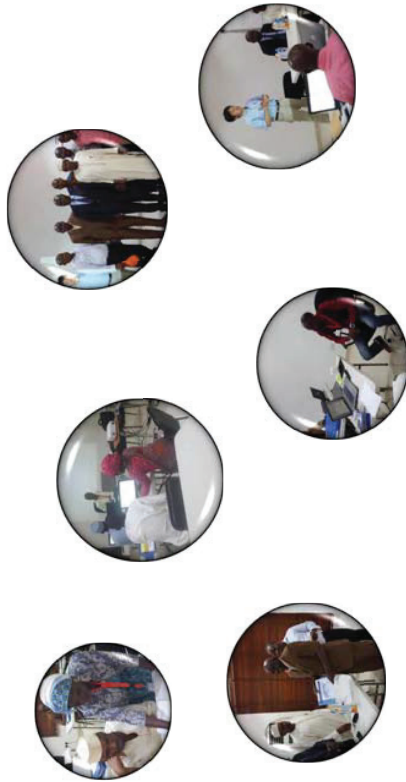


Annex 9:

Report of GIS Training



# WORK ACTIVITY REPORT ON THE TRAINING OF 8 FEDERAL CAPITAL TERRITORY WATER BOARD (FCTWB) STAFF ON GEOGRAPHICAL INFORMATION SYSTEM (GIS) IN THE FEDERAL CAPITAL TERRITORY REDUCTION OF NON-REVENUE WATER PROJECT COVERING INTRODUCTION TO GIS, BASIC ARC GIS AND GEOMEDIA ESSENTIALS



Submitted By:  
**SLL-SPATIAL LAYERS LTD**  
Plot 2121 Ndola Crescent,  
Wuse Zone 5, Abuja, FCT  
+2349084964077  
[Sllspatiallayersltd@yahoo.co.uk](mailto:Sllspatiallayersltd@yahoo.co.uk)

Submitted To:  
Akinori Miyoshi  
Chief Advisor  
JICA Expert Team



Friday 4<sup>th</sup> December, 2015

## Contents

|  |     |
|--|-----|
| List of Figures.....   | 3   |
| List of Tables.....  | 4   |
| Covering Letter.....   | 5   |
| Recommendations from the Trainees.....   | 6   |
| Proffered Solution(s) to the Recommendations from the Trainees by the Instructor.....  | 6   |
| Training record in bar chart and table from contract signing to report submission..... | 7   |
| Approved summary sheet of the Training.....  | 11  |
| Course content and outline.....  | 12  |
| Course programme (time schedule).....  | 17  |
| Training Schedule for Theoretical Classes:.....  | 17  |
| Training Schedule for Practical Classes:.....  | 17  |
| Fieldwork Schedule:.....   | 18  |
| Name and Experience of the assigned lecturer and his associate lecturers.....          | 18  |
| Training Materials distributed.....  | 31  |
| Evaluation of capacity development of the trainees before and after the Training.....  | 32  |
| Evaluation of capacity development of the trainees before the Training.....            | 33  |
| Summary of evaluation of capacity development of the trainees before training.....     | 37  |
| Evaluation of capacity development of the trainees after the Training.....             | 38  |
| Self-evaluation of the Training/Instructor based on questionnaire to the trainees..... | 39  |
| Evaluation of trainee's understanding based on test.....                               | 41  |
| Training Test Result.....  | 44  |
| Training Test Output for the trainees.....   | 46  |
| Appendix.....  | 52  |
| Training Exercise Pictures.....  | 53  |
| Distributed Training Questionnaires.....   | 65  |
| Training Certificates.....   | 132 |
| Attendance List for the Training Exercise.....   | 141 |
| Training Manuals.....  | 149 |

**List of Figures**

|   |    |
|---|----|
| Figure 1: Training Evaluation before Training.....  | 7  |
| Figure 2: Training Evaluation after Training Exercise.....  | 8  |
| Figure 3: The Trainee Attendance Record.....  | 9  |
| Figure 4: Training Attendance per Day.....  | 10 |
| Figure 5: Evaluation of the Trainees after the Training.....  | 38 |
| Figure 6: General Training Evaluation.....  | 40 |
| Figure 7: Training Workshop/Presentation Summary Chart.....   | 40 |
| Figure 8: GeoMedia Test Result (Bar Chart).....   | 44 |
| Figure 9: ArcGIS Test Result (Bar Chart).....   | 45 |
| Figure 10: Shehu Suleiman's GeoMedia Test Result/Output.....  | 46 |
| Figure 11: Abdul Muhammed's GeoMedia Test Result/Output.....  | 47 |
| Figure 12: Abdulrahman Shehu's GeoMedia Test Result/Output.....   | 47 |
| Figure 13: Abubakar Ubale Abubakar's GeoMedia Test Result/Output.....   | 47 |
| Figure 14: Wasiu Olajide's GeoMedia Test Result/Output.....   | 48 |
| Figure 15: Abdul Muhammed's ArcGIS Test Result/Output.....  | 49 |
| Figure 16: Abubakar Ubale Abubakar's ArcGIS Test Result/Output.....   | 49 |
| Figure 17: Abdulrahman Shehu's ArcGIS Test Result/Output.....   | 50 |
| Figure 18: Shehu Suleiman's ArcGIS Test Result/Output.....  | 50 |
| Figure 19: Hillary Eze's ArcGIS Test Result/Output.....   | 51 |
| Figure 20: Wasiu Olajide's ArcGIS Test Result/Output.....   | 51 |
| Figure 21: Training Picture - Training Day 1.....   | 53 |
| Figure 22: Training Picture - Training Day 1.....   | 53 |
| Figure 23: Training Picture - Training Day 2.....   | 54 |
| Figure 24: Training Picture - Training Day 2.....   | 54 |
| Figure 25: Training Picture - Training Day 3.....   | 55 |
| Figure 26: Training Picture - Training Day 3.....   | 55 |
| Figure 27: Training Picture - Training Day 4.....   | 56 |
| Figure 28: Training Picture - Training Day 4.....   | 56 |
| Figure 29: Training Picture - Training Day 5.....   | 57 |
| Figure 30: Training Picture - Training Day 5.....   | 57 |
| Figure 31: Training Picture - Training Day 6.....   | 58 |
| Figure 32: Training Picture - Training Day 7.....   | 59 |
| Figure 33: Presentation of Training Certificates.....   | 59 |
| Figure 34: Presentation of Training Certificate (Abdulrahman Muhammed).....                                       | 60 |
| Figure 35: Presentation of Training Certificate (Wasiu Olajide).....  | 60 |
| Figure 36: Presentation of Training Certificate (Abubakar Ubale Abubakar).....                                    | 61 |
| Figure 37: Presentation of Training Certificate (Abdulrahman Shehu Sani).....                                     | 61 |
| Figure 38: Presentation of Training Certificate (Eze C. Hillary).....   | 62 |
| Figure 39: Presentation of Training Certificate (Ifechukwu I. Justin).....  | 62 |
| Figure 40: Presentation of Training Certificate (Shehu Suleiman).....   | 63 |
| Figure 41: Presentation of Training Certificate (Moh. Kabir Rabi'u).....  | 63 |
| Figure 42: Group Photograph of the Instructor's Team, JICA Representative, FCTWB Management and the Trainees..... | 64 |

**List of Tables**

|   |    |
|---|----|
| Table 1: Trainee Evaluation before the Training Exercise..... | 7  |
| Table 2: Trainee Evaluation after the Training Exercise.....  | 8  |
| Table 3: Training Attendance Register.....                    | 9  |
| Table 4: Training Schedule for Theoretical Classes.....       | 17 |
| Table 5: Training Schedule for Practical Classes.....         | 18 |
| Table 6: Fieldwork Schedule.....                              | 18 |
| Table 7: Questionnaire Compendium 1.....                      | 34 |
| Table 8: Questionnaire Compendium 2.....                      | 35 |
| Table 9: Questionnaire Compendium 3.....                      | 36 |
| Table 10: Questionnaire Compendium 4.....                     | 37 |
| Table 11: Summary of Trainee Evaluation before Training.....  | 37 |
| Table 12: Trainee Evaluation after the Training Exercise..... | 38 |
| Table 13: Training Test Results.....                          | 44 |

Covering Letter

Akinori Miyoshi  
Chief Advisor  
JICA Expert Team

Sir,

**WORK ACTIVITY REPORT ON TRAINING OF 8 FEDERAL CAPITAL TERRITORY WATER BOARD (FCTWB) STAFF ON GEOGRAPHICAL INFORMATION SYSTEM (GIS) IN THE FEDERAL CAPITAL TERRITORY REDUCTION OF NON-REVENUE WATER PROJECT COVERING INTRODUCTION TO GIS, BASIC ARCGIS AND GEOMEDIA ESSENTIALS**

Having completed the above attached herewith is the work activity report for the training exercise that was conducted between 23<sup>rd</sup> November and 1<sup>st</sup> December, 2015. As part of the requirements for the work activity report, attached to this document includes;

- Training record in bar chart and table from contract signing to report submission.
- Approved summary sheet of the Training.
- Training Materials distributed.
- Evaluation of capacity development of the trainees before and after the Training.
- Self-evaluation of the Training based on questionnaire to the trainees.
- Evaluation of trainee's understanding based on test

The analysis carried out through the issuance of questionnaires to the trainees both before and after the training exercise and through the test that was conducted after the training exercise both revealed that there is a significant increase in the knowledge acquired through the training exercise (see charts and tables in the body of the report for further explanation as well as snap shots from the training and presentation of certificates).

We are extremely glad that the training exercise was very successful and we ensure you that the training exercise has delivered quality service to the all the trainees and FCTWB as a whole.

Yours sincerely,



OLANIYAN, Olakunle  
For: SLL-Spatial Layers Ltd

Recommendations from the Trainees

1. The overall time for this kind of training should be more than seven (7) days.
2. More time should be provided to enable full and effective utilization of the two (2) important GIS software.
3. Need to acquire or provide data related to trainee's job during practical for better understanding provision of a definitive work flow for a project implementation i.e. data acquisition of coordinate, manipulation process and map production.
4. I recommend the instructor emphasizes more on the current geography of Nigeria because it will be more practical and easy to understand.
5. Encourage the trainee to come with laptops and also advice that computer oriented people should be trained.
6. I commend the effort of all the staff for their effort and assistance.
7. Make the software accessible to the trainers to perfect what they learnt from the training.

Proffered Solution(s) to the Recommendations from the Trainees by the Instructor

1. The FCT, Abuja base data was use for the training as we localized the data for all our tutorials.
2. The FCTWB water distribution dataset was used for all the practical classes.
3. A trial version of the application software were installed on all of the systems, the installation was even extended to the trainees personal systems as well.
4. The time for the theory classes was extended from 3hrs to 4hrs.

Training record in bar chart and table from contract signing to report submission.

The GIS knowledge evaluation estimated through the issuance of questionnaire during the Detailed User Needs Assessment (DUNA) exercise indicates that 6 of the trainees are GIS competent, 1 has a sound knowledge of the GIS while only 1 of the trainees have no GIS competence at all. Only 1 out of the 6 trainees with GIS competence has some bit of experience working with ArcGIS, while all the other 5 trainees have some background knowledge of GeoMedia. See the summary of the evaluation exercise in the table below:

| SN | NAMES                   | EVALUATION BEFORE TRAINING |
|----|-------------------------|----------------------------|
| 1  | ABDULRAHMAN SHEHU SANI  | 50%                        |
| 2  | ABDULRAHMAN MUHAMMED    | 50%                        |
| 3  | ABUBAKAR UBALÉ ABUBAKAR | 50%                        |
| 4  | IFECHUKWU I. JUSTIN     | 50%                        |
| 5  | SHEHU SULEIMAN          | 50%                        |
| 6  | MOH. KABIR RABIU        | 0%                         |
| 7  | WASIU OLAJIDE           | 90%                        |
| 8  | EZEH C. HILLARY         | 50%                        |

Table 1: Trainee Evaluation before the Training Exercise

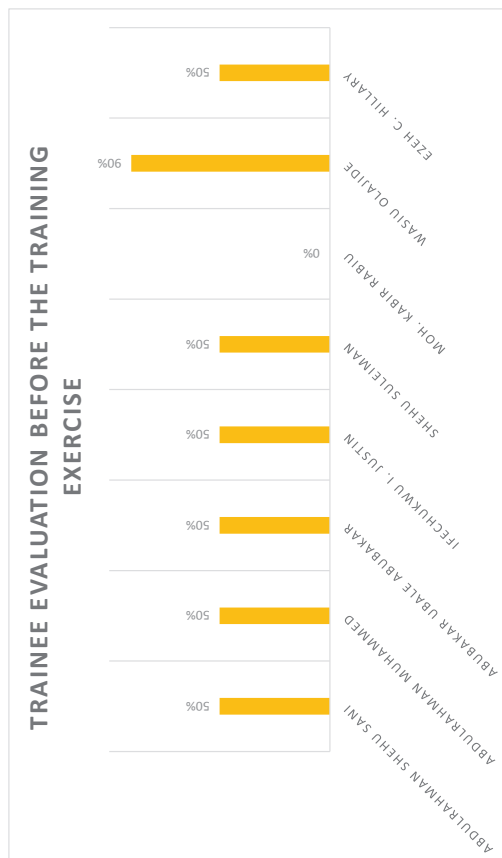


Figure 1: Training Evaluation before Training

The training assessment conducted through simple application software test after the training exercise was used to produce the summary of evaluation shown in the table and bar charts below:

| SN | NAMES                   | EVALUATION AFTER TRAINING |        |         |
|----|-------------------------|---------------------------|--------|---------|
|    |                         | GEOMEDIA                  | ARCGIS | AVERAGE |
| 1  | ABDULRAHMAN SHEHU SANI  | 67%                       | 80%    | 74%     |
| 2  | ABDULRAHMAN MUHAMMED    | 67%                       | 80%    | 74%     |
| 3  | ABUBAKAR UBALÉ ABUBAKAR | 75%                       | 80%    | 78%     |
| 4  | IFECHUKWU I. JUSTIN     | 90%                       | 92%    | 91%     |
| 5  | SHEHU SULEIMAN          | 67%                       | 80%    | 74%     |
| 6  | MOH. KABIR RABIU        | 68%                       | 80%    | 74%     |
| 7  | WASIU OLAJIDE           | 70%                       | 70%    | 70%     |
| 8  | EZEH C. HILLARY         | 70%                       | 70%    | 70%     |

Table 2: Trainee Evaluation after the Training Exercise

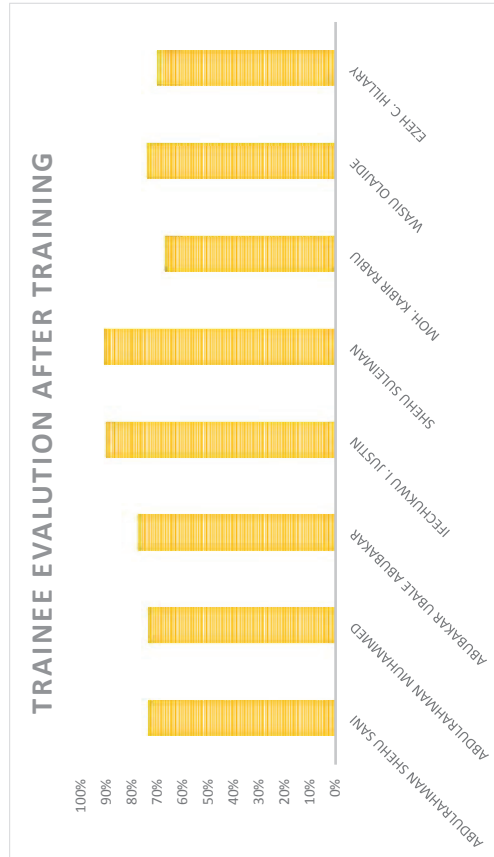


Figure 2: Training Evaluation after Training Exercise

NB: Kindly note that Ifechukwu I. Justin and Ezeh C. Hillary were both note available for the GeoMedia training test exercise while Moh. Kabir Rabiu was not available also for the ArcGIS training test exercise.

The tables and charts below shows the summary of the attendance record and attendance per day of the trainees;

| S/NO | NAME                       | MONDAY 23rd | TUESDAY 24th | WEDNESDAY 25th | THURSDAY 26th | FRIDAY 27th | MONDAY 30th | TUESDAY 1st | Total    |
|------|----------------------------|-------------|--------------|----------------|---------------|-------------|-------------|-------------|----------|
| 1    | ABDULRAHMAN SHEHU SANI     | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 7        |
| 2    | ABDULRAHMAN UBALE MUHAMMED | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 7        |
| 3    | ABUBAKAR ABUBAKAR          | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 7        |
| 4    | IFECHUKWU I. JUSTIN        | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 7        |
| 5    | SHEHU SULEIMAN             | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 7        |
| 6    | MOH. KABIR RABIU           | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 6        |
| 7    | WASIU OLAIJIDE EZEH C.     | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 7        |
| 8    | HILLARY                    | 1           | 1            | 1              | 1             | 1           | 1           | 1           | 4        |
|      | <b>Total</b>               | <b>8</b>    | <b>8</b>     | <b>8</b>       | <b>7</b>      | <b>7</b>    | <b>7</b>    | <b>7</b>    | <b>4</b> |

Table 3: Training Attendance Register

Annex9-5

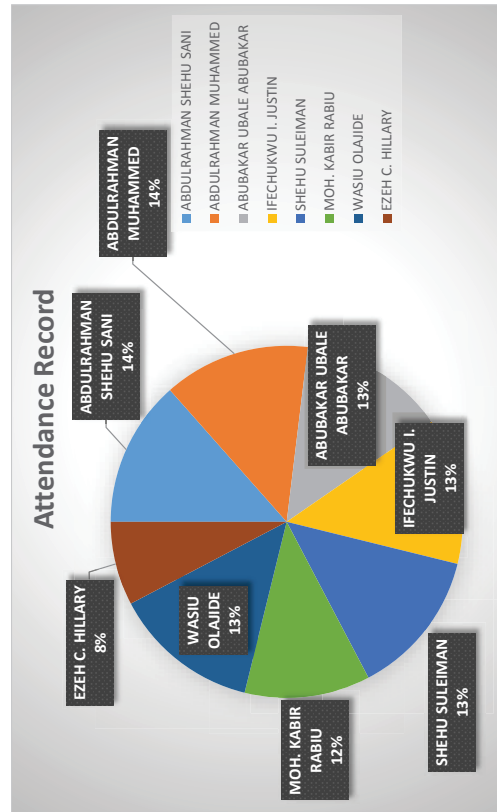


Figure 3: The Trainee Attendance Record

### Attendance per Day

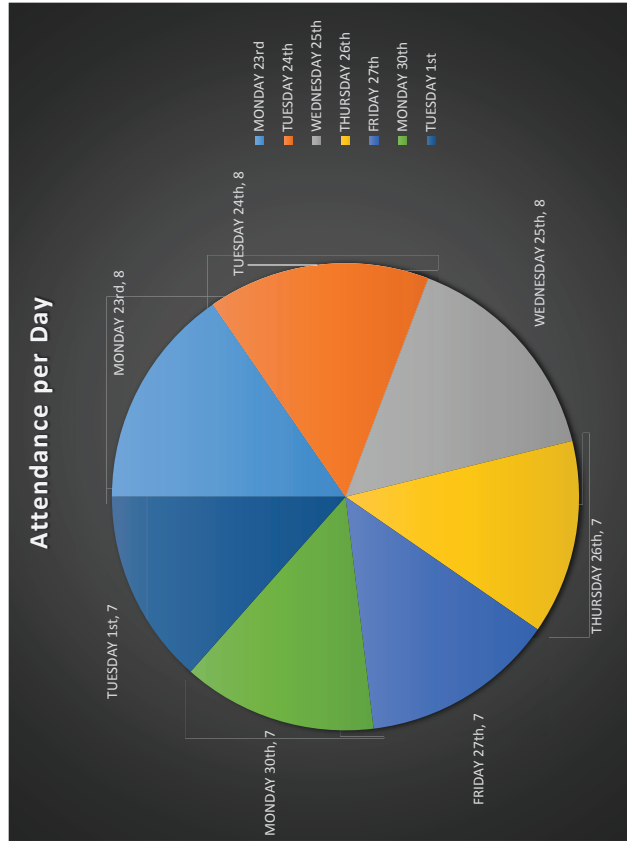


Figure 4: Training Attendance per Day

Approved summary sheet of the Training.

