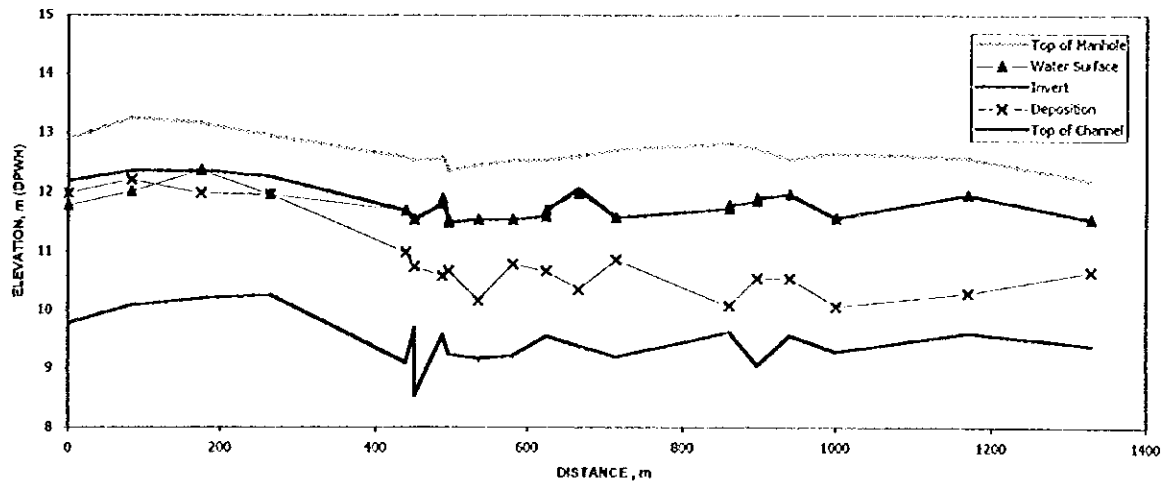


Table 4.1 DRAINAGE CHANNEL PROFILE (32 OF 35)
DRAINAGE MAINS

DM29 TAYUMAN

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
H15B3204	IN	1	2.81	2.81	2.40	23.00		12.82	10.29	10.29	9.50	7.89	1.61
H15B3090	OUT	1	3.10	3.10	1.68		23.00	12.64	10.28	10.28	9.49	8.60	0.89
	IN	1	3.10	3.10	1.68	150.00	23.00	12.64	10.28	10.28	9.49	8.60	0.89
H15B3023	OUT	1	2.98	2.98	1.36		173.00	11.96	10.27	10.27	10.27	8.91	1.36
	IN	1	2.98	2.98	1.36	110.00	173.00	11.96	10.27	10.27	10.27	8.91	1.36
H15B3024	OUT	1	2.46	2.46	1.64		283.00	12.46	10.41	10.41	10.37	8.77	1.60
	IN	1	2.46	2.46	1.64	105.00	283.00	12.46	10.41	10.41	10.37	8.77	1.60
H15B3034	OUT	1	2.12	2.12	1.73		388.00	12.25	10.48	10.48	10.43	8.75	1.68
	IN	1	2.12	2.12	1.73	98.00	388.00	12.25	10.48	10.48	10.43	8.75	1.68
H15B3036	OUT	1	2.26	2.26	1.72		486.00	11.99	10.68	10.68	10.68	8.96	1.72
	IN	1	2.26	2.26	1.72	125.00	486.00	11.99	10.68	10.68	10.68	8.96	1.72
H15B3054	OUT	1	2.34	2.34	1.70		611.00	11.87	10.66	10.66	9.86	8.96	0.90
	IN	1	2.34	2.34	1.70	286.00	611.00	11.87	10.66	10.66	9.86	8.96	0.90
H15B3061	OUT	1	2.34	2.34	1.67		897.00	12.09	10.52	10.52	10.52	8.85	1.67
	IN	1	1.91	1.91	1.67	114.00	897.00	12.09	10.74	10.74	10.74	9.07	1.67
H15B3097	OUT	1	1.85	1.85	1.58		1011.00	12.18	10.91	10.91	10.14	9.33	0.81
	IN	1	1.85	1.85	1.58	96.00	1011.00	12.18	10.91	10.91	10.14	9.33	0.81
H15B3112	OUT	1	1.95	1.95	1.48		1107.00	12.25	10.84	10.84	10.84	9.36	1.48
	IN	1	1.95	1.95	1.48	98.00	1107.00	12.25	10.84	10.84	10.84	9.36	1.48
H15B3122	OUT	1	1.93	1.93	1.50		1205.00	12.40	10.74	10.74	9.94	9.24	0.70
	IN	1	1.93	1.93	1.50	118.00	1205.00	12.40	10.74	10.74	9.94	9.24	0.70
H15B3136	OUT	1	1.90	1.90	1.89		1323.00	12.99	12.69	11.46	11.35	10.80	0.55