The approved summary sheet for the Training includes;

- The outlines of each lecture
- Time Schedule
- Name and Experience of the assigned lecturer and associate lecturers
- Training Manuals \*\*\* (see appendix for the approved training manuals)

Course content and outline

| Course Code | Course Title             | Description   |
|-------------|--------------------------|---|
| FCTWBGIS101 | Introduction of GIS      | <p>To learn concepts and overview of GIS.</p> <ul style="list-style-type: none"> <li>• What is GIS?</li> <li>• Basic Terms and Definitions</li> <li>• Advantages and Utilization</li> <li>• Basics of GIS Database and Workflow</li> <li>• Question and Answer</li> </ul>   |
| FCTWBGEO101 | Introduction to GeoMedia | <p>To learn the necessary GeoMedia tools used to visualize real-world features, discover patterns, obtain information, and communicate that information to others. To also learn how to create GIS maps and explore the data behind the maps as fundamental concepts that underlies GIS technology, using the GeoMedia platform</p> <ul style="list-style-type: none"> <li>• Open, create, and save a GeoWorkspace document.</li> <li>• View default file paths (Tools &gt; Options).</li> <li>• Obtain information about named connections (Warehouse &gt; Connections).</li> <li>• View and change the GeoWorkspace coordinate system (View &gt; GeoWorkspace Coordinate System).</li> <li>• Change and read coordinate readouts in the GeoWorkspace.</li> <li>• Select features using the Select Tool.</li> <li>• Set Map Window Properties.</li> <li>• View Legend Statistics.</li> <li>• Create a new warehouse.</li> <li>• Copy data to another warehouse using the Output to Feature Class command.</li> </ul> |



|              |   |
|--------------|---|
| FCTWBGEO 102 | <ul style="list-style-type: none"> <li>Use the Output to Feature Class command to output join queries as tables.</li> <li>Close and delete unneeded connections.</li> <li>Question and Answer</li> <li>Hands on Practical (Lab)</li> </ul>  |
|              | <p>Essential Workflows using GeoMedia</p> <ul style="list-style-type: none"> <li>Essential To acquire the necessary skills that will prepare you to perform the most common GeoMedia workflows. Primarily using GeoMedia Essential and how to explore, manage, and analyze geographic data and create informative maps. The course covers techniques to effectively share your GeoMedia work with decision makers, colleagues, and the public.</li> <li>Create a connection to an Access warehouse.</li> <li>Use the Warehouse Configuration File utility to create .ini files for ArcView.</li> <li>Create a connection to ArcView Data.</li> <li>Create a connection to CAD data using a CAD Schema Definition (.csd) file.</li> <li>Toggle between View and Paper Style Scaling methods.</li> <li>Display features by scale.</li> <li>Review, Edit and Organize Styles using Styles Manager.</li> <li>Use Legend Entry Properties to Select Styles.</li> <li>Establish a connection to an existing library.</li> <li>Use Library organizer to review and copy library objects into the GeoWorkspace.</li> <li>Append a new legend to map legend.</li> <li>Review and delete library connections.</li> <li>Create data windows.</li> <li>Sort records in the data window.</li> <li>Review the relationship between the data and map windows.</li> <li>Place text features interactively.</li> <li>Use the Insert Label command.</li> <li>Make edits in the data window.</li> <li>Question and Answer</li> </ul> |

|             |  |   |
|-------------|--|---|
| FCTWBGEO103 | Performing Analysis of GeoMedia Essential  | <ul style="list-style-type: none"> <li>Hands on Practical (Lab)</li> <li>GeoMedia Professional will be taught as well as how to attain achievable result by using them.</li> <li>Edit an existing feature class definition.</li> <li>Create new feature classes.</li> <li>View text and Excel spreadsheets as a data table.</li> <li>Create attribute queries.</li> <li>Learn the Search command</li> <li>Learn how to customize Searches</li> <li>Create spatial queries.</li> <li>Question and Answer</li> <li>Hands on Practical (Lab)</li> </ul>  |
| FCTWBGEO104 | Working with Raster Data, which includes: Working With Images and Image Registration | <p>To learn how to use Raster Data within the GeoMedia Workspace.</p> <ul style="list-style-type: none"> <li>Insert new raster image records into the warehouse.</li> <li>Add images to the GeoWorkspace.</li> <li>Use Spatial Filtering to aid in controlling image display.</li> <li>Delete image records from the warehouse.</li> <li>Use Raster Snap options to snap to binary raster data.</li> <li>Perform image registration.</li> <li>Export the image as Georeferenced Geotiff image.</li> <li>Practice Inserting (digitizing) features.</li> <li>Question and Answer</li> <li>Hands on Practical (Lab)</li> </ul> |
| FCTWBGEO105 | Editing Features   | <p>To learn how to create and edit features with the tools at your disposal with the GeoMedia Workspace.</p> <ul style="list-style-type: none"> <li>Set up the map and data window for an edit session.</li> <li>Reviewing and editing hypertext attributes.</li> <li>Deleting features records vs. deleting feature geometry</li> <li>Linking new graphics to an existing record</li> <li>Cut holes and create islands using the Continue Geometry command.</li> <li>Use the Geometry Information command.</li> </ul>  |

|             |  |   |
|-------------|--|---|
| FCTWBGEO106 | <p>Designing Maps with GeoMedia Essential</p>  | <ul style="list-style-type: none"> <li>• Use Edit Geometry command.</li> <li>• Split and Merge geometries.</li> <li>• Question and Answer</li> <li>• Hands on Practical (Lab)</li> </ul> <p>To learn how to create attractive maps that are easy to interpret and properly designed for their audience and delivery medium and how to apply a standard cartographic workflow to efficiently produce high-quality maps for print.</p> <ul style="list-style-type: none"> <li>• To export to MicroStation Design File (.dgn) format</li> <li>• To export to ArcView Shape Files</li> <li>• To export ASCII data files for use with Oracle Object Model data loading</li> <li>• Configure a GeoMedia Professional map window(s) for plotting.</li> <li>• Set up the layout window for plotting.</li> <li>• Add GeoMedia Professional map window and legend information to the layout window.</li> <li>• Question and Answer</li> <li>• Hands on Practical (Lab)</li> </ul> |
| FCTWBARC100 | <p>Introduction to ArcGIS</p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Components of ArcGIS Desktop 10.3</li> <li>• ArcCatalog</li> <li>• ArcMap</li> <li>• Symbology and Labelling</li> </ul> | <p>To learn ArcGIS tools used to visualize real-world features, discover patterns, obtain information, and communicate that information to others. To also learn how to create GIS maps and explore the data behind the maps as fundamental concepts that underlie GIS technology, using the ArcGIS platform.</p> <ul style="list-style-type: none"> <li>• Definition of GIS</li> <li>• ArcMap</li> <li>• ArcCatalog</li> <li>• Data Management</li> <li>• Searching and Content</li> <li>• Previewing Data</li> <li>• Organization of ArcMap</li> <li>• Adding Data through ArcCatalog</li> <li>• Adding Data through ArcMap</li> <li>• Moving Around the Map Display</li> <li>• Identifying Objects</li> </ul>  |

|                   |  |   |
|-------------------|--|---|
| FCTWBARC101       | <p>Essential Workflows using ArcGIS Basic Display</p> <ul style="list-style-type: none"> <li>• Performing Analysis in the Map</li> <li>• Queries</li> <li>• Layouts</li> </ul> | <ul style="list-style-type: none"> <li>• Setting Map Units, Display Units and Map Projection</li> <li>• Measuring in the Map Display</li> <li>• Labeling: Dynamic labels</li> <li>• Converting Dynamic Labels to Annotation</li> <li>• Labeling: Interactive Labels</li> <li>• Question and Answer</li> <li>• Hands on Practical (Lab)</li> </ul>   |
| FCTWBFWK001 – 007 | <p>Hands on Field Exercise</p>   | <ul style="list-style-type: none"> <li>• To acquire necessary skills that will prepare you to perform the most common ArcGIS workflows. Primarily using ArcGIS Basic and how to explore, manage, and analyze geographic data and create informative maps. The course covers techniques to effectively share your ArcGIS work with decision makers, colleagues, and the public.</li> <li>• Mapping by Category: Unique Values</li> <li>• Mapping by Quantity: Color Maps</li> <li>• Mapping by Quantity: Dot Maps</li> <li>• Chart Maps</li> <li>• Attribute Queries</li> <li>• Creating a New Map Layer</li> <li>• Spatial Queries</li> <li>• Adding a Title, Scale Bar, North Arrow, and Legend</li> <li>• Moving Graphics and Layout Objects</li> <li>• Grouping and Ungrouping Graphic Objects</li> <li>• Toggling Back and Forth (Layout View/Data View)</li> <li>• Question and Answer</li> <li>• Hands on Practical (Lab)</li> </ul> <p>This session has been introduced to make the trainees fully understand the usefulness of this training programme and so that can apply whatever is thought here to their day to day activities at their various office(s).</p> <ul style="list-style-type: none"> <li>• Identification of water features</li> <li>• Geolocate AMR Meters</li> <li>• ETC</li> <li>• Question and Answer</li> </ul> |

**NB: The Hands on Practical (Lab) would comprise of two sessions the first session would be based on the practical exercise(s) demonstrated in the manual and the second session would be based on the FCTWB Base Data.**

Course programme (time schedule)

- o Participants will make a set of 8 persons
- o Each Class will have more than 1 workstation(s) for each of the participants in the set
- o Courses will be scheduled as shown in the table below.
- o There will be a certified trainer for the class.
- o The ratio of practical instructors to participants will be 1:8 i.e. 1 practical instructor for every eight (8) participants (or one instructor for the class) supported by 2 assistant instructors.
- o Daily **theoretical** classes will be held as one session - a morning session which would last for 2 hours
- o Daily **practical** classes will be held as one session - an afternoon session which would last for 3 hours
- o **Field Exercise** will also be held to demonstrate hands-on practice for all what would be thought in the aforementioned classes. It would last for just an hour.
- o There will be a tea and lunch breaks between the morning and afternoon classes.
- o Detailed schedules of training classes are shown below:

Training Schedule for Theoretical Classes:

| Course Code | Course Title                               | Day   | Morning Class       |
|-------------|--|-------|---------------------|
| FCTWBGIS101 | Introduction of GIS                        | Day 1 | 9 am - 10 pm        |
| FCTWBGEO101 | Introduction to GeoMedia                   | Day 1 | 10.30 am - 11.30 am |
| FCTWBGEO102 | Essential Workflows using GeoMedia         | Day 2 | 9 am - 10 pm        |
| FCTWBGEO104 | Working With Images and Image Registration | Day 2 | 10.30 am - 11.30 am |
| FCTWBGEO103 | Performing Analysis of GeoMedia Essential  | Day 3 | 9 am - 11.30 am     |
| FCTWBGEO105 | Editing Features                           | Day 4 | 9 am - 11.30 am     |
| FCTWBGEO106 | Designing Maps with GeoMedia Essential     | Day 5 | 9 am - 11.30 am     |
| FCTWBARC100 | Introduction to ArcGIS                     | Day 6 | 9 am - 11.30 am     |
| FCTWBARC101 | Essential Workflows using ArcGIS Basic     | Day 7 | 9 am - 11.30 am     |

Table 4: Training Schedule for Theoretical Classes

Training Schedule for Practical Classes:

| Course Code | Course Title   | Day   | Afternoon Class |
|-------------|--|-------|-----------------|
| FCTWBGIS101 | Introduction of GIS  | Day 1 | 1 pm - 4 pm     |
| FCTWBGEO101 | Introduction to GeoMedia   | Day 1 | 1 pm - 4 pm     |
| FCTWBGEO102 | Essential Workflows using GeoMedia   | Day 2 | 1 pm - 4 pm     |
| FCTWBGEO104 | Working With Raster Data, which includes; Working With Images and Image Registration | Day 2 | 1 pm - 4 pm     |
| FCTWBGEO103 | Performing Analysis of GeoMedia Essential  | Day 3 | 1 pm - 4 pm     |
| FCTWBGEO105 | Editing Features   | Day 4 | 1 pm - 4 pm     |
| FCTWBGEO106 | Designing Maps with GeoMedia Essential   | Day 5 | 1 pm - 4 pm     |
| FCTWBARC100 | Introduction to ArcGIS   | Day 6 | 1 pm - 4 pm     |

SLL-Spatial Layers Ltd 2015©

Table 5: Training Schedule for Practical Classes

| Course Code | Course Title                           | Day   | Afternoon Class |
|-------------|--|-------|-----------------|
| FCTWBARC101 | Essential Workflows using ArcGIS Basic | Day 7 | 1 pm - 4 pm     |

| Course Code | Course Title     | Day   | Afternoon Class |
|-------------|------------------|-------|-----------------|
| FCTWBFWK001 | On-Site Exercise | Day 1 | 4 pm - 5 pm     |
| FCTWBFWK002 | On-Site Exercise | Day 2 | 4 pm - 5 pm     |
| FCTWBFWK003 | On-Site Exercise | Day 3 | 4 pm - 5 pm     |
| FCTWBFWK004 | On-Site Exercise | Day 4 | 4 pm - 5 pm     |
| FCTWBFWK005 | On-Site Exercise | Day 5 | 4 pm - 5 pm     |
| FCTWBFWK006 | On-Site Exercise | Day 6 | 4 pm - 5 pm     |
| FCTWBFWK007 | On-Site Exercise | Day 7 | 4 pm - 5 pm     |

Table 6: Fieldwork Schedule

Name and Experience of the assigned lecturer and his associate lecturers  
 The following are the key personnel that will form the core of the project implementation team (detailed profiles have been included as well).

OLANIYAN OLAKUNLE OLAFEMI  
 GIS Consultant/GIS Developer/GIS Subject Matter Expert

OLUSEYE BANDELE  
 GIS Analyst/Expert

ENECHÉ PATRICK  
 GIS Analyst/Expert

SLL-Spatial Layers Ltd 2015©

## OLANIYAN, OLAKUNLE

E-mail: [kunleolaniyan32@yahoo.co.uk](mailto:kunleolaniyan32@yahoo.co.uk), [leadandnotfollow@yahoo.co.uk](mailto:leadandnotfollow@yahoo.co.uk) TEL: 0803 498 9043

### EDUCATION AND TRAINING

CERTIFICATE OF COMPLETION (ESRI TRAINING AND EDUCATION), CERTIFICATE OF COMPLETION (INTERGRAPH Professional Workshop), MGIS (Masters in Geographic Information systems), UNIVERSITY OF ILORIN, ILORIN, B.Sc Geology, UNIVERSITY OF ILORIN, ILORIN

### SUMMARY

- Expert-level technical competence in contemporary GIS & Spatial Information Modeling, Software Development, Database Administration and Systems Integration.
- Extensive GIS/IT experience in consulting and advisory capacities for FCT agencies and an intimate knowledge of their unique inter-connectivity and spatial data integration requirements.
- Multi-disciplinary technical and management skills, and a goal-oriented private sector mindset.

### CAREER HISTORY

SLL-Spatial Layers Ltd (Project Manager/GIS Consultant) September 2014

- Project Manager / GIS Consultant/ Head Technical Operations for Abia State Geographic Information System (ABIAGIS).
- Involved in the establishment of the Abia State Geographic Information System (ABIAGIS) as an independent Abia state service agency with competence in geospatial services, including cadastre, land registry, and to provide datasets and analysis to all Abia MDAs.
- Involved as the GIS consultant in the implementation and operation of a Land Information System (LIS) for the Ministry. The 5-year, renewable, partnership agreement involves a phased deployment of technologies, processes and personnel required for the operation of a fully computerized Land Information System (LIS) and associated services, as spelt-out in the Scope of Works for the Management Contract. The LIS and associated services are to be deployed within the institutional framework of the Abia State Geographic Information System (ABIAGIS), by extending the infrastructural platform of the Abia State Geographic Information System (ABIAGIS).

SLL-Spatial Layers Ltd (COO/GIS Consultant)

- GIS Consultant for Implementation of Enterprise GIS Visualization Solution for TCN's Market Operator (MO), (May, 2014)

Millennium Integrated Ltd (Head GIS/GIS Consultant)

- Project Manager / Head Technical Operations for Kano State Geographic Information System (KANGIS).

- Involved in the establishment of the Kano State Geographic Information System (KANGIS) as an independent Kano state service agency with competence in geospatial services, including cadastre, land registry, and to provide datasets and analysis to all Kano MDAs.

- Appointed as the lead consultant to the Office of the Surveyor General, Kwara State and the Bureau of Lands June (2012)

- Optimize the TDP, C of O & R of O generation processes
- Automate the TDP, C of O & R of O generation processes
- Provide solutions for increasing IGR

- Involved as an associate consultant in the implementation and operation of a Land Information System (LIS) for the Ministry. The 3-year, renewable, partnership agreement involves a phased deployment of technologies, processes and personnel required for the operation of a fully computerized Land Information System (LIS) and associated services, as spelt-out in the Scope of Works for the Management Contract. The LIS and associated services are to be deployed within the institutional framework of the Imo State Geographic Information Agency (IGLA), by extending the infrastructural platform of the Imo State Geographic Information System (IGIS).

- Involved in the establishment of the Edo State Geographic Information Service (EGIS) as an independent Edo state service agency with competence in geospatial services, including cadastre, land registry, and to provide datasets and analysis to all Edo MDAs.

- Consultant on the analysis and design consultancy services for geographic information land administration & development control system (GLADS) project for Abuja Technology Village. (July 2011)

- Responsible for the high level design for the GLADS project (July 2011)
- Major GIS and Software Consultant to the GLADS, having provided consulting and advisory services, in various capacities. (July 2011)

- Plan and Design of the GeoMedia Public works manager Water Data Model for the Automated

- Meter Reading system for the FCT Water Board Abuja (March 2011 till date)

- Programming and Design of the Object Data Model
- Creation of Topology and Relationships
- Attribute Pick List
- Creation of Associations
- Creation of Connectivity
- Definition of Precision Key-in Rules Based Digitization

- Coordination of the Abuja Technology Village Tree Survey Project (January 2011)

- Creation of workflows/methodology for the Field base survey exercise and GIS analysis.
- Responsible for carrying out supervised classification
- Responsible for the generation of field sheets for all the sectors within the project area.
- Responsible for the coordination of the ground truthing exercise for the project
- Responsible for the coordination of the (Botanists) Academicians
  - Tree survey plan
  - Schedule of tree species / tree types

SLL-Spatial Layers Ltd 2015©

- Original signed off (by the team leader) copy of each tree data sheet per sector
- Procurement of Satellite Imagery, Installation, Configuration and Training of AIV GIS Personnel for Abuja Technology Village. (June 2010)
- Associate Consultant to the AGIS Interface Consultant.
  - o Responsible for the high level designs for the GIS projects
  - o GIS Software, having provided consulting and advisory services, in various capacities.
  - o Provide key solutions for satellite imagery acquisition
  - o Create reports
- Coordination of the Technical and GIS aspects of the Development of an Enterprise System for the Digitization, 3-Dimensional Modeling and Spatial Integration/Processing of Property-Related Data for Development Control Activities (Phase I/II/III of FCC and Related Works).
  - o Creation of workflows/methodology for the GIS/CAD aspects of the aforementioned project
- Associate GIS consultant responsible for the computer-aided classification of roadside vegetation and associated land cover types in the Federal Capital City (FCC) using advanced supervised classification photogrammetric and GIS/database analysis techniques, on behalf of the Department of Parks and Recreation, Abuja Metropolitan Management Council (AMMC), to provide an empirical basis for the estimation of shrubs, trees, grassland and bareland along the city's road corridors (streets median, islands, intersections and green verges (2009).
- 2 weeks GIS Training on the use of satellite imagery in infrastructural development, for 20 federal civil servants. Jos, August 2008.
- Production and development of GIS base intelligent maps for Lifeline NGO, for partner hospital zones. Abuja, April 2008.
- Vectorization and attribute creation for Abuja, Phase I water distribution network, with AutoDESK Map 2009, for the FCT Water Board. Abuja, September 2008.
- Creation of network topology for the vectorized water distribution network, with AutoDESK Map 2009 and ArcGIS 9.3, for FCT Water Board. Abuja, December 2008.
- Development of inset's and overview maps for parks and recreation centers for the Department of Parks and Recreation FCT. Abuja, January 2008.
- Production, Development and Printing of LGA and State level maps for Schools in Kaduna, Kano and Kwara States with MapInfo 9.0 Professional for British Council Nigeria. Abuja, December 2007.
- Development of GIS Optimized Route maps for AMR meter reading, for the FCT Water Board. Abuja, April 2008.
- Co-ordination and interpretation of data for water distribution network ground truthing exercise for FCT Water Board. Abuja, October 2008.
- Creation of GIS base map layers for the Department of Development Control FCT with AutoDESK Map Guide Viewer. Abuja, April 2008.
- Co-ordination of FCT Water Board customer enumeration exercise, Abuja. August 2008
- Production of As-Built drawings for the water pipeline network for FCTWB for University of Abuja permanent site. Abuja, August 2008.

#### AutoCAD Instructor

SLI-Spatial Layers Ltd 2015©

- EIF Training Programme for Postgraduate Students and lecturers on AutoCAD Software. FUT Minna (North West Region) July 2007

#### EDGES Environmental Services, Gariki Abuja

- GIS Expert
    - GIS, Digital Survey (Total Station, Handheld GPS, Differential GPS, Promark2&3), Digital Map Making, LIS, Environmental Studies, Data Acquisition, Management & Presentation using AutoCad, ILWIS, ArcView, ArcMap & Erdas Imagine, DataBase Management System.
- March – August 2007

#### PIOS Hydro Geophysical Services Ltd

Ilorin, Kwara State.

- Geophysicist & Data Analyst  
January 2006 – February 2007

#### PERSONAL SKILLS AND COMPETENCIES

##### GIS, Spatial Data Integration & Photogrammetry

- GIS skill sets:
  - o Training and Capacity Building
  - o GIS Programming
  - o GIS Analysis
  - o Customized GIS development using industry-standard Application Programming Interfaces
  - o Python Scripting
  - o Development of Custom Title Deed Plan and Site Plan Applications using python scripting language on ESRI platform.
  - o Enterprise spatial data integration
  - o Geodatabase design & development (SQL 2008 R2, personal/desktop Access geodatabases, ArcSDE Geodatabases – Workgroup & Enterprise)
  - o Advanced data modelling using sophisticated UML tools including Microsoft Visio 2010 and industry-standard Geomedia, ESRI and OGC object architectures for modelling Land/ parcel, Water/Waste water/Electric Utilities, Government feature class datasets.
  - o 3-dimensional Digital Terrain analysis and modelling, Digital Elevation Modelling (DEM)
  - o Photogrammetry/Digital imagery processing & analysis, Ortho-rectification, Georeferencing, Raster to Vector conversion – manual/automated vectorization, Grid analysis, supervised/unsupervised photogrammetric classification for land cover analysis (vegetation, roadways, buildings, soil, hydrological features)
- Expert-level competence in leading desktop, server, web and mobile GIS applications, including
  - o Python Scripting, Arcpy Scripting, Creation of Automation tools for ArcGis 10.1, ArcView GIS 3.2a, ILWIS 3.3 Academic, AutoCad Map, MapInfo 9.0 Professional, AutoCad Land

SLI-Spatial Layers Ltd 2015©

- Development 2013, Erdas Imagine 11, AutoDesk Map Guide 11, GeoMedia Professional, GeoMedia WebMap, GeoMedia OnDemand
- Hands-on Experience managing high profile GIS projects, including:
  - Water/Waste Water Utilities (Pipeline Infrastructure GIS, Customer GIS, Automated Metering, route planning & optimization, web-based GIS/mapping and photogrammetry, Custom GIS development)
  - Solid Minerals sector (nationwide inventory of abandoned mines & quarries, Custom GIS development)
  - Education (School mapping and demographic analysis, web-based GIS/mapping and photogrammetry)
  - Development Control (automated mapping, spatial data integration & analysis, web-based GIS/mapping and photogrammetry, Custom GIS development)
  - Land Administration & Management (Land-Related Information Systems, spatial data integration & analysis, Automated Land Registry, web-based GIS/mapping and photogrammetry, Custom GIS development)
  - Transportation (GIS street mapping, terrain analysis for road surveys, landmark data collection & integration, GPS vehicle navigation & tracking, mobile and web-based GIS application development)
  - Telecommunications (Location Based Services (LBS) applications, Terrain analysis for cell site positioning, Global Positioning Satellite applications, WAP solutions for mobile devices & smart phones, IP-based thin client solutions for GPRS/3G networks, mobile/web mapping)
  - Financial Services (GIS mapping/spatial integration of customer demographic & ATM location data)
  - E-Government (Dynamic GIS web portal solution, enterprise GIS, mobile GIS for field force automation, customer service GIS visualization solution, G2G/G2B/G2C applications)

#### KEY SKILLS

##### *Personal qualities*

- Highly analytical, well-organised, self-starter, highly flexible, willingness to accept responsibility, high energy level, commitment, competitiveness.

#### PROFESSIONAL MEMBERSHIP

- Member, Geoinformation Society of Nigeria (GEOSON)
- Member, ESRI Developer Network (EDN)

#### UNPUBLISHED WORKS

- Remote Sensing in Solid Minerals Exploration [Seminar].
- Reservoir Characteristics of Cretaceous Mudstone Sediment of Eida Basin Lafagi – Patigi Axis, Kwara State [Project].
- Integration of Geologic Data for Mineral Mapping in Odo – Ara, Kogi State, A GIS Approach [Seminar &Project].

### BANDELE, Oluseye A.

+2348028949223,  
72, Victoria Street, Ojota, Lagos

oluseye.bandlele@gmail.com  
[www.linkedin.com/in/oluseyebandlele](http://www.linkedin.com/in/oluseyebandlele)

#### OBJECTIVE & SUMMARY:

To lead, challenge and be challenged in a business administration and development position. Analyze data based on business strategy to improve efficiency, sales, and operational performance. Foster relationships between core business units of organizations to build effective systems for problem solving and create holistic business solutions. A GIS Analyst Professional with over 3 years of progressive experience in Geographic Information Systems, Software Development and Management.

#### SKILLS

- GIS Analysis
- Web analytics and Reporting
- Team Building and Management
- Value based price consulting
- Financial Projection and Analysis
- Consumer Behavior analysis
- Project Management
- Advanced Microsoft Office Skills

#### PROFESSIONAL EXPERIENCE:

##### Spatial Layers Ltd

##### GIS Analyst

2012 - Present

- Utilize Geographic Information System techniques to provide a better understanding of certain variables in a given geographic location.
- Extract data from GIS software and uses varying analysis methods to arrive at results.
- Recommend appropriate reactionary strategies in response to GIS analysis.
- Provides maps and data sets to clients to supplement analysis.
- Knowledge and mastery of GIS software and technology.
- Work in conjunction with CADD drafters and technicians

##### SPL Vending Ltd

##### GIS Analyst

2012

- Trend analysis for sales performance of products and services
- Business planning for maximization of profit and revenue generation
- Application of GIS techniques to enhance revenue generation
- Enhance corporate sales and handle customer relationship management.
- Proper documentation and inventory management for corporate customers and case files
- Develop and design solution for Bay Mapping, Bay identification and Trend Analysis
- Work closely with sales team for the actualization of daily, weekly and monthly targets
- Work on financial data breakdown to create realistic projections on sales and revenue.

**Millenium Integrated Ltd**

GIS Analyst

2011

- Utilize Geographic Information System techniques to provide a better understanding of certain variables in a given geographic location.
- Extract data from GIS software and uses varying analysis methods to arrive at results.
- Recommend appropriate reactionary strategies in response to GIS analysis.
- Provides maps and data sets to clients to supplement analysis.
- Knowledge and mastery of GIS software and technology.
- Work in conjunction with CADD drafters and technicians

**EDUCATION:**

- Walbrook College : West African Senior School Examination Certificate 1998 - 2004
- UNAAB: B-Agric Plant Physiology and Crop Production 2005 - 2010

**PROFESSIONAL QUALIFICATION:**

- ArcGIS Desktop Professional (ESRI)

**BIO:**

**Gender:** Male

**DOB:** 6<sup>th</sup> July 1988

**State:** Lagos

**REFERENCES:**

Available on Request

**ENECHE PATRICK SAMSON**

Flat 4, Block A<sup>2</sup>, 2<sup>nd</sup> Street, Zone II, Games Village, Abuja.

+234 706 471 5857; +234 812 953 5883

[patrick@vulva.com](mailto:patrick@vulva.com), [eneche247@gmail.com](mailto:eneche247@gmail.com)

|                                    |   |
|------------------------------------|---|
| <b>DATE OF BIRTH</b>               | 23 <sup>rd</sup> October, 1986  |
| <b>LOCAL GOVT. AREA</b>            | Olamaboro   |
| <b>STATE</b>                       | Kogi  |
| <b>SEX</b>                         | Male  |
| <b>NATIONALITY</b>                 | Nigerian  |
| <b>MARITAL STATUS</b>              | Single  |
| <b>RELIGION</b>                    | Christianity  |
| <b>OBJECTIVES</b>                  | <ul style="list-style-type: none"> <li>▪ Giving the best possible in any organization (or institution) I find myself with or without supervision; overcoming the challenges of the job and participating actively where team work is required.</li> <li>▪ Seeking to reach the zenith of my career in a dynamic way that would encourage growth and increased productivity in any organization.</li> <li>▪ Exhibit pure zest for research activities.</li> <li>▪ Geographic Information System (GIS) software including ArcGIS 10.2.1, IDRISI Selva, ERDAS Imagine, ILWIS 3.8, AUTOCAD 2013 (Civil 3D), SURFER 11.0 and Quantum GIS.</li> <li>▪ Survey Equipment: Leica Total Station, Sokkia Total Station, Topcon RTK GPS Receiver, Javad Dual Frequency GPS Receivers, Levels and E.D.Ms.</li> <li>▪ Microsoft Office Suites - MS Word, Excel, Access, Power Point and Publisher</li> <li>▪ Fast Typing Skill (with an average of 55 Words per Minute)</li> <li>▪ Programming Software: Visual Basic and Python (just basic).</li> </ul> |
| <b>OFFICE/FIELD SUPPORT SKILLS</b> |   |

|                                   |  |
|-----------------------------------|--|
| <p>EDUCATIONAL QUALIFICATIONS</p> | <ul style="list-style-type: none"> <li>▪ Website Development - Macromedia Dreamweaver and Fireworks</li> <li>▪ Statistical Packages: Epi-Info, Minitab 17.0 and SPSS 22.0.</li> <li>▪ Utility/Data Integration Packages: Blue Marble Geographic Calculator, Map Source, Google Earth Pro, GPS Utility 4.30, Dxf2xyz Converter and Geocal Mobile Mapper Office Suite.</li> <li>▪ Possess good organizational skills; confident approach and ability to work (and lead) in a team.</li> </ul> <p><b>Nnamdi Azikiwe University, Awka</b><br/> <b>Anambra State.</b><br/>         Environmental Management (M.Sc.)<br/> <i>In View</i></p> <p><b>Kogi State University, Anyigba</b><br/> <b>Kogi State.</b><br/>         Geography cum Urban and Regional Planning<br/>         Bachelor of Science (B.Sc.)<br/> <i>2<sup>nd</sup> Class Upper</i><br/>         2012</p> <p><b>Pope John Paul II Junior Seminary</b><br/> <b>Okpoma, Yala L.G.A, Cross River State.</b><br/>         SSCE Certificate<br/>         2001</p> <p><b>Holy Family Nursery and Primary School</b><br/> <b>Ikrom, Cross River State</b><br/>         First School Leaving Certificate<br/>         1995</p> <p><b>Nigerian Institute of Management (NIM)</b><br/>         Proficiency Certificate in Management<br/>         2013</p> <p><b>Kogi State University, Anyigba</b><br/> <b>Graduate Assistant</b><br/>         Department of Geography and Planning,<br/>         Faculty of Social Sciences,<br/>         Kogi State University, Anyigba,</p> |
| <p>PROFESSIONAL QUALIFICATION</p> | <p><b>Nigerian Institute of Management (NIM)</b><br/>         Proficiency Certificate in Management<br/>         2013</p>  |
| <p>WORKING EXPERIENCE</p>         | <p><b>Kogi State Poverty Mapping and Training for Kogi State Community and Social Development Project (Kogi-GSDP) – 2012.</b></p>  |

|  |  |
|--|--|
| <p><b>Dekina L.G.A, Kogi State.</b><br/> <i>Till Date</i></p> <p><b>Spatial Layers Limited [SLL]</b><br/> <b>GIS Instructor</b><br/>         Plot 2121 Ndola Crescent,<br/>         Wuse, Zone 5, Abuja<br/> <i>Till Date</i></p> <p><b>Abia State Geographic Information System [AbiaGIS]</b><br/> <b>GIS Analyst/Supervisor</b><br/>         New Abia State Secretariat,<br/>         Plot P/31, Govt. Station (Ogurube) Layout,<br/>         Umuahia, Abia State.<br/>         Jan, 2015 –<br/>         Aug, 2015.</p> <p><b>Nike Environmental Resource Services Ltd.</b><br/> <b>Assistant Head of Operations</b><br/>         Km 1, Umuahia – Ikot Ekepe Expressway,<br/>         Opp. Oppet Fuel Station,<br/>         Umuahia, Abia State.<br/>         July, 2013 –<br/>         Dec. 2014.</p> <p><b>National Youth Service Scheme (NYSC)</b><br/> <b>GIS/Cartography Unit and</b><br/> <b>Abia State Land Information System (ALIS)</b><br/>         Ministry of Lands and Survey<br/>         Umuahia, Abia State<br/>         2012 - 2013</p> <p><b>Industrial Training</b><br/> <b>Space Application Centre</b><br/>         National Space Research and Development Agency<br/>         (NASRDA)<br/>         Airport Road, Abuja<br/>         2010</p> | <p><b>PROJECTS EMBARKED UPON</b></p> <ul style="list-style-type: none"> <li>▪ Topographic Mapping of Anyigba Using Geospatial Techniques. Submitted to the Department of Geography and Planning, Kogi State University, Anyigba (Unpublished) – 2012</li> <li>▪ Kogi State Poverty Mapping and Training for Kogi State Community and Social Development Project (Kogi-GSDP) – 2012.</li> </ul> |
|--|--|



- Abia State Poverty/Micro Projects Mapping and Training for Abia State Community and Social Development Project (Abia-CSDP) – 2013
- Mapping of Abia State Oil Wells in Imo River, Isimiri and Obigbo Oil Fields in Ukwa West L.G.A for Dispute/Claim Survey - 2014
- More on request.
- Conference of the Association of Nigerian Geographers (ANG): Contemporary Issues in Infrastructural Development and Management in Nigeria held in Kogi State University between 7<sup>th</sup> and 11<sup>th</sup> March, 2010.
- Project Implementation Manual for the Nigerian Erosion and Watershed Management Project (NEWMAP) Workshop held in Umuahia, Abia State between 29<sup>th</sup> April – 4<sup>th</sup> May, 2013.
- Ifatimehin, O.O., Ujoh, F. and Eneche, P.S.U (2013). Attributes of Topographic Mapping of a Fast Urbanizing Area in Nigeria, Using Remote Sensing and GIS. *Journal of Scientific Research Reports*

**PUBLICATION**

**AWARDS/  
RECOMMENDATIONS**

- Recommendation* – Abia State Ministry of Lands and Survey (2013)
- Recommendation* – National Youth Service Corps (2012)
- Captain Idris Wada Prize for Best Graduating Student* – Department of Geography and Planning, Kogi State University, Anyigba - 2011/2012 Academic Session
- K.S.U Prize for Best Academic Result* – Kogi State University, Anyigba – 2011/2012 Academic Session.

**HOBBIES**

Reading, adventures and listening to classical music.

**REFEREES**

**Dr. S. D. Musa**  
Deputy Vice Chancellor - Administration  
Kogi State University, Anyigba,  
Kogi State.

+234 805 133 5030

**Dr. O. O. Ifatimehin**  
Head of Department  
Department of Geography and Planning,  
Kogi State University, Anyigba,  
Kogi State.  
+234 816 375 3865

**Surv. A. O. Iwonye**  
Surveyor General – Abia State,  
Ministry of Lands and Survey,  
Umuahia, Abia State.  
+234 803 585 4525

Training Materials distributed.