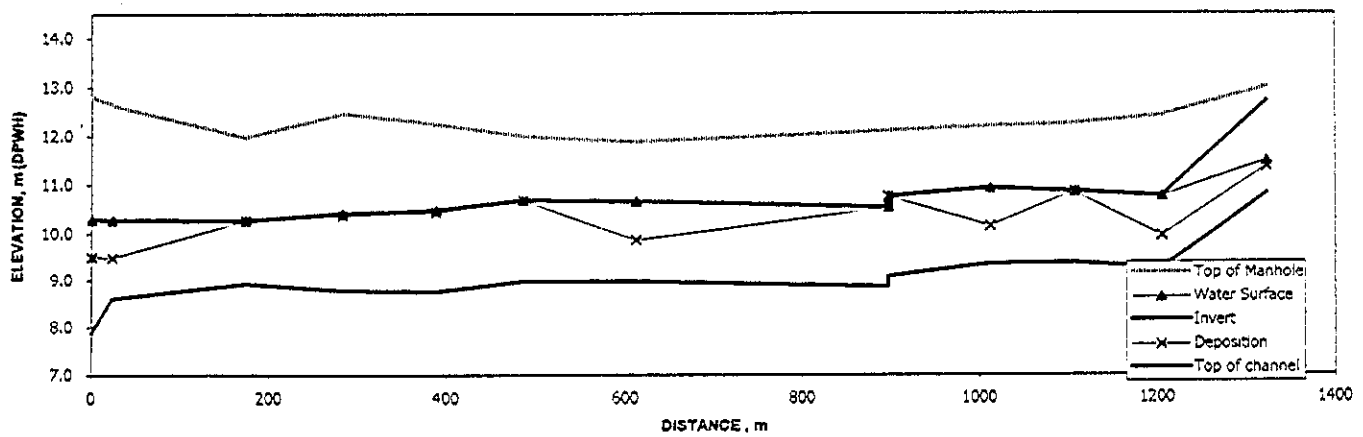


Table 4.1 DRAINAGE CHANNEL PROFILE (33 OF 35)
DRAINAGE MAINS

DM30 LEPANTO - GOV. FORBES

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15C4178	IN	3	3.68	3.68	3.15	148.36		12.51	11.66	10.91	9.11	8.51	0.60
II15C4108	OUT	3	3.64	3.64	2.91		148.36	12.56	11.81	10.46	9.76	8.90	0.86
	IN	3	3.64	3.64	2.91	534.71	148.36	12.56	11.81	10.46	9.76	8.90	0.86
II15C4101	OUT	3	4.00	4.00	1.75		683.07	12.23	11.13	10.43	10.00	9.38	0.62
	IN	3	4.00	4.00	1.75	82.63	683.07	12.23	11.13	10.43	10.00	9.38	0.62
II15C4068	OUT	3	3.80	3.80	2.12		765.70	12.42	11.07	10.45	9.21	8.95	0.26
	IN	3	3.80	3.80	2.14	67.70	765.70	12.42	11.09	10.45	9.21	8.95	0.26
II15C4067	OUT	3	3.54	3.54	2.10		833.40	12.42	11.07	10.45	9.27	8.97	0.30
	IN	3	3.54	3.54	2.10	259.80	833.40	12.42	11.07	10.45	9.27	8.97	0.30
II15C4093	OUT	3	3.40	3.40	2.25		1093.20	12.15	11.20	10.48	9.48	8.95	0.53
	IN	3	3.40	3.40	2.25	51.03	1093.20	12.15	11.20	10.48	9.48	8.95	0.53
II15C4092	OUT	3	3.40	3.40	2.25		1144.23	12.15	11.20	10.48	9.45	8.95	0.50