\*\*\*\* See Appendix

Evaluation of capacity development of the trainees before and after the Training.

|   |                            |                      |                |         |         |  |  |
|---|----------------------------|----------------------|----------------|---------|---------|--|--|
| 5 | Abubakar Ubale<br>Abubakar | Distribution         | Average        | Average | Good    | B.Sc. Civil Engineering                            | 1. Planning and design<br>2. Data analysis and input   |
| 6 | Muhammed Abdulrahman       | Distribution/Project | Average        | Average | Average | B.Eng. water resources and environment engineering | 1. Project supervision and monitoring according to the approved drawing<br>2. Measurement of quantities executed<br>3. Project Progress report<br>4. Cross checking and confirmation of certificate of valuation |
| 7 | Wasiu Olatunde Olajide     | MIS                  | Very competent | Average | Good    | M.Sc. Computing Software Technology                | Geo-coding and digitizing  |
| 8 | Engr. M.K. Rabiu           | Distribution         | Beginner       | Average | Average | B.Eng. water resources and environment engineering | Maintenance of water distribution  |

Table 7: Questionnaire Compendium 1

SLL-Spatial Layers Ltd 2015©

#### Evaluation of capacity development of the trainees before the Training

The following tables' summaries all information supplied by the trainees during the User Needs Assessment Exercise carried out between Monday 16<sup>th</sup> – Thursday 19<sup>th</sup> November, 2015.

| S/No | Name                   | Department                  | GIS Competence | Hardware Competence | Software Competence | Academic Qualification            | Nature of Routine Task   |
|------|------------------------|-----------------------------|----------------|---------------------|---------------------|-----------------------------------|--|
| 1    | Ikenna Justice         | Director's office           | Average        | None                | None                | M.Sc Geoinformatics               | Monitoring and Evaluation  |
| 2    | Abdulrahman Shehu Sani | Distribution/Pre-paid meter | Average        | very competent      | very competent      | HND in Civil Engineering          | 1. Installation of pre-paid meter<br>2. Maintenance of the service unit<br>3. Design or distribution of network<br>4. Maintenance of the service line  |
| 3    | Ezeh .C. Hillary       | Distribution/Logistics      | Average        | Average             | Average             | B.Sc Surveying and Geoinformatics | General surveying of works, GIS works, engineering surveying etc.  |
| 4    | Shehu suleiman         | Distribution/MIS            | Average        | Average             | Average             | PGD (GIS/Remote sensing)          | 1. Ensuring effective operation and management<br>2. Liaise with AGIS to ensure regular update of FCT data<br>3. Ensure effective monitoring and supervision of AMR system operations and other activities |

| S/No | Name                    | ArcMap/Geo Media Experience | Expected Benefits  | Special Requirements   | Familiarity with ArcGIS |                            |
|------|-------------------------|-----------------------------|--|--|-------------------------|----------------------------|
|      |                         |                             |  |  | Data Analysis           | Digitizing/Geo-referencing |
| 1    | Ikenna Justice          | Yes                         | 1. Exposure to the latest techniques<br>2. New Skill acquisition   | Data availability is limited   | NIL                     | NIL                        |
| 2    | Abdulrahman Shehu Sani  | NIL                         | 1. I want to learn about the basics of GIS, ArcGIS, and GeoMedia   | NIL  | Yes                     | Yes                        |
| 3    | Ezeh .C. Hillary        | Yes                         | 1. Higher level of data analysis/input<br>2. Network analysis in ArcGIS<br>3. Profiling using ArcMap (road or pipe profile)  | Data requirement   | Yes                     | NIL                        |
| 4    | Shehu suleiman          | Yes                         | 1. Acquisition of new skills for improved work performance<br>2. Ability to work more effectively and efficiently<br>3. Ability to store and manage important information for quick and enhanced decision making | 1. Water supply and Distribution data<br>2. Coordinate data<br>3. Customer's information<br>4. Satellite and cadastral data of FCT | Yes                     | Yes                        |
| 5    | Abubakar Ubale Abubakar | Yes                         | 1. Adequate information of area of interest/project<br>2. Enhancement of computer skills<br>3. Improved presentation skills of area under consideration<br>4. Improved engineering Judgement                     | Data requirement   | Yes                     | Yes                        |
| 6    | Muhammed Abdulrahman    | NIL                         | 1. Using GIS to manipulate satellite image of catchment areas<br>2. Using GIS to get data such as the coordinate<br>3. Using GIS to locate positions of pipes and their sizes in an area                         | NIL  | Yes                     | Yes                        |
| 7    | Wasiu Olatunde Olajide  | Yes                         | 1. Gain additional skill in GIS and ESRI tools<br>2. Improve on interpersonal skill and learn work   | RDMS, access, oracle, excel, Jpeg  | NIL                     | NIL                        |
| 8    | Engr. M.K. Rabi         |                             |  |  |                         |                            |

Table 9: Questionnaire Compendium 3

SLL-Spatial Layers Ltd 2015©

| S/No | Name                    | Data  | Challenges   | GIS Software Competence   | Experience with Raster/Vector       | ArcMap/Geo Media Experience |
|------|-------------------------|---|--|---|-------------------------------------|-----------------------------|
| 1    | Ikenna Justice          | X and Y Values of properties/customer location  | None provision of licensed application and obsolete datasets   | ArcGIS 10.3.1 (Desktop Basic, Standard and Advance), Erdas Imagine 6.1 and Erdas Photogrammetry | Average                             | Yes                         |
| 2    | Abdulrahman Shehu Sani  | Working PSIOW in resetting cable, Hand Terminal (manas) and EU resetting cable green card shank | Lack of spare part for pre-paid meter, problem of network, lack of equipment etc.                                  | NIL   | NIL                                 | NIL                         |
| 3    | Ezeh .C. Hillary        | Satellite image, GPS data, Paper maps and existing maps   | Inadequacy of modern equipment   | GIS ArcGIS 10.3.1, 10.0 and 9.0   | Very Good                           | Yes                         |
| 4    | Shehu suleiman          | GPS Coordinates data, Survey data, FCT cadastral layout, Satellite imagery, etc.                | Lack of provision of adequate licensed GIS software, lack of provision of adequate training for the GIS staff etc. | 1. Integraph Geomedia - Very Good<br>2. ESRI ArcGIS - Fair<br>3. Autodesk AutoCAD Map - Good    | Raster - Fair<br>Vector - Very Good | Yes                         |
| 5    | Abubakar Ubale Abubakar | Data coordinates (X,Y,Z) UTM, report of activities, progress report, and google earth           | Network availability of data and insufficient software and knowledge   | Good  | Very little                         | Yes                         |
| 6    | Muhammed Abdulrahman    | Excel, Word and drawings from AutoCAD   | NIL  | NIL   | NIL                                 | NIL                         |
| 7    | Wasiu Olatunde Olajide  | Excel, Jpeg, Access   | NIL centralized for proper data synchronization and migration  | Geo media Professional, ArcGIS and Oracle database  | Average                             | Yes                         |
| 8    | Engr. M.K. Rabi         | NIL   | None submission of maintenance record from various area offices  |   |                                     |                             |

Table 8: Questionnaire Compendium 2

SLL-Spatial Layers Ltd 2015©

**Evaluation of capacity development of the trainees after the Training**

The training assessment conducted through simple application software test after the training exercise was used to arrive at the summary of evaluation shown in the table and bar charts below;

| SN | NAMES                   | EVALUATION BEFORE TRAINING |          |         | EVALUATION AFTER TRAINING |          |         |
|----|-------------------------|----------------------------|----------|---------|---------------------------|----------|---------|
|    |                         | ARC GIS                    | GEOMEDIA | AVERAGE | ARC GIS                   | GEOMEDIA | AVERAGE |
| 1  | ABDULRAHMAN SHEHU SANI  | 50%                        | 74%      | 62%     | 80%                       | 80%      | 80%     |
| 2  | ABDULRAHMAN MUHAMMED    | 50%                        | 75%      | 62.5%   | 80%                       | 80%      | 80%     |
| 3  | ABUBAKAR UBALÉ ABUBAKAR | 50%                        | 78%      | 64%     | 90%                       | 90%      | 90%     |
| 4  | IFECHUKWU I. JUSTIN     | 50%                        | 91%      | 70.5%   | 92%                       | 92%      | 92%     |
| 5  | SHEHU SULEIMAN          | 0%                         | 67%      | 33.5%   | 68%                       | 68%      | 68%     |
| 6  | MOH. KABIR RABIU        | 50%                        | 70%      | 60%     | 80%                       | 80%      | 80%     |
| 7  | WASIU OLAJIDE           | 50%                        | 70%      | 60%     | 80%                       | 80%      | 80%     |
| 8  | EZEH C. HILLARY         | 50%                        | 70%      | 60%     | 80%                       | 80%      | 80%     |

Table 12: Trainee Evaluation after the Training Exercise

Most of the trainees where on the average mark (50%) before the training, except for Wasiu who was evaluated and placed at 90% and Kabir at 0% (with no GIS knowledge). It is evident from the table above that the evaluation obtained through the training test conducted, most of the participants had an average grade of above 70%, expect for Kabir who has 67% which is very good for a beginner and Wasiu who had a drop in his initial grade. During the course of the training the trainees gained tremendous practical experience as the FCTWB Water Distribution data was used for all the practical's (labs), the trainees were all treated on the listed aspects of GIS (their day-to-day office/field duties) and they can now perform all the following tasks easily;

- Data Analysis
- Digitizing/Geo-Referencing/Geocoding
- Data Warehousing
- Data Exchange
- Map Production

Kindly note that all the participants have fulfilled the basic requirements of the training, what makes the major difference(s) in their scores is the **final output, map production** i.e. see table on GeoMedia & ArcGIS Test Grading Sheet on pg. 52 all the participants scored all the full marks pertaining to all the other aspects of the training except for map production). The trainees are now very familiar with and understand both application software working environment and they can easily use/share the FCTWB data within the 2 platforms, hence attaining the objectives of the training exercise which are Introduction to GIS, ArcGIS Basic & GeoMedia Essential respectively.

**Evaluation of the Trainees after the Training**

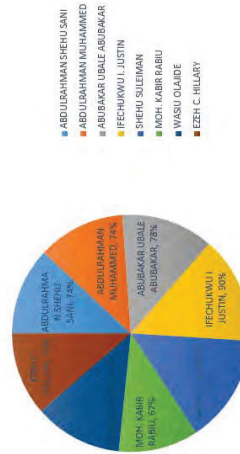


Figure 5: Evaluation of the Trainees after the Training

**WORK ACTIVITY REPORT ON THE TRAINING OF 8 FEDERAL CAPITAL TERRITORY WATER BOARD (FCTWB) STAFF ON GEOGRAPHICAL INFORMATION SYSTEM (GIS) IN THE FEDERAL CAPITAL TERRITORY REDUCTION OF NON-REVENUE WATER PROJECT COVERING INTRODUCTION TO GIS, BASIC ARCGIS AND GEOMEDIA ESSENTIALS**

| S/No | Name                    | Familiarity with ArcGIS |               |                | Familiarity with GeoMedia |                            |                  |               |                |
|------|-------------------------|-------------------------|---------------|----------------|---------------------------|----------------------------|------------------|---------------|----------------|
|      |                         | Data Warehousing        | Data Exchange | Map Production | Data Analysis             | Digitizing/Geo-referencing | Data Warehousing | Data Exchange | Map Production |
| 1    | Ikenna Justice          | NIL                     | NIL           | NIL            | Yes                       | Yes                        | Yes              | Yes           | Yes            |
| 2    | Abdulrahman Shehu Sani  | Yes                     | Yes           | Yes            | Yes                       | Yes                        | Yes              | Yes           | Yes            |
| 3    | Ezeh .C. Hillary        | NIL                     | NIL           | NIL            | Yes                       | Yes                        | Yes              | Yes           | Yes            |
| 4    | Shehu suleiman          | Yes                     | Yes           | Yes            | NIL                       | Yes                        | Yes              | Yes           | Yes            |
| 5    | Abubakar Ubale Abubakar | Yes                     | Yes           | Yes            | Yes                       | Yes                        | Yes              | Yes           | Yes            |
| 6    | Muhammed Abdulrahman    | Yes                     | Yes           | Yes            | Yes                       | Yes                        | Yes              | Yes           | Yes            |
| 7    | Wasiu Olatunde Olajide  | NIL                     | NIL           | NIL            | Yes                       | NIL                        | NIL              | NIL           | Yes            |
| 8    | Engr. M.K. Rabiu        |                         |               |                |                           |                            |                  |               |                |

Table 10: Questionnaire Compendium 4

**Summary of evaluation of capacity development of the trainees before training**

| SN | NAMES                   | EVALUATION BEFORE TRAINING |
|----|-------------------------|----------------------------|
| 1  | ABDULRAHMAN SHEHU SANI  | 50%                        |
| 2  | ABDULRAHMAN MUHAMMED    | 50%                        |
| 3  | ABUBAKAR UBALÉ ABUBAKAR | 50%                        |
| 4  | IFECHUKWU I. JUSTIN     | 50%                        |
| 5  | SHEHU SULEIMAN          | 50%                        |
| 6  | MOH. KABIR RABIU        | 0%                         |
| 7  | WASIU OLAJIDE           | 90%                        |
| 8  | EZEH C. HILLARY         | 50%                        |

Table 11: Summary of Trainee Evaluation before Training

Self-evaluation of the Training/Instructor based on questionnaire to the trainees.

Below is the summary of the Trainees perception of the instructor/training (general) and the training workshop/presentation summary chart computed from the distributed questionnaires (see appendix for the aforementioned) after the training exercise;

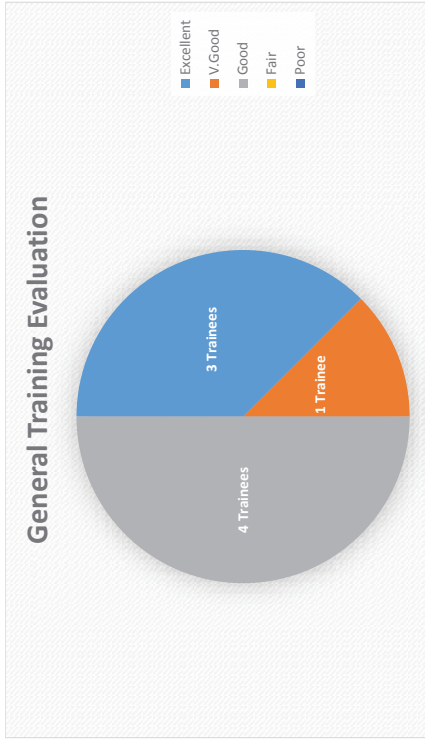


Figure 6: General Training Evaluation

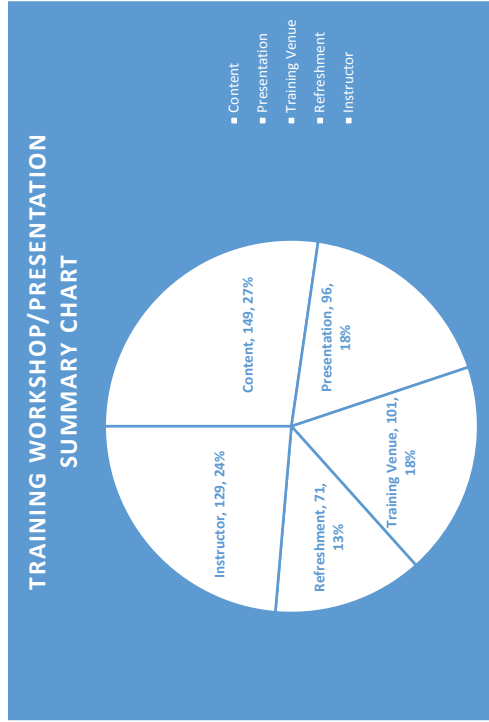


Figure 7: Training Workshop/Presentation Summary Chart

Evaluation of trainee's understanding based on test

The trainees were subjected to two different tests which included a test on GeoMedia and ArcGIS respectively. Find below the Test on GeoMedia and ArcGIS;

=====

*GeoMedia Assessment Exercise*

Friday, December 4, 2015

1. Create a blank Geoworkspace name it <YourName>\_Assessment
2. Load the "PROJ\_UTM32N\_Minna.csf" file from the Geoworkspace coordinate system
3. Create a new Warehouse – name it <YourName>\_Assessment
4. Create an ArcView .ini file from the Define Warehouse Utility tool Configuration
5. Connect to the ArcView workspace on C: \Desktop\Training\Shapefiles, using the .ini created above
6. Create 3 Map windows
  - a. The Phase I Distribution Overview
    - i. For the Distribution Overview map insert through *insert legend features* the following layers;
      1. DistributionLines
      2. Fittings
      3. Hydrants
      4. LateralLine
      5. Meters
  - b. Phase I
    - i. For the Phase I map insert through *insert legend features* the following layers;
      1. Phase I
  - c. FCT Overview
    - i. For the FCT Overview map insert through *insert legend features* the following layers;
      1. FCT\_Cadzones
      2. StreetCenterlines
  7. Use the necessary cosmetics/symbolologies etc.
  8. Create a new layout
  9. Produce and print an A0 size map Comparison

**Good Luck**

**ArcGIS Assessment Exercise**

Tuesday 1<sup>st</sup> December, 2015

1. Create a blank Mapdocument name it <YourName>\_Assessment
2. Connect to the Ashawa AMIS.mdb on C: \Desktop\Training\Ashawa AMIS.mdb, through the ArcCatalog window
3. Load the LGAs layer as well as the States layer from the above connection
4. Create the 1st Map window to include
  - a. The LGAs in your state only, label the LGAs with their respective names.
5. Create an inset map mainly with the outline of all the States in Nigeria, by inserting a new data frame window
6. Use the necessary cosmetics/symbolologies etc.
7. Create a new layout
8. Produce and export an A4 size map (name the exported map <YourName>\_Assessment.pdf)

**Good Luck**

**Training Test Result**

Below are the Tests results based on the Trainees

| SN | NAMES                   | GEOMEDIA | ARCGIS |
|----|-------------------------|----------|--------|
| 1  | ABDULRAHMAN SHEHU SANI  | 67%      | 80%    |
| 2  | ABDULRAHMAN MUHAMMED    | 67%      | 80%    |
| 3  | ABUBAKAR UBALE ABUBAKAR | 75%      | 80%    |
| 4  | IFECHUKWU I. JUSTIN     | NA       | 90%    |
| 5  | SHEHU SULEIMAN          | 90%      | 92%    |
| 6  | MOH. KABIR RABIU        | 67%      | NA     |
| 7  | WASIU OLAJIDE           | 68%      | 80%    |
| 8  | EZEH C. HILLARY         | NA       | 70%    |

Table 13: Training Test Results

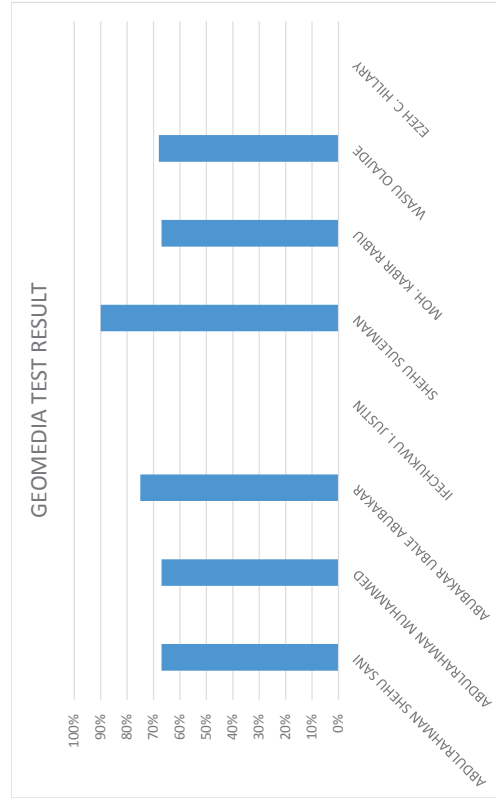


Figure 8: GeoMedia Test Result (Bar Chart)



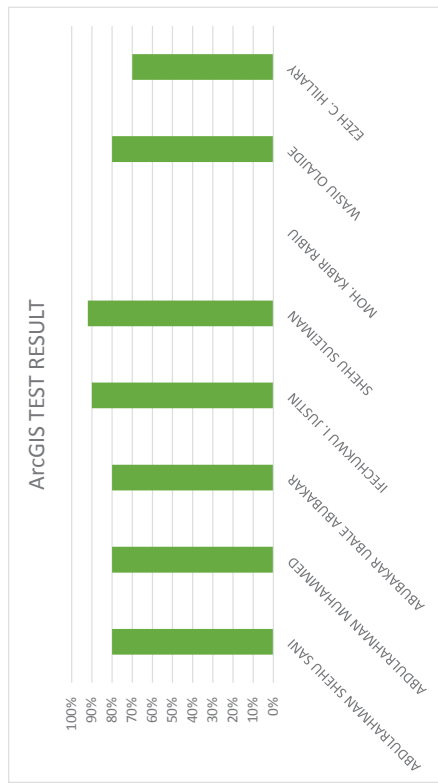


Figure 9: ArcGIS Test Result (Bar Chart)

**Training Test Output for the trainees**  
Below are the test output for the trainees

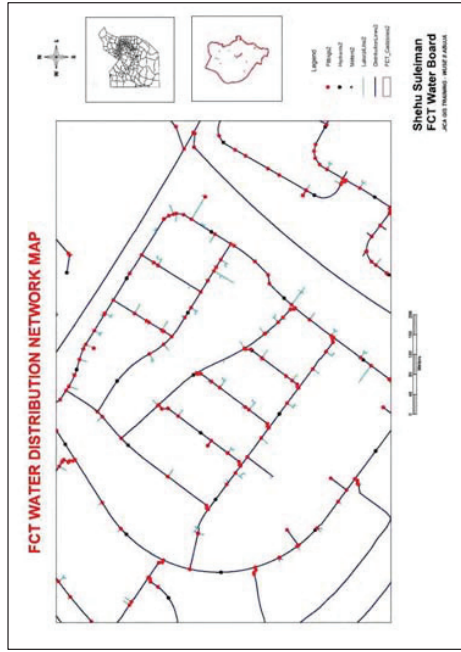


Figure 10: Shehu Suleiman's GeoMedia Test Result/Output

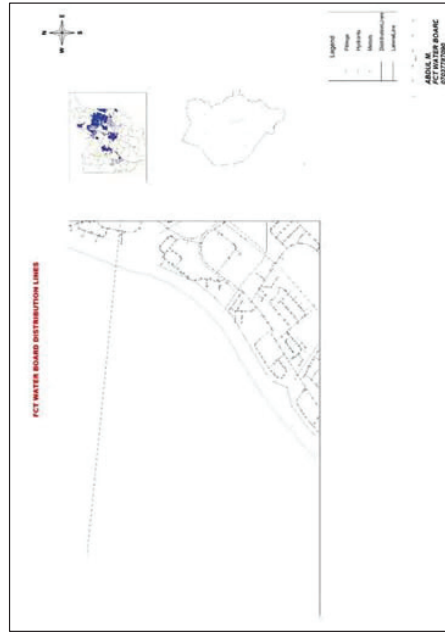


Figure 11: Abdul Muhammed's GeoMedia Test Result/Output



Figure 12: Abulrahman Shehu's GeoMedia Test Result/Output

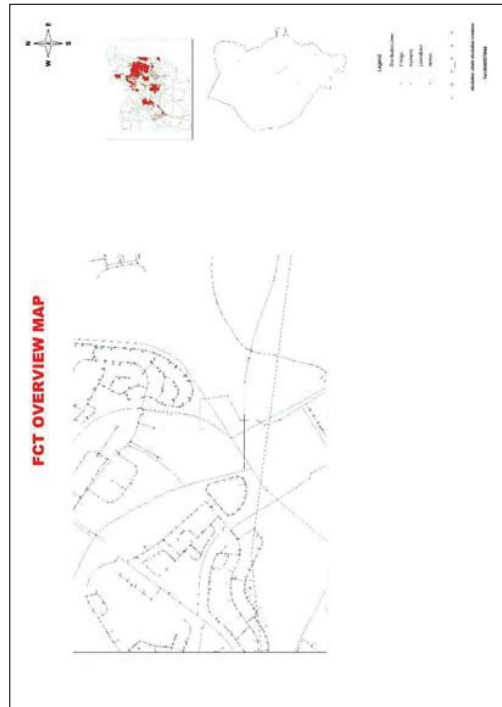


Figure 13: Abubakar Ubale Abubakar's GeoMedia Test Result/Output



Figure 14: Wasiu Olojide's GeoMedia Test Result/Output



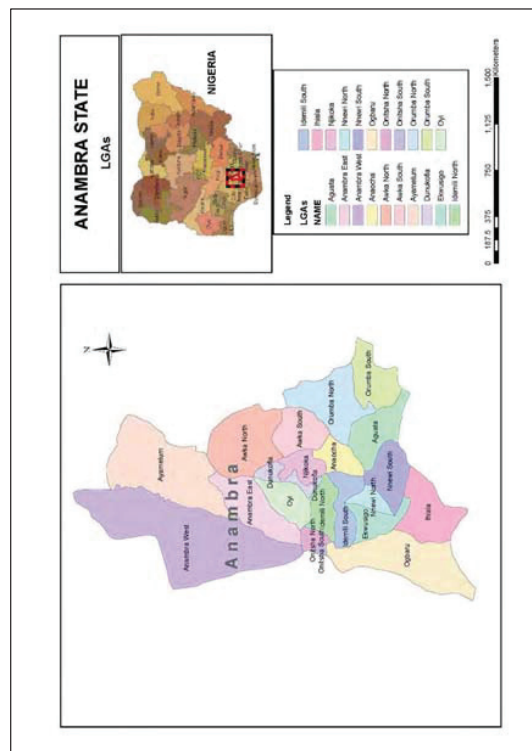


Figure 19: Hillary Eze's ArcGIS Test Result/Output

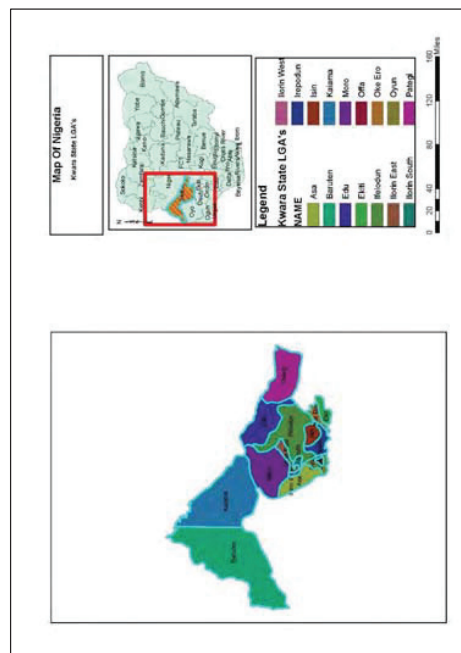


Figure 20: Wasiu Olajide's ArcGIS Test Result/Output

| SN | TEST QUESTIONS   | Mark Obtainable | ABDULRAHM AN SHEHU SANI | ABDULRAHM AN MUHAMMED | ABUBAKAR UBALE ABUBAKAR | IFECHUKWU I. JUSTIN | SHEHU SULEIMAN | MOH. KABIR RABIR | WASIU OLAJIDE | EZEH C. HILLARY |
|----|--|-----------------|-------------------------|-----------------------|-------------------------|---------------------|----------------|------------------|---------------|-----------------|
| 1  | Create a blank Geoworkspace name it <YourName> _Assessment                                       | 10              | 10                      | 10                    | 10                      | NA                  | 10             | 10               | 10            | NA              |
| 2  | Load the "PROJ_UTM32N_Minna.csf" file from the Geoworkspace coordinate system                    | 10              | 10                      | 10                    | 10                      | NA                  | 10             | 10               | 10            | NA              |
| 3  | Create a new Warehouse – name it <YourName> _Assessment  | 10              | 10                      | 10                    | 10                      | NA                  | 10             | 10               | 10            | NA              |
| 4  | Create an ArcView .ini file from the Define Warehouse Utility tool Configuration                 | 10              | 10                      | 10                    | 10                      | NA                  | 10             | 10               | 10            | NA              |
| 5  | Connect to the ArcView workspace on C:\Desktop\Training\Shapefiles, using the .ini created above | 10              | 10                      | 10                    | 10                      | NA                  | 10             | 10               | 10            | NA              |
| 6  | Create 3 Map windows   | 60              | 31                      | 30                    | 35                      | NA                  | 50             | 30               | 32            | NA              |
| a  | The Phase I Distribution Overview  |                 |                         |                       |                         |                     |                |                  |               |                 |
|    | For the Distribution Overview map insert through insert legend features the following layers;    |                 |                         |                       |                         |                     |                |                  |               |                 |
|    | DistributionLines  |                 |                         |                       |                         |                     |                |                  |               |                 |
|    | Fittings   |                 |                         |                       |                         |                     |                |                  |               |                 |
|    | Hydrants   |                 |                         |                       |                         |                     |                |                  |               |                 |
|    | LateralLine  |                 |                         |                       |                         |                     |                |                  |               |                 |
|    | Meters   |                 |                         |                       |                         |                     |                |                  |               |                 |
| b  | Phase I  |                 |                         |                       |                         |                     |                |                  |               |                 |

| SN | TEST QUESTIONS   | Mark Obtainable | ABDULRAHMAN SHEHU SANI | ABDULRAHMAN MUHAMMED | ABUBAKAR UBALE ABUBAKAR | IFECHUKWU I. JUSTIN | SHEHU SULEIMAN | MOH. KABIR RABIU | WASIU OLAJIDE | EZEH C. HILLARY |
|----|--|-----------------|------------------------|----------------------|-------------------------|---------------------|----------------|------------------|---------------|-----------------|
| 1  | Create a blank Mapdocument name it <YourName>_Assessment   | 10              | 10                     | 10                   | 10                      | 10                  | 10             | NA               | 10            | 10              |
| 2  | Connect to the Ashawa AMIS.mdb on C: \Desktop\Training\ Ashawa AMIS.mdb, through the ArcCatalog window         | 10              | 10                     | 10                   | 10                      | 10                  | 10             | NA               | 10            | 10              |
| 3  | Load the LGAs layer as well as the States layer from the above connection                                      | 10              | 10                     | 10                   | 10                      | 10                  | 10             | NA               | 10            | 10              |
| 4  | Create the 1st Map window to include   | 40              | 30                     | 20                   | 25                      | 30                  | 30             | NA               | 20            | 17              |
|    | The LGAs in your state only, label the LGAs with their respective names.                                       |                 |                        |                      |                         |                     |                |                  |               |                 |
| 5  | Create an inset map mainly with the outline of all the States in Nigeria, by inserting a new data frame window | 20              | 14                     | 14                   | 14                      | 20                  | 20             |                  | 14            | 14              |
| 6  | Use the necessary cosmetics/symbologies etc.   | 10              | 5                      | 10                   | 7                       | 7.5                 | 9              | NA               | 7             | 5               |
| 7  | Create a new layout  | 10              | 10                     | 10                   | 10                      | 10                  | 10             | NA               | 10            | 10              |
| 8  | Produce and export an A4 size map (name the exported map <YourName>_Assessment.pdf)                            | 20              | 15                     | 20                   | 18                      | 20                  | 19             | NA               | 15            | 15              |
|    | <b>Total Marks Obtainable</b>  | 130             | 104                    | 104                  | 104                     | 117.5               | 118            | NA               | 96            | 91              |
|    | <b>ArcGIS Practical Test Score</b>   | <b>100</b>      | <b>80</b>              | <b>80</b>            | <b>80</b>               | <b>90.38</b>        | <b>90.77</b>   | <b>NA</b>        | <b>73.85</b>  | <b>70.00</b>    |

Table 2: ArcGIS Test Grading Sheet

|   |  |            |             |             |             |           |           |             |             |           |
|---|--|------------|-------------|-------------|-------------|-----------|-----------|-------------|-------------|-----------|
|   | For the Phase I map insert through insert legend features the following layers;      |            |             |             |             |           |           |             |             |           |
|   | Phase I  |            |             |             |             |           |           |             |             |           |
| c | FCT Overview   |            |             |             |             |           |           |             |             |           |
|   | For the FCT Overview map insert through insert legend features the following layers; |            |             |             |             |           |           |             |             |           |
|   | FCT_Cadzones   |            |             |             |             |           |           |             |             |           |
|   | StreetCenterlines  |            |             |             |             |           |           |             |             |           |
| 7 | Use the necessary cosmetics/symbologies etc.   | 10         | 5           | 2           | 3           | NA        | 10        | 2           | 5           | NA        |
| 8 | Create a new layout  | 10         | 10          | 10          | 10          | NA        | 10        | 10          | 10          | NA        |
| 9 | Produce and print an A0 size map   | 20         | 5           | 9           | 15          | NA        | 15        | 9           | 5           | NA        |
|   | <b>Total Marks Obtainable</b>  | 150        | 101         | 101         | 113         | NA        | 135       | 101         | 102         | NA        |
|   | <b>GeoMedia Practical Test Score</b>   | <b>100</b> | <b>67.3</b> | <b>67.3</b> | <b>75.3</b> | <b>NA</b> | <b>90</b> | <b>67.3</b> | <b>68.0</b> | <b>NA</b> |

Table 1: GeoMedia Test Grading Sheet



Annex 10:

Training in Japan and Action Plans prepared  
by Participants





## The First Training in Japan

**Course Name:** The Federal Capital Territory Reduction of Non-Revenue Water Project, Water Supply Services Management and NRW Reduction

**Purpose:**

Necessity to comprehensive management of water supply services, and knowledge and technology about NRW reduction are shared and diffused in FCTWB. In particular,

- Trainees understand institution and system of water supply services, and various efforts in Japan and Yokohama City , and then can compare them with those in Nigeria
- Trainees understand a variety of skills and practical approaches about NRW reduction, and then contribute to taking appropriate response to NRW in Pilot Metering Area (PMA) and apply their know-how gained to routine works of FCTWB.
- Trainees enhance understanding of planning and operations in water supply services, and then contribute to future improvement of management of water supply services of FCTWB.

**Programme:**

- Overview of Water Supply in Japan and Yokohama
- Self-supporting Accounting System and PPP
- Rehabilitation Project of Purification Plant by PFI
- Membrane filtration
- Water Tariff Management
- Customer Services (CS) Center
- Customer Services (CS) and Public Relations
- Mapping System
- Water Supply Operation Management
- Outline of Leakage (NRW) Prevention
- Leakage Detection Demonstration (Training Facility)
- Aged Pipe Replacement Plan
- Pipe Replacement Works
- Water Mater Maintenance
- Human Resources Development
- Technology Succession
- Water Supply Planning
- Asset Management
- Medium Term Management & Financial Planning
- Purification Plant

**Period:** 16<sup>th</sup> to 29<sup>th</sup> August 2015

**Receiving Water Utility:** Yokohama City Waterworks Bureau

**Participants:** 4 delegation officials (FCTWB: 4)

| Name                             | Organ. | Position in FCTWB                               |
|----------------------------------|--------|---|
| Engr.(Mr.) NAHUCHE Aliyu Ahamad  | FCTWB  | Head of Distribution Department,                |
| Mr. MUHAMMAD Said Adis           | Ditto  | Head of Commerce Department,                    |
| Engr. (Mr.) ALIYU Abubakar Usman | Ditto  | Head of Reservoir and Production Department,    |
| Mr. DIKKO Musa Suleiman          | Ditto  | Head of Pipeline Unit, Distribution Department, |





# Action Plan By Team of FCTWB delegates for Management of Water Supply Services and NRW Training In Japan

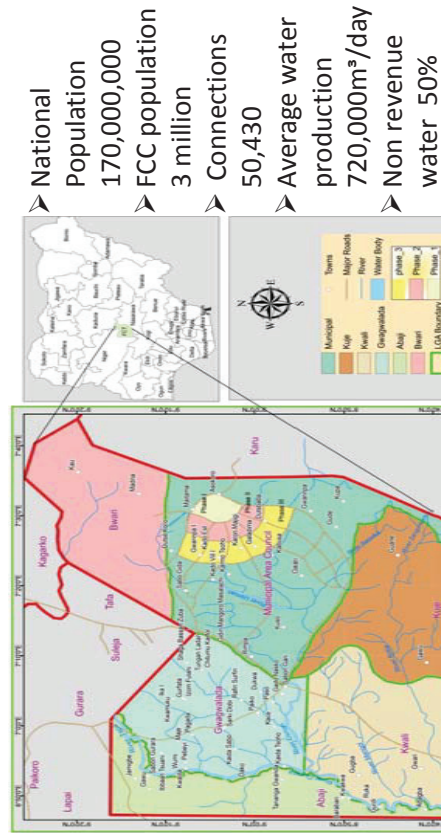
Engr. A. A. Nahuiche  
Engr. Aliyu A. Usman  
Mohammed S. Adis  
Dikko S. Musa



AUGUST ,2015



## BACKGROUND



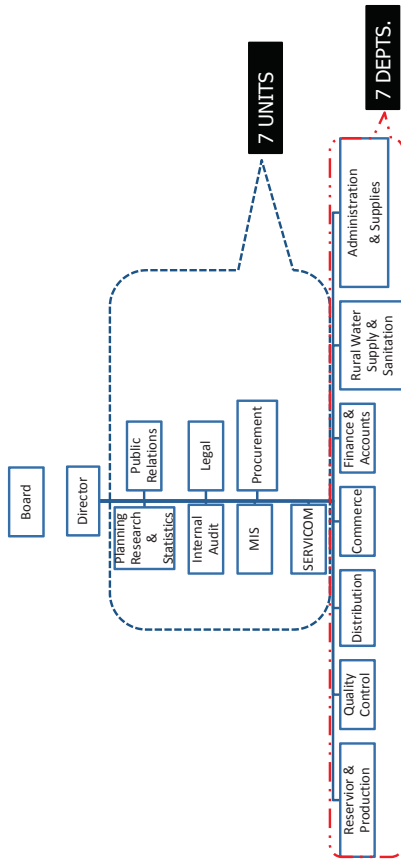
## Background Contd.