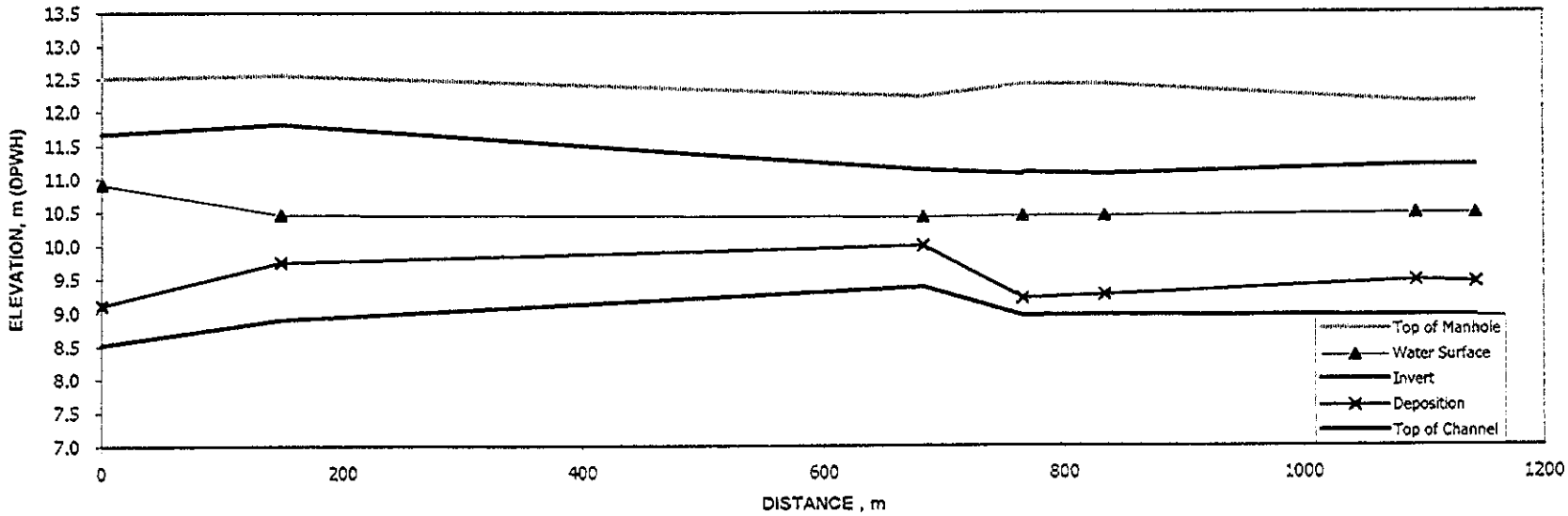


Table 4.1 DRAINAGE CHANNEL PROFILE (34 OF 35)
DRAINAGE MAINS

DM32 G. PERFECTO

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
II15B3206	IN	1	5.80	5.80	2.31	110.00		12.49	11.44	10.50	9.30	9.13	0.17
II15B3013	OUT	1	5.80	5.80	2.70		110.00	12.11	11.76	10.58	9.52	9.06	0.46
	IN	1	5.80	5.80	2.70	130.00	110.00	12.11	11.76	10.58	9.52	9.06	0.46
II15B3014	OUT	1	4.50	4.50	1.83		240.00	11.80	11.21	10.76	10.31	9.38	0.93
	IN	1	4.50	4.50	1.83	15.00	240.00	11.80	11.21	10.76	10.31	9.38	0.93
II15B3216	OUT	1	4.50	4.50	2.00		255.00	11.93	11.30	10.80	11.30	9.30	2.00
	IN	1	4.50	4.50	2.00	100.00	255.00	11.93	11.30	10.80	11.30	9.30	2.00
II15B3217	OUT	1	3.35	3.35	2.44		355.00	12.83	11.63	10.87	11.47	9.19	2.28