- The Federal Capital Territory (FCT), Abuja was created in 1976 to serve as the new capital city of the Federal Republic of Nigeria.
  - The FCT Water Board was established in October 1989 to provide potable water of adequate quantity and quality at affordable rate to the residents of the FCT.
- Functions:**
- ❖ Management and maintenance of all water works in the FCT
  - ❖ Harnessing all water resources of the Territory for economic development.
  - ❖ Conducting research for the purpose of carrying out its functions
  - ❖ Submission of the findings of the research to the Hon. Minister of the FCT for the purpose of policy formulation

## Preamble

- ❑ The water sub-sector of the FCT is well documented under the support infrastructure system of the Master Plan of Abuja.
- ❑ The manner in which the water is supplied, distributed, used and disposed off in the FCT properly documented in the Abuja Water supply Master Plan
- ❑ The Federal Capital Development Authority (FCDA) Engineering Services Department is responsible for the provision of Water Infrastructure in FCT
- ❑ The FCT Water Board (FCT WB) is the Government Agency responsible for the provision of water supply to the residents of FCT

## Organizational Structure



## Raw Water Sources



- **Lower Usuma Dam**  
Capacity: 100 mil. m3
- **Gurara Dam**  
Capacity: 880 mil. m3

## Existing Water Infrastructure Cont...



- **Treatment Plants 1 & 2**  
Capacity 10,000cu.m/hr designed to operate 24hrs a day thus the total output of 240,000cu.m/day is expected
- **Treatment Plants 3 & 4**  
Designed capacity: To provide 20,000cu.m/hr treated water each boosting treated water supply to 480,000cu.m/day.

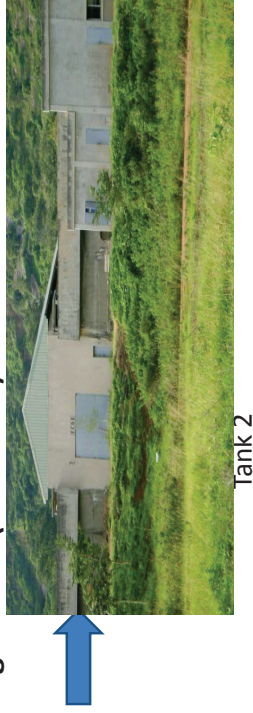
Combine treatment capacity is 720,000cu.m/day

## Existing Water Infrastructure Cont...

- **Trunk Mains:** Gravity flow via 2 Nos. 1500mm diameter trunk mains into 4 Nos. hydraulically located balancing tanks No.2,3,4 and 5, which distribute the treated water to various sections of the city (phases I & II).
- Two additional 1500mm diameter trunk mains to tanks 1 and 6 for phases III FCC (final stages of completion) on-going project

## Existing Water Infrastructure Cont...

- **Storage Tanks:** (Next slide)



## Existing Water Infrastructure Cont...

| TANK   | LOOP | CAPACITY (m <sup>3</sup> ) | PHASE | STATUS             | DISTRICTS   |
|--------|------|----------------------------|-------|--------------------|---|
| Tank 1 | 1    | 30,000                     | III   | Under construction | Wupa, Karmo, Bunkoro, Nbora, kafe, Gwarimpa I, Gwarimpa II, Dape, Industrial (Area 1)                 |
| Tank 2 | 2    | 45,000                     | II    | Completed          | Jahi, Utako, katampe, Dakibiyu, Kado, Wuye, Mabushi, Kukwaba, Jabi, Recreational park                 |
| Tank 3 | 3    | 24,000                     | I     | Completed          | Maitama, Wuse I and Wuse II   |
| Tank 4 | 4    | 24,000                     | I     | Completed          | Garki I, Garki II, Asokoro  |
| Tank 5 | 5    | 40,000                     | II    | Completed          | Durumi, kaura, Gudu, Duboyi, Guzape, Gaduwa, Duse   |
| Tank 6 | 6    | 40,000                     | III   | Under Construction | Galadimawa, Dakwo, Lokogoma, Wumba, Saraji, Kabusa, Okanje, Pyakasa, Institutional/Industrial Area II |

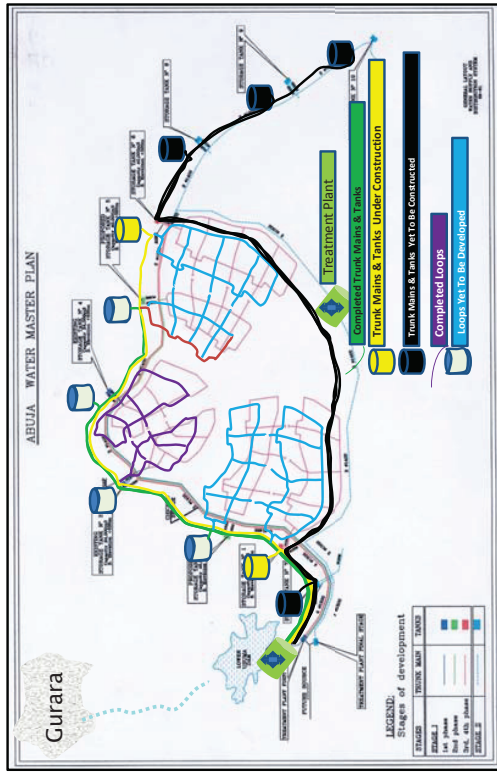
## Existing Water Infrastructure Cont...

- **Distribution Network:** Each storage tank is connected to a loop to feed areas of the FCC.
- There are 8 Nos. Booster stations to areas of high elevations within the loops

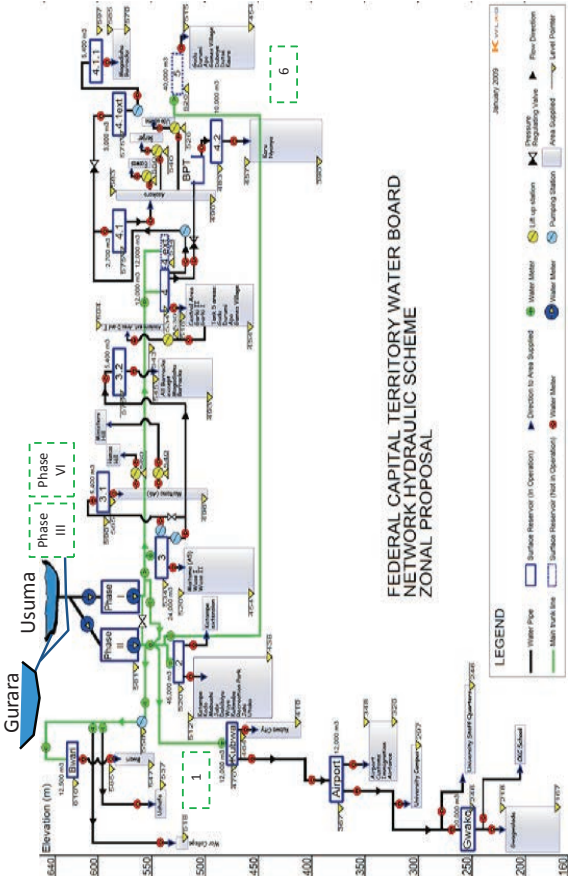


Booster station at Hamza Hill

### Master Plan for Water Supply in the FCC



13



### What we learned (1)

- Water supply system in Japan
- Self-supporting Accounting system
- Rehabilitation of WTP
- New technology of membrane filtration / Kosuzume purification plant
- Water tariff
- Customer service center
- Customer satisfaction
- Mapping system
- Water supply operation & management

### What we learned (2)

- Leakage detection
- Aged pipe replacement
- Water meter maintenance
- Human resource developing & water demand prediction
- Asset management
- Management plan







## The Second Training in Japan

**Course Name:** The Federal Capital Territory Reduction of Non-Revenue Water Project (Distribution and Commerce)

**Purpose:**

1. All trainees belonging to both Distribution and Commerce understand system/outline of water supply services in Japan and Yokohama City, and then can compare them with those in Nigeria and FCTWB.
2. Through participation in common lectures, visiting and discussions, all trainees belonging to both Distribution and Commerce understand systems and efforts for operation and maintenance and NRW reduction.
3. Through participation in lectures and visiting related to each area, Distribution or Commerce separately, trainees belonging to each area understand systems, technologies, methodologies and efforts for operation and maintenance and NRW reduction.
4. In consideration of consistency to the action plan proposed by trainees participated in the 1<sup>st</sup> Training in August 2015, more practical and pragmatic action plan for realization is prepared by trainees belonging to both Distribution and Commerce jointly.
5. Eventually, the action plan and their knowledge are fully utilized for implementation of appropriate operation and maintenance and cross-organizational NRW reduction by FCTWB.

**Programme:**

1. Common Subject: Water Supply in Japan, Non-Revenue Water, Self-support Accounting System, Distribution Management, Mapping System (GIS), Yokohama Water Supply Museum, Water Meter, Service Connection & Inspection, Water Supply Facility Development Planning, Medium-Term Management and Financial Planning, Schoolchild Education Activity in Water Treatment Plant
2. Distribution: Facility O&M, Leakage Prevention, Leakage Detection Demonstration, Supervision & Inspection, Water Supply Operation & Management
3. Commerce: Water Tariff, Public Relations, Customer Services, Meter Reading, Human Resources Development

**Period:** 19<sup>th</sup> June to 2<sup>nd</sup> July 2016

**Receiving Water Utility:** Yokohama City Waterworks Bureau

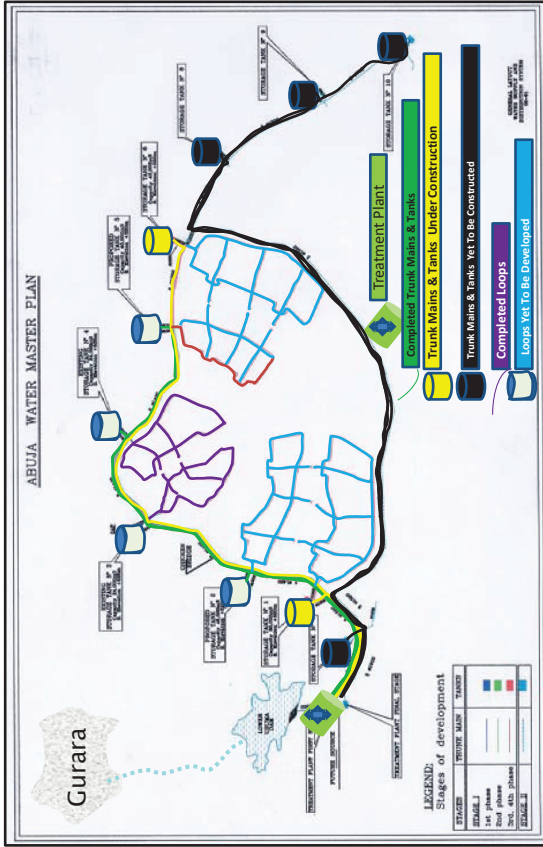
**Participants:** 8 project members (Distribution: 4, Commerce: 4)

| Name                       | Position in the Project          | Position in FCTWB   |
|----------------------------|----------------------------------|---|
| Engr. Abolade Rasaki Lawal | Coordinator, NRW Management Team | Head of Special Projects Unit, Distribution                               |
| Mr. Habib Ahmed Kiru       | NRW Action Team Leader           | Area Manager, Gudu Area Office  |
| Mr. Mohammed Dauda Debo    | NRW Management Team member       | Technical Officer, Pipeline Unit, Distribution                            |
| Mr. Abdulrahman Shehu Sani | Ditto                            | Senior Technical Officer / Head of Prepaid Meter Unit, Distribution       |
| Mr. Danjumma Isah          | Ditto                            | Chief Commercial Officer, Head of Monitoring and Detection Unit, Commerce |
| Mr. Shehu Sulaiman         | Ditto                            | Head of GIS, Head of AMR Operations, Distribution / Commerce              |
| Mr. Aliyu Muhammad Maradun | Ditto                            | Chief Commercial Officer, Head of Major Consumers Unit, Commerce          |
| Mrs. Rose Aniekan Akpan    | Ditto                            | Head of Billing Unit, Commerce  |





### 1-4. Master Plan for Water Supply in the FCC



### 1-5. Water Sources & Water Infrastructure

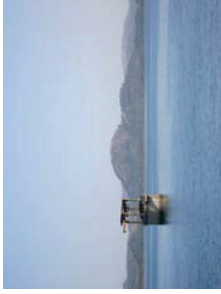
- **Lower Usuma Dam**  
Capacity: 100 mil. m<sup>3</sup>

- **Gurara Dam**  
Capacity: 880 mil. M<sup>3</sup>

- **Treatment Plants 1 & 2**  
Capacity 10,000m<sup>3</sup>/hr designed to operate 24hrs a day thus the total output of 240,000m<sup>3</sup>/day is expected

- **Treatment Plants 3 & 4**  
Designed capacity: To provide 20,000m<sup>3</sup>/hr treated water each boosting treated water supply to 480,000m<sup>3</sup>/day.

Total Treatment Capacity: 720,000m<sup>3</sup>/day.

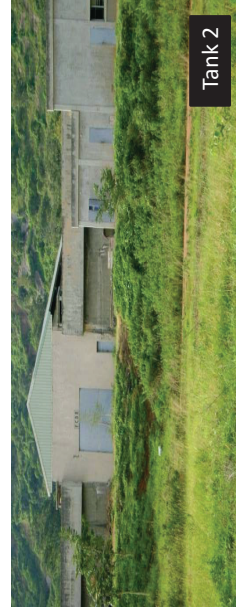


### Experience from Yokohama Case

1. Leakage Detection Equipment and Training Yard
2. Standard GIS/Mapping Section
3. Standard Meter Accuracy Test (Meter Laboratory)
4. 100 % Customer Metering
5. Meter Reading: Once in Two Months (2-month Billing Cycle)

### 1-4. Master Plan for Water Supply in the FCC

| TANK   | LOOP | CAPACITY (m <sup>3</sup> ) | PHASE | STATUS             | DISTRICTS SUPPLIED  |
|--------|------|----------------------------|-------|--------------------|---|
| Tank 1 | 1    | 30,000                     | III   | Under construction | Wupa, Karmo, Bunkoro, Nbora, kafe, Gwarimpa I, Gwarimpa II, Dape, Industrial (Area 1)                     |
| Tank 2 | 2    | 45,000                     | II    | Completed          | Jahi, Utako, katampe, Dakibiyu, Kado, Wuye, Mabushi, Kukwaba, Jabi, Recreational park                     |
| Tank 3 | 3    | 24,000                     | I     | Completed          | Maitama, Wuse I and Wuse II   |
| Tank 4 | 4    | 24,000                     | I     | Completed          | Garki I, Garki II, Asokoro  |
| Tank 5 | 5    | 40,000                     | II    | Completed          | Durumi, kaura, Gudu, Duboyi, Guzape, Gaduwa, Dutse  |
| Tank 6 | 6    | 40,000                     | III   | Under construction | Galadimawa, Dakwo, Lokogoma, Wumba, Saraji, Kabusa, Okanje, Pyakasa, Institutional Are Industrial Area II |



## Customer Category

| Customer Category                | No. of Bill (Nos.)    | Percentage (%) |
|----------------------------------|-----------------------|----------------|
| Domestic                         | 46,900                | 96.7           |
| Commercial <sub>(un-coded)</sub> | (30,700+11,100+5,100) |                |
| Major Consumers                  | 1,600                 | 3.3            |
| Institutions                     | (1,000+600+0)         |                |
| <b>Total</b>                     | <b>48,500</b>         | <b>100.0</b>   |

| Customer Category                | Billed Charge (Mil. N) | Percentage (%) |
|----------------------------------|------------------------|----------------|
| Domestic                         | 356.6                  | 76.4           |
| Commercial <sub>(un-coded)</sub> | (293.1+56.1+7.4)       |                |
| Major Consumers                  | 110.2                  | 23.6           |
| Institutions                     | (104.0+6.2+0)          |                |
| <b>Total</b>                     | <b>466.8</b>           | <b>100.0</b>   |

Annex 10-13

9

## Customer Meter

| Meter Type   | No. of Bill (Nos.) | Percentage (%) |
|--------------|--------------------|----------------|
| Conventional | 24,600             | 50.7           |
| AMR          | 11,700             | 24.1           |
| Prepaid      | 5,100              | 10.5           |
| Flat-rate    | 7,100              | <b>14.6</b>    |
| <b>Total</b> | <b>48,500</b>      | <b>100.0</b>   |

| Meter Type   | Billed Charge (Mil. N) | Percentage (%) |
|--------------|------------------------|----------------|
| Conventional | 313.2                  | 67.1           |
| AMR          | 62.3                   | 13.3           |
| Prepaid      | 7.4                    | 1.6            |
| Flat-rate    | 83.9                   | <b>18.0</b>    |
| <b>Total</b> | <b>466.8</b>           | <b>100.0</b>   |

10

## Billing Measures

| Meter Type             | No. of Bill (Nos.) | Percentage (%) |
|------------------------|--------------------|----------------|
| Conventional_Reading   | 11,100             | 35.0           |
| Conventional_Estimate  | <b>13,500</b>      | <b>42.6</b>    |
| Conventional_Flat-rate | <b>7,100</b>       | <b>22.4</b>    |
| Sub-Total              | 31,700             | 100.0          |
| AMR_Reading            | 5,900              | 50.4           |
| AMR_Estimate           | <b>5,800</b>       | <b>49.6</b>    |
| Sub-Total              | 11,700             | 100.0          |
| Prepaid                | N/A                | N/A            |
| Prepaid_Flat-rate      | <b>N/A</b>         | <b>N/A</b>     |
| Sub-Total              | 5,100              | 100.0          |
| <b>Total</b>           | <b>48,500</b>      | <b>-</b>       |

11

## Action Plan against

### Meter Reading

#### Reason for inability to achieve 100% Meter Reading

1. Lack of Logistics (Utility Vehicle and meter reading devices);
2. Existence of faulty meters;
3. Lack of meter fittings and spare parts (Battery, etc);
4. Existence of flat rate properties;
5. Location of water meter and poor quality of meter installation;
6. Lack of guideline and manual for the location of water meter and installation;
7. Lack of meter laboratory & standardization for quality management;

12

## Action Plan against (cont.....)

### Meter Reading

#### Reason for inability to achieve 100% Meter Reading (Cont.)

8. Lack of training & Standard Operation Procedures (SOP) for meter reading;
9. Lack of monitoring and feedback from meter readers
10. Inability of billing system to measure consumption, Existence of estimated billing;
11. Customer/Staff behavior; and
12. Unauthorized removal of meters

## Action Plan against (cont.....)

### Action needed to achieve 100% Meter Reading

- **Presentation & Fact finding (Statistical data)**
  - Presentation to FCTWB Management for approval of the plan & budget proposal;
  - Create a team & make Presentation to all relevant FCT WB Staff;
  - Incorporate comments & observations from Staff into the Proposal;
  - Collect all data & information to prepare the Plan;
- **Planning and Budget proposal**
  - Develop the plan and budget proposal base on information and data collected.
  - Presentation & follow-up for approval and release of fund for implementation of the plan.

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

1. Lack of Logistics (Utility Vehicle and meter reading devices)

#### Action Needed

- Collect information about current situations and any other we have to do;
- Analysis of each Area Office;
- Nos. of Meter Readers and Distribution
- Procurement

#### Who is in Charge

- HOD Commerce, HOD Admin&Supply

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

2. Existence of faulty meters;

#### Action Needed

- Identification of faulty meter by survey;
- Verification of faulty meters by meter readers and relevant units;
- Procurement, replacement of the faulty meter & possible change of location.

#### Who is in Charge

- HOD Commerce, HOU (Meter), Area Managers, & Meter Readers.

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

3. Lack of meter fittings and spare parts (Battery, etc);

#### Action Needed

- Identify the required spare parts based on historical records of the meters;
- Adopt preventive maintenance.
- Procurement

#### Who is in Charge

- HOD Distribution, relevant Units

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

4. Existence of flat rate properties;

#### Action Needed

- Identify the flat rate customers and location;
- Collect all information for the procurement;
- Procurement;
- Install new meters in a suitable location.

#### Who is in Charge

- HOD Commerce, HOD (Dist.), Area Manager, and other relevant HOU (Meter)

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

5. Location of water meter and poor quality of meter installation

#### Action Needed

- Identify all meters that were poorly installed & not accessible for reading and where customer behavior not favorable;
- Collect all information;
- Procurement;
- Install or reinstall meters in a suitable location

#### Who is in Charge

- HOD Commerce, HOD (Dist.), Area Manager, and other relevant HOU (Meter)

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

6. Lack of guideline and manual for the location of water meter and installation

#### Action Needed

- Set-up committee
- Based on the fact finding information from Location of water meter and poor quality of meter installation  
Committee prepare the guideline and manual;

#### Who is in Charge

- HOD Distribution, HOD Commerce, & Committee members,

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

7. Lack of meter laboratory & standardization for quality management

#### Action Needed

- Planning and setting-up of meter laboratory suitable for FCT WB
- Survey and Identify all type of meters in FCT;
- Collect the samples, evaluate, assess the meters;
- Discuss about the Standardization using the three JICA pilot project

#### Who is in Charge

- HOD Distribution, HOD Commerce, and HOU (Meter)

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

8. Lack of training & Standard Operation Procedures (SOP) for meter reading

#### Action Needed

- Assess the meter readers ability and their activities;
- Identify the training needs;
- Prepare the training plan;
- Prepare the SOP

#### Who is in Charge

- HOD (Admin & Supply), HOD Commerce, and relevant Unit

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

9. Lack of monitoring and feedback from meter readers

#### Action Needed

- Identify the current situation physically and on the record;
- Set-up meter monitoring plan for all kinds of meters;
- Revise/update Feedback form;
- Set-up proper workflow for the implementation of the feedback
- Training of the personnel in conjunction with meter reading training plan

#### Who is in Charge

- HOD Commerce, Area Manager, and other relevant unit

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

10. Inability of billing system to measure consumption, Existence of estimated billing

#### Action Needed

- Fact finding of existing billing systems
- Clarification of estimated bills;
- Defining new parameters;
- Modification of billing system;
- Discussion of by-monthly meter reading

#### Who is in Charge

- Management Team, facilitated by HOD Commerce



## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

- 1.1. Customer/Staff behavior

#### Action Needed

- Identify the customers who has un-favorable behaviors towards FCT WB Staff and Meter Reader and vice versa;
- Discussion with the PR Unit for strategic public relation
- Customer Relations training and awareness;
- Preparation of Code of Ethics for relating with customer.
- Implementation of the Code of Ethics by FCT WB Staff

#### Who is in Charge

- HOD Commerce, HOU (PR), Customer Care Unit and Legal Unit.

## Action Plan against (cont.....)

### Meter Reading

#### Fact Finding:

- 12. Unauthorized removal of meters

#### Action Needed

- Identify all unauthorized removed meters;
- Replacement of the meters;

#### Who is in Charge

- HOD (Dist.), HOD Commerce, Area Manager, and other relevant Unit.

## Proposed Schedule

| No  | Actions against  | 2016     |          |          |          | 2017     |          |          |          | 2018     |          |  |  |  |
|-----|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--|--|--|
|     |  | 3rd Qtr. | 4th Qtr. | 1st Qtr. | 2nd Qtr. | 3rd Qtr. | 4th Qtr. | 1st Qtr. | 2nd Qtr. | 3rd Qtr. | 4th Qtr. |  |  |  |
| -   | Presentation & Fact finding  |          |          |          |          |          |          |          |          |          |          |  |  |  |
| -   | Planning and Budget proposal   |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 1.  | lack of Logistics (Utility Vehicle and meter reading devices).                     |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 2.  | Existence of faulty meters;  |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 3.  | lack of meter fittings and spare parts (battery, etc);                             |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 4.  | Existence of flat rate properties;   |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 5.  | Location of water meter and poor quality of meter installation;                    |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 6.  | lack of guideline and manual for the location of water meter and installation;     |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 7.  | lack of meter laboratory & standardization for quality management.                 |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 8.  | lack of training & Standard Operation  |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 9.  | Procedures (SOP) for meter reading.  |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 9.  | Lack of monitoring and feedback from meter readers                                 |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 10. | Inability of billing system to measure consumption. Existence of estimated billing |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 11. | Customer/Staff behavior;   |          |          |          |          |          |          |          |          |          |          |  |  |  |
| 12. | Unauthorized removal of meters   |          |          |          |          |          |          |          |          |          |          |  |  |  |

## List of Participants

- Engr. A. R. Lawal (Team Leader) - Danjumma Isah
- Habib Ahmed Kiru - Shehu Sulaiman
- Debo Dauda Mohammed - Aliyu Muhammad Maradun
- Shehu Abdulrahman Sani - Mrs. Akpan Rose Aniekan



Thank you for your kind Attention !!



### The Third Training in Japan

**Course Name:** The Federal Capital Territory Reduction of Non-Revenue Water Project, NRW Reduction (Strategy)

**Purpose:**

The participants visit “Yokohama City”, as a model case or benchmark, the second largest city in Japan,

- To understand institutions and organization structure of integrated water supply services, and planning, designing and O&M and coordination and feedback among them.
- To understand bases, knowledge and methodology of water supply services/O&M including non-revenue water reduction.

The participants compare them with those of FCT and utilize them in contribution for further improvement and implementation in development and O&M of water supply services of FCT.

**Programme:**

- Water Supply O&M System
- Water Supply Control and Management
- History of Waterworks Technology
- Water Distribution Management
- Outline of Water Supply Installation (Service Connection)
- NRW Contents / Water Pressure Control
- Water Treatment Plant
- Water Leakage Detection
- Pipeline Information Management
- Water Meter Maintenance
- Construction Management and As-built Drawing Making
- Self-support Accounting System and PPP
- Management (Business) Plan
- Water Demand Forecasting (Facility Development Planning)
- Replacement of Aged Pipes

**Period:** 9<sup>th</sup> to 15<sup>th</sup> July 2017

**Receiving Water Utility:** Yokohama City Waterworks Bureau

**Participants:** 6 delegation officials (FCDA: 4, FCTWB: 2)

| Name                               | Organ. | Position in FCTWB   |
|------------------------------------|--------|---|
| Engr. AHMAD Shehu Hadi             | FCDA   | Director, Department of Engineering Services                        |
| Engr. EZEHOA Ferdinand Obiora      | FCDA   | Deputy Director, Water & Sewage, Department of Engineering Services |
| Engr. OSAYANDE Joseph Uyi          | FCDA   | Deputy Director, Department of Engineering Design and Evaluation    |
| Engr. OLUWADAMISI Emmanuel Abiodun | FCDA   | Deputy Director. Engineering PPP, Department of Mass Housing / PPP  |
| Engr. ALIYU Abubakar Usman         | FCTWB  | Head of Department, Department of Production,                       |
| Engr. LAWAL Rasaki Abolade         | FCTWB  | Assistant Director, Distribution Department                         |

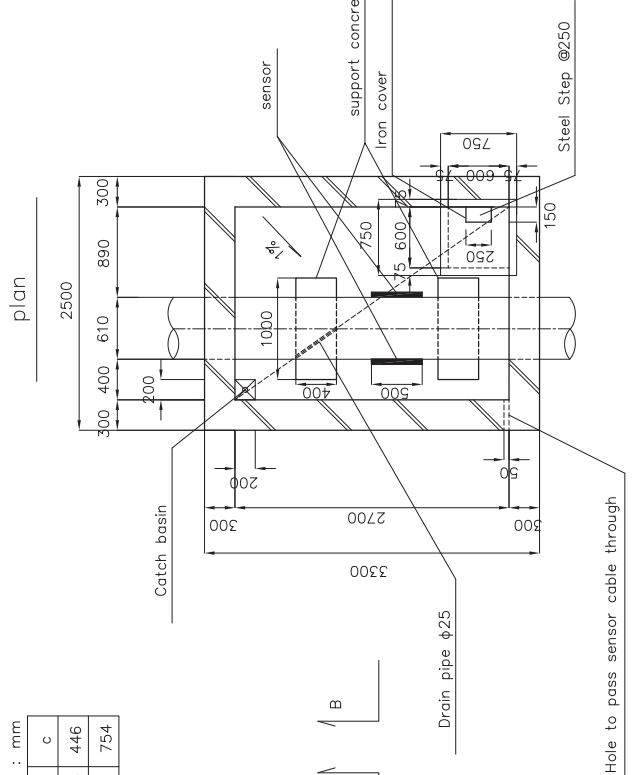
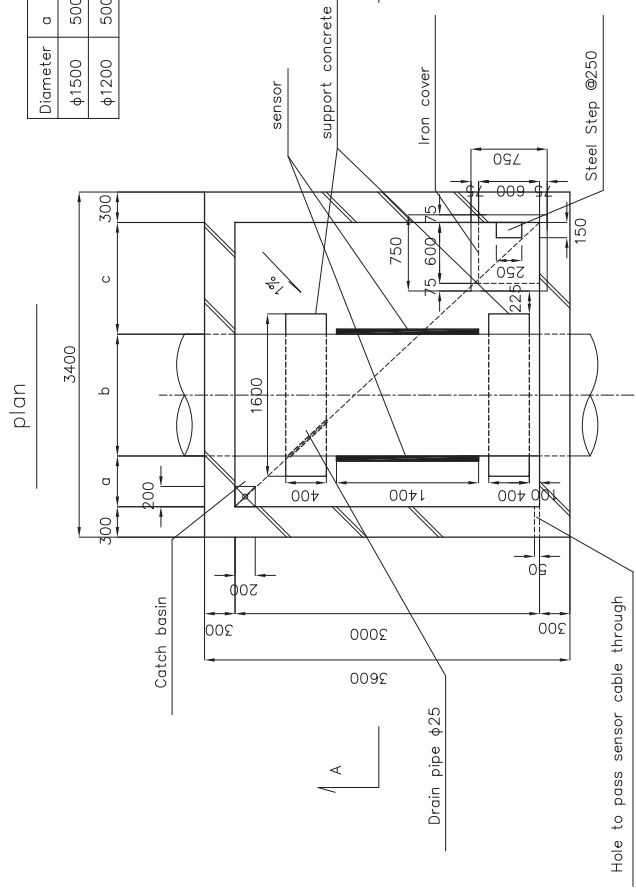


Annex 11:

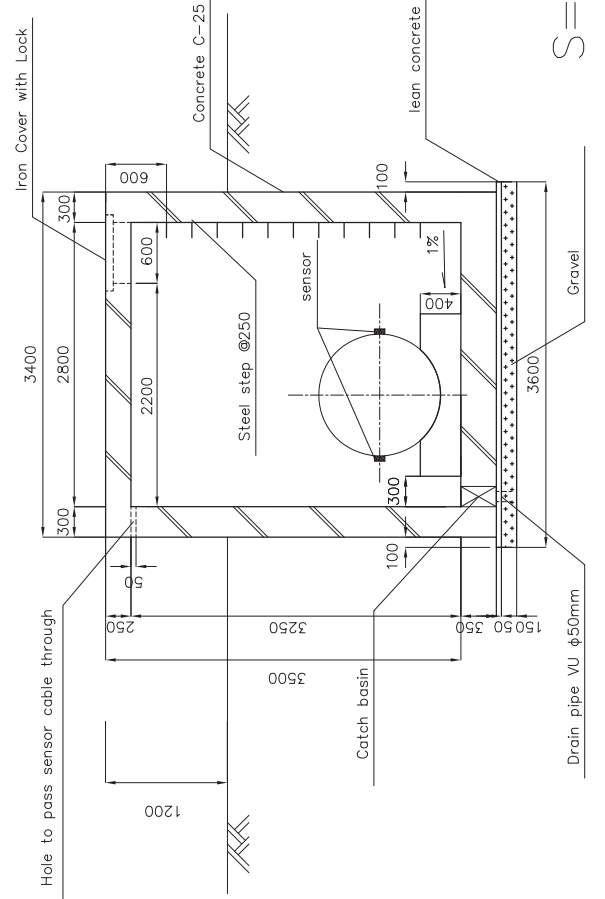
Shop Drawings for Bulk Meters



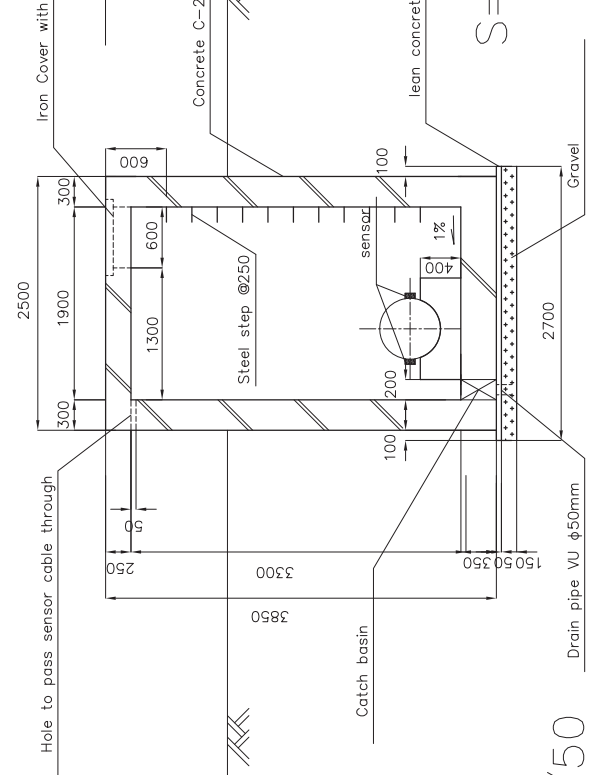
Bulk flow Meter chamber of  $\phi 1500$ ,  $\phi 1200$



A-A' cross section



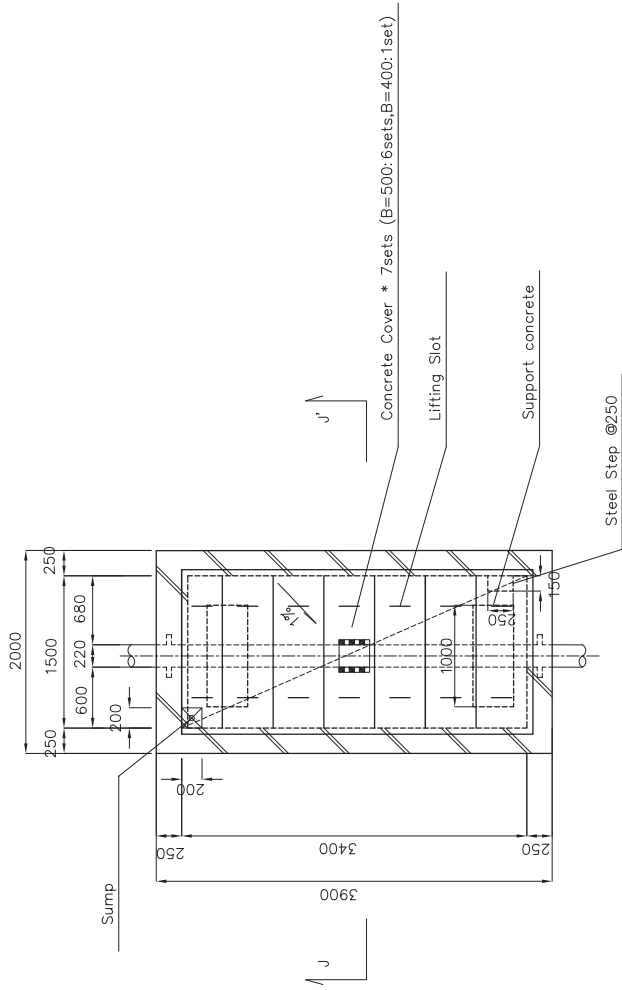
B-B' cross section



Bulk flow Meter chamber of  $\phi 600$

No.10

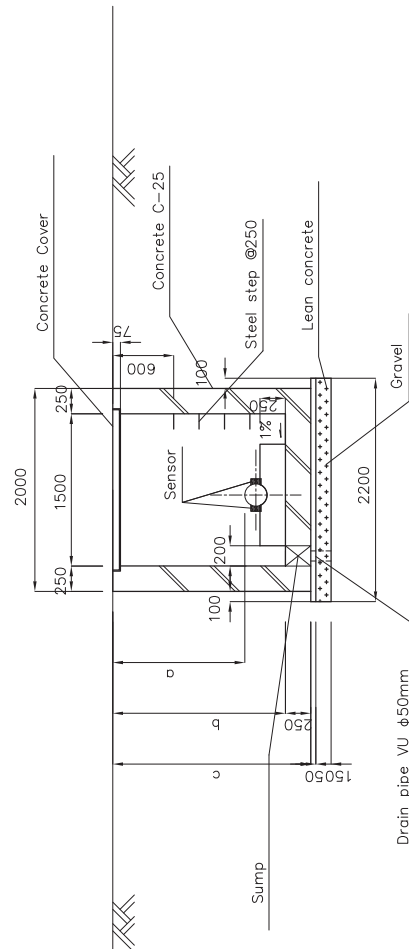
Chamber of Flow Meter (Ultra-sonic) and Step-test Valve of  $\phi 200$



unit:mm

| a    | b    | c    |
|------|------|------|
| 1000 | 1400 | 1650 |
| 1300 | 1700 | 1950 |