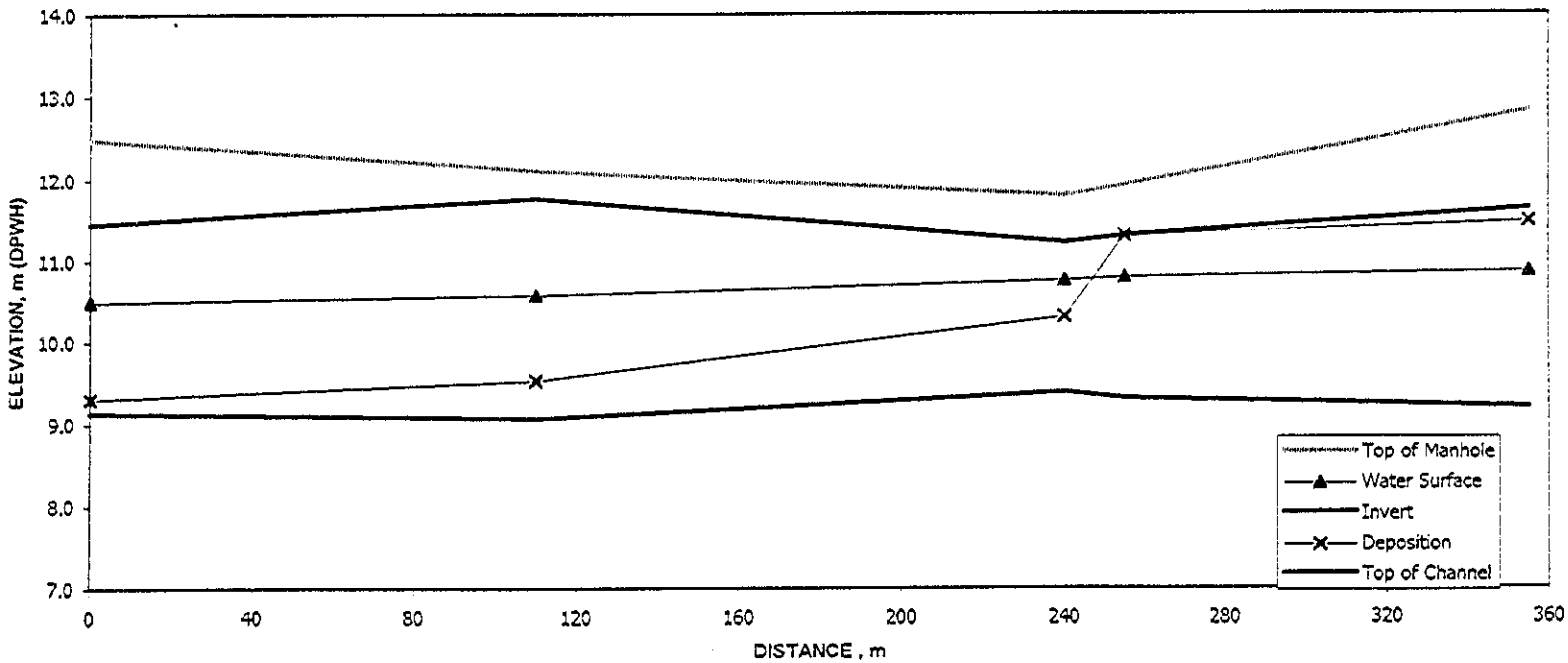
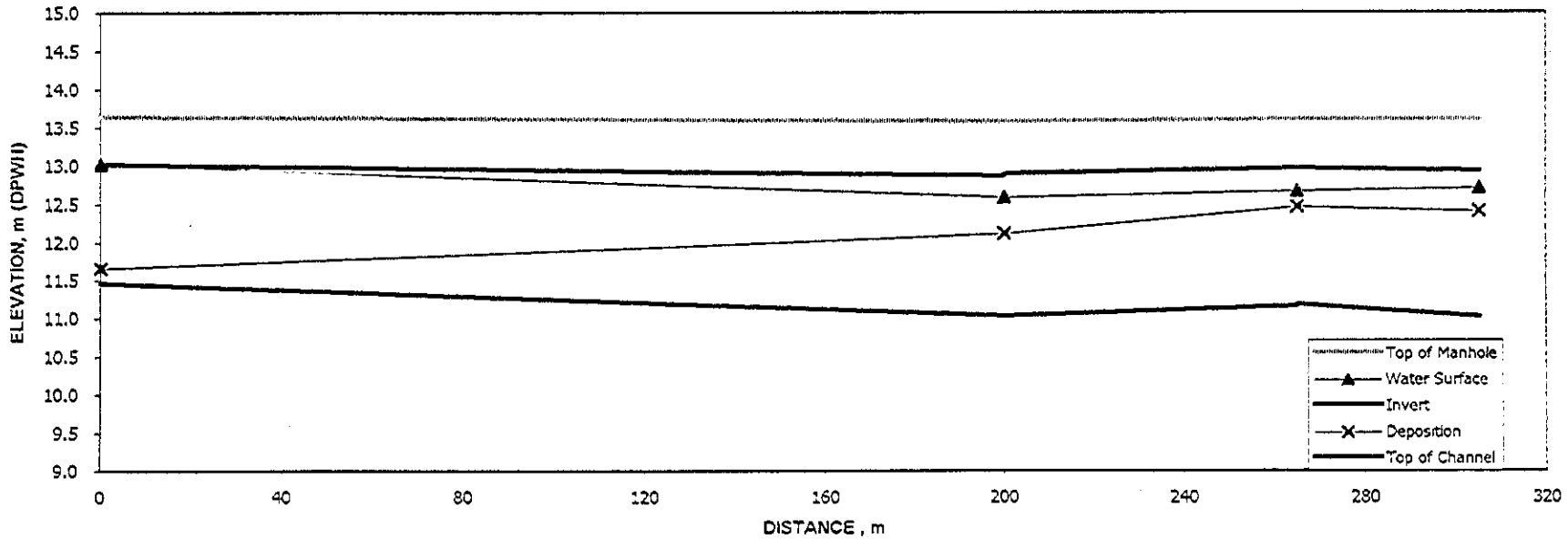


Table 4.1 DRAINAGE CHANNEL PROFILE (35 OF 35)
DRAINAGE MAINS

DM33 PASONG TAMO

MANHOLE CODE NO.	LOCATION	MEASURED CHANNEL DIMENSIONS, m				DISTANCE BETWEEN MANHOLES (m)	CUMULATIVE DISTANCE (m)	ELEVATION, m					DEPOSITION DEPTH
		NO. OF CELLS	TOP WIDTH	BOTTOM WIDTH	DEPTH / DIA.			TOP OF MANHOLE LEVEL	TOP OF CHANNEL LEVEL	WATER SURFACE LEVEL	SAND/ SILT DEPOSITION LEVEL	INVERT ELEVATION OUTLET/INLET	
OF332	IN	1	3.50	3.50	1.55	200.00		13.64	13.01	13.01	11.66	11.46	0.20
III16A3257	OUT	1	3.44	3.44	1.83		200.00	13.58	12.86	12.59	12.12	11.03	1.09
	IN	1	3.44	3.44	1.86	65.00	200.00	13.58	12.89	12.59	12.12	11.03	1.09
III16A3256	OUT	1	3.45	3.45	1.80		265.00	13.60	12.96	12.66	12.46	11.16	1.30
	IN	1	3.45	3.45	1.78	40.00	265.00	13.60	12.96	12.66	12.46	11.18	1.28
III16A3255	OUT	1	4.05	4.05	1.90		305.00	13.60	12.92	12.70	12.40	11.02	1.38



LIST OF DRAINAGE CHANNEL PROFILE
DRAINAGE LATERALS
NORTH MANILA

NO.	NORTH MANILA	
	Code	Name
1	NL001	IMELDA/HERBOSA (C-2 RD-HERBOSA-OSMENA)
2	NL002	LACSON/HERBOSA/OSMENA (PANDAY PIRA-HERBOSA-OSMENA-PACHECO-DM03)
3	NL003	VARONA (HERBOSA-PACHECO-DM03)
4	NL004	MORIONES/NOLASCO/MORGA (MASINOP-NOLASCO-MORGA-ASUNCION-DM04)
5	NL005	HONORIO LOPEZ BLVD -RIGHT SIDE (JUAN LUNA-DEL ROSARIO-DM26)
6	NL006	FRANCO (HERBOSA-PACHECO-DM03)
7	NL007	JUAN LUNA-LEFT SIDE (H LOPEZ BLVD-DEL FIERRO-DM02)
8	NL008	JUAN LUNA-RIGHT SIDE (MA GUIZON-SOLIS-DM02)
9	NL009	JUAN LUNA-LEFT SIDE (BENITA-EST03)
10	NL010	C M RECTO -LEFT SIDE (STO CRISTO-EST05)
11	NL011	DAGUPAN (CORAL-TAYUMAN-DM29)
12	NL012	ANTONIO RIVERA/MAYHALIGUE/J ABAD SANTOS (C M RECTO-MAYHALIGUE-J ABAD SANTOS- C M RECTO)
13	NL013	JOSE ABAD SANTOS-LEFT SIDE (MAYHALIGUE-TAYUMAN-DM29)
14	NL014	JOSE ABAD SANTOS-RIGHT SIDE (BATANGAS-TAYUMAN-DM29)
15	NL015	JOSE ABAD SANTOS-LEFT SIDE (ANTIPOLO-TAYUMAN-DM29)
16	NL016	JOSE ABAD SANTOS-RIGHT SIDE (ANTIPOLO-SOLIS-DM02)
17	NL017	JOSE ABAD SANTOS-LEFT SIDE (RIZAL AVE EXT-SOLIS-DM02)
18	NL018	S HERRERA (SEVERINO REYES-EST06)
19	NL019	TAYABAS (T MAPUA-EST06)
20	NL020	IPIL (T BUGALLON-ANTIPOLO-EST09)
21	NL023	MAYHALIGUE/F HUERTAS (RIZAL AVE-F HUERTAS-FUGOSO-DM05)
22	NL024	OROQUIETA (MALABON-FUGOSO-DM05)
23	NL025	OROQUIETA (ANTIPOLO-TAYUMAN-DM29)
24	NL026	P GUEVARRA (TAYUMAN-FUGOSO-DM05)
25	NL027	F HUERTAS (BATANGAS-TAYUMAN-DM29)
26	NL028	CARLOS PALANCA/PADILLA/NEPOMUCENO (ELIZONDO-P CASAL EXT-J NEPOMUCENO-EST15)
27	NL029	M V DELOS SANTOS-RIGHT SIDE (C TORTUOSA-LEGARDA)
28	NL030	M V DELOS SANTOS-LEFT SIDE (C TORTUOSA-LEGARDA)
29	NL031	LAONGLAAN/GOV FORBES/ESPAÑA (ANDALUCIA-GOV FORBES-ESPAÑA-P CAMPA)
30	NL032	DIMASALANG/GOV FORBES/ESPAÑA (CONSTANCIA-LAONGLAAN-ESPAÑA-N REYES)
31	NL033	M EARNSHAW/ESPAÑA (SULUCAN-GOV FORBES-ESPAÑA)
32	NL034	ESPAÑA-RIGHT SIDE (KUNDIMAN-VICENTE CRUZ-DM08)
33	NL035	ESPAÑA-LEFT SIDE (CRAIG-VICENTE CRUZ-DM08)
34	NL036	ESPAÑA-RIGHT SIDE (QUEZON CITY CIRCLE-CRAIG-DM07)
35	NL037	DAPITAN/ANTIPOLO (JOSEFINA-ANTIPOLO-EST12)
36	NL038	LAONGLAAN/ANTIPOLO (MUSA-ANTIPOLO-MARIA CLARA)
37	NL039	ANDRES BONIFACIO (WACAT-BLUMENTRITT-DM01)
38	NL040	LAONGLAAN (CONSTANCIA-GOV FORBES)
39	NL041	AMORANTO/MAYON/CALAMBA-RIGHT SIDE (KANLAON-MAYON-CALAMBA-BLUMENTRITT-DM01)
40	NL042	APO/CALAMBA-LEFT SIDE (AMORANTO-CALAMBA-BLUMENTRITT-DM01)
41	NL043	MAYON/M CUENCO (DAPITAN-M CUENCO-BLUMENTRITT-DM01)
42	NL044	CORDILLERA/QUEZON AVE/D TUAZON/DATA/MATIMYAS
43	NL045	MATIMYAS-RIGHT SIDE (T ALFONSO-JOSEFINA III-DM07)
44	NL046	MATIMYAS-LEFT SIDE (ALEX-JOSEFINA III-DM07)
45	NL047	ALGECIRAS/SOBRIEDAD/VICENTE CRUZ/HONRADEZ (FAJARDO-SOBRIEDAD-HONRADEZ-GOV FORBES-DM30)
46	NL048	ANZURES/E QUINTOS/ANTIPOLO/G TUAZON/PRUDENCIO (SOBRIEDAD-E QUINTOS-ANTIPOLO-G TUAZON-EST16)
47	NL049	LUZON/NEGROS (BOHOL-NEGROS-VISAYAN AVE-DM10)
48	NL050	SANTOL/MINDANAO/CEBU -RIGHT SIDE (G TUAZON-MINDANAO-CEBU-VISAYAN-DM10)
49	NL051	PIÑA AVE (SANTOL-MINDANAO AVE.)
50	NL053	PUREZA (R MAGSAYSAY AVE-ANONAS)
51	NL054	OLD STA MESA/ALBINA/ALTURA EXT/R MAGSAYSAY/HIPODROMO/ANONAS
52	NL055	F HUERTAS (BATANGAS-ANTIPOLO-EST10)
53	NL056	TAYUMAN-(KATAMANAN-JUAN LUNA-EST05)