J-J' cross section



S=1/50

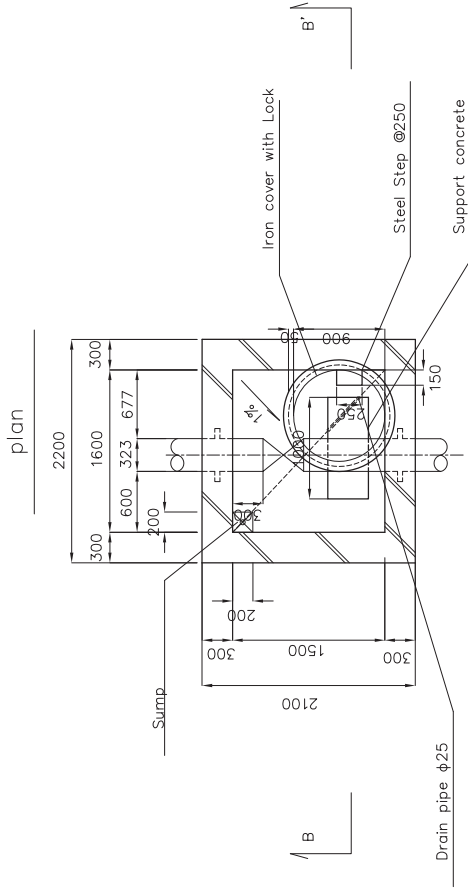
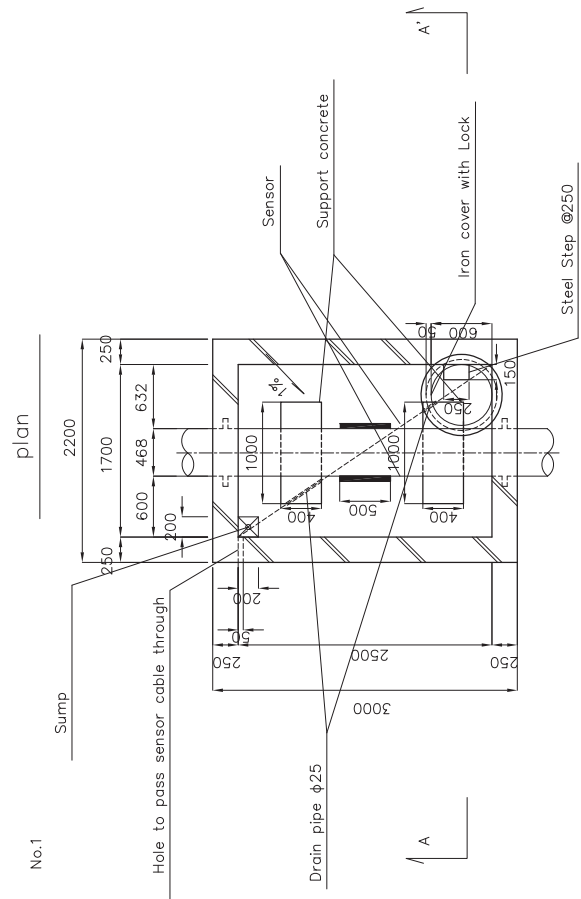


Chamber of Flow Meter (Ultra-sonic) of  $\phi 450$

Chamber of Isolation Valve of  $\phi 300$

No.2

No.1

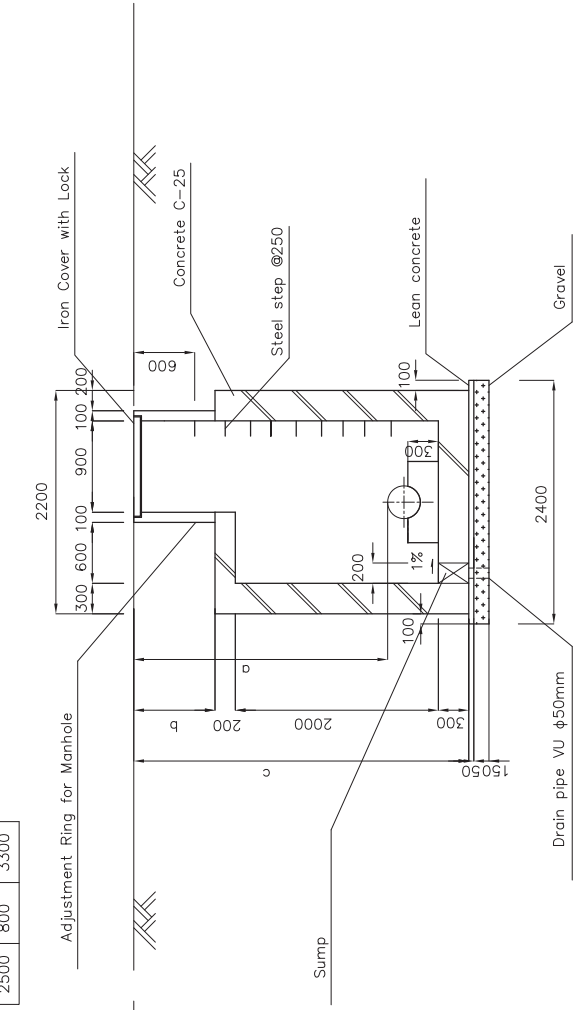
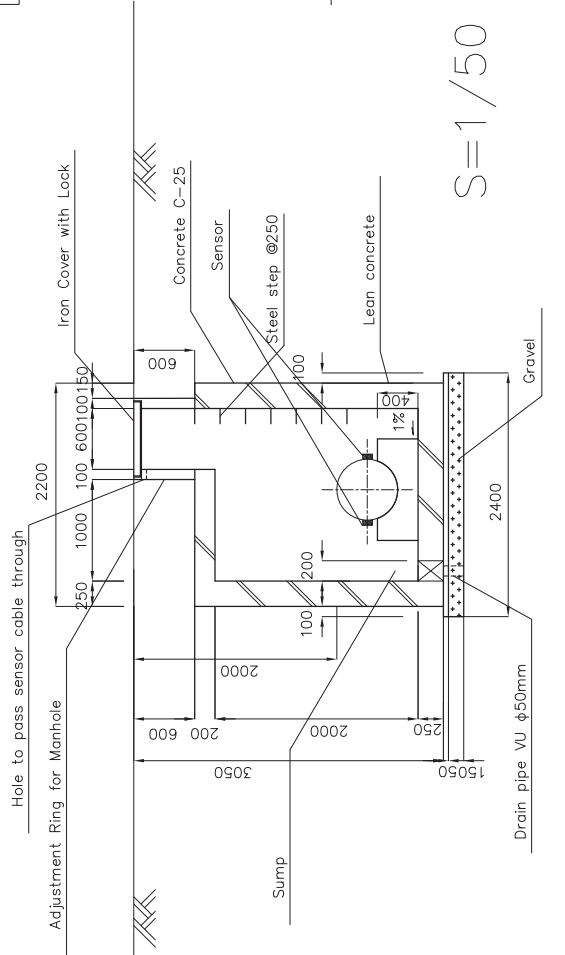


unit: mm

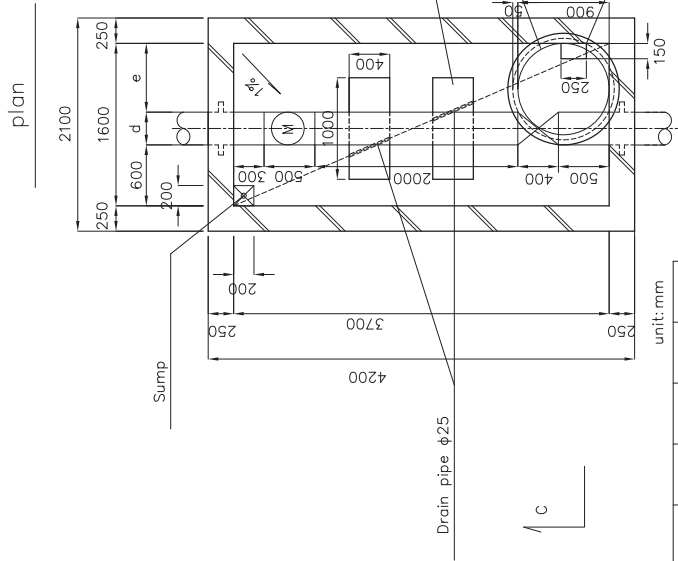
| a    | b   | c    |
|------|-----|------|
| 2000 | 300 | 2800 |
| 2500 | 800 | 3300 |

B-B' cross section

A-A' cross section



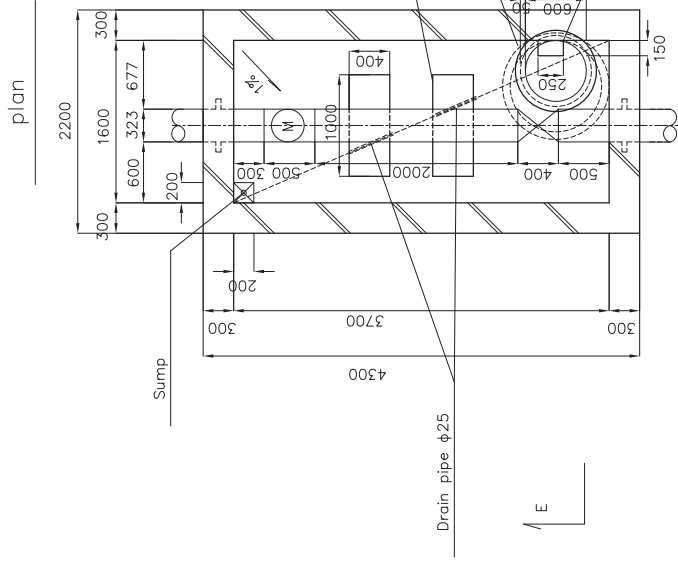
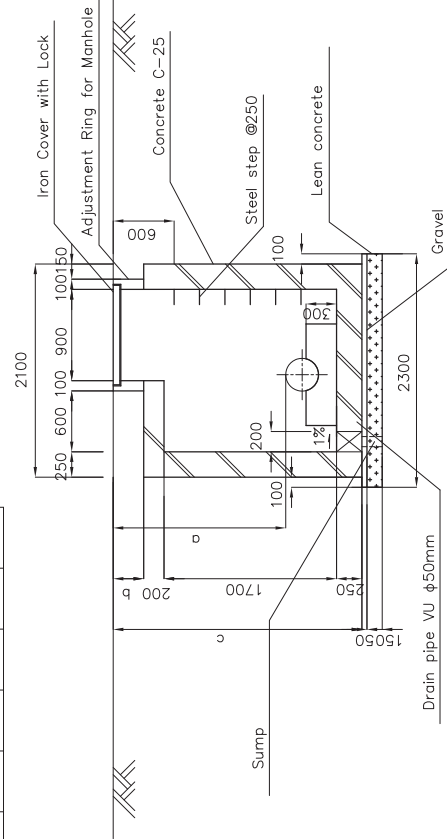
S=1/50



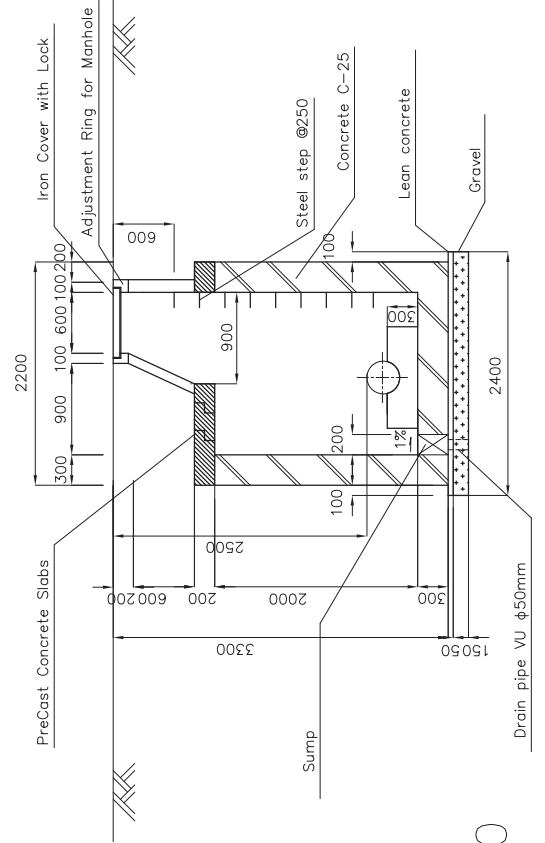
unit:mm

| pipe size  | a    | b   | c    | d   | e   |
|------------|------|-----|------|-----|-----|
| $\phi 200$ | 1500 | 100 | 2250 | 220 | 780 |
| $\phi 300$ | 1800 | 400 | 2550 | 323 | 677 |

C-C' cross section



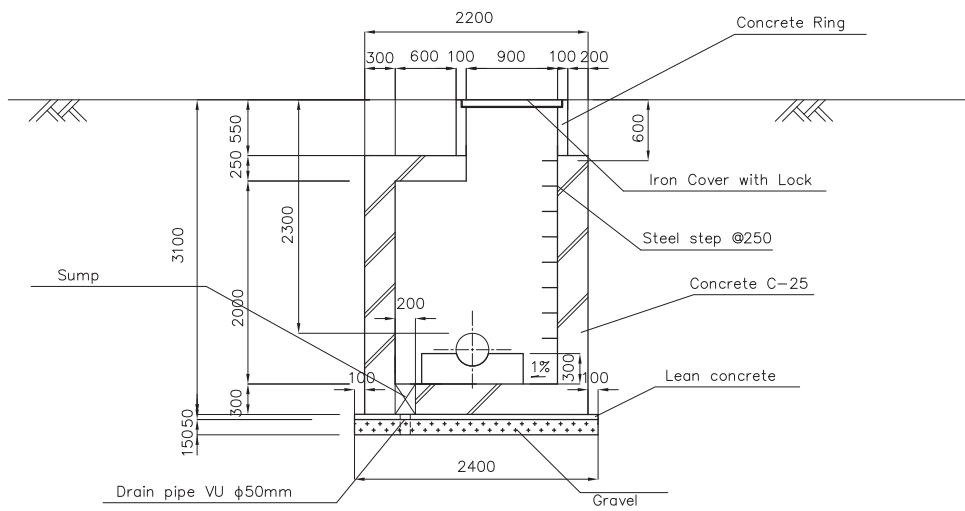
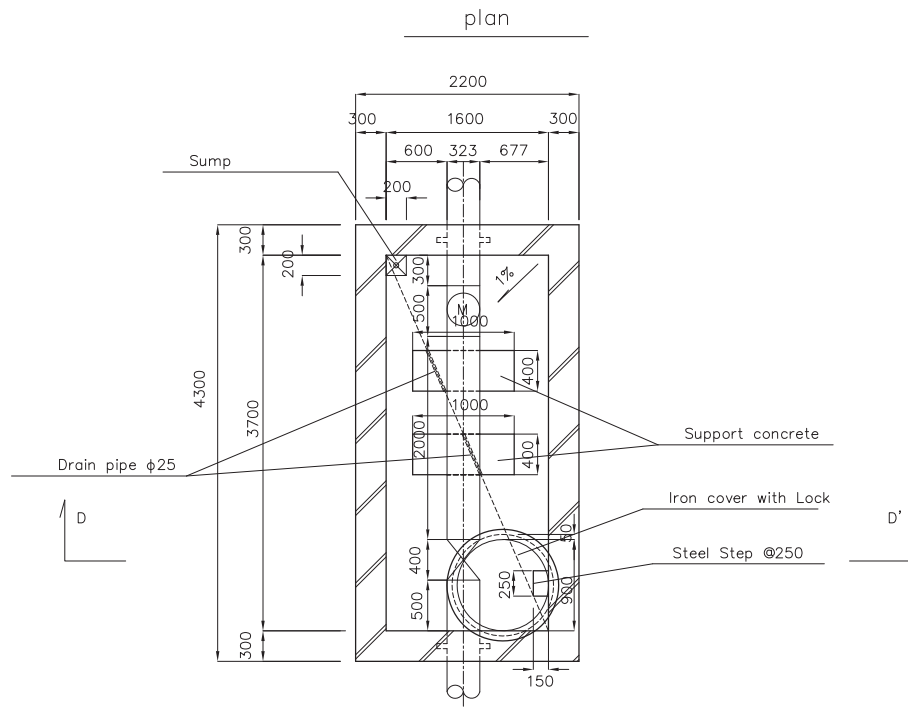
E-E' cross section



S=1/50

Camber of Flow Meter (Mechanical) and Maintenance Values of  $\phi 300$

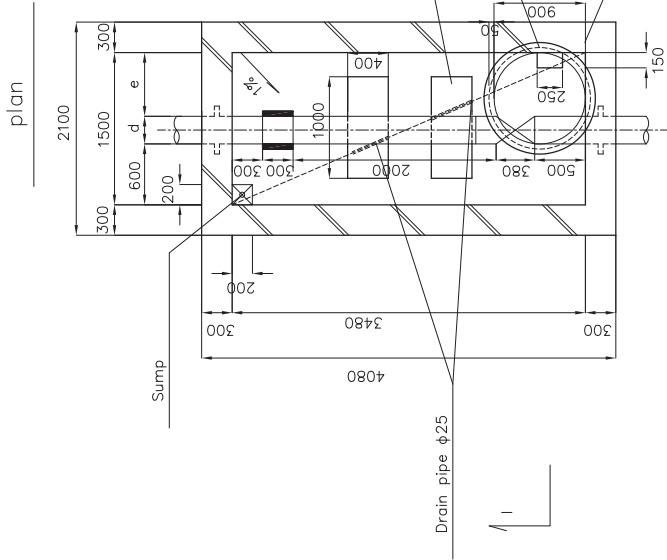
No.4



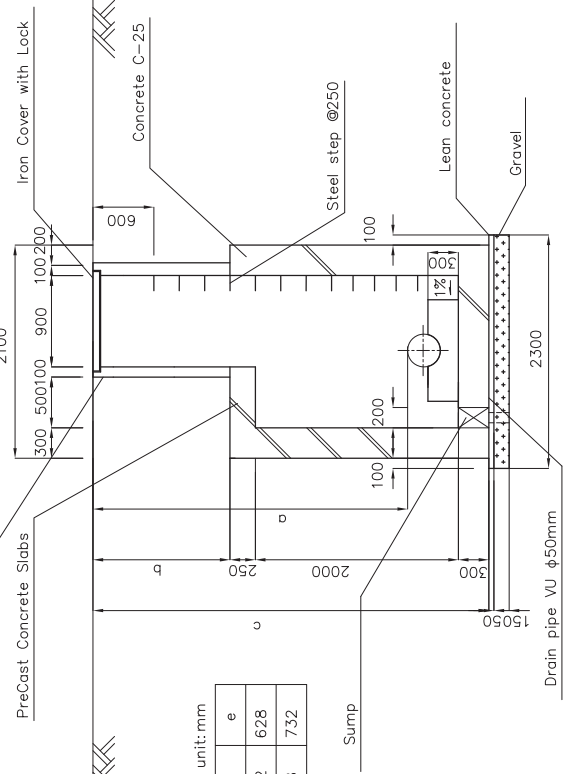
S=1/50



Chamber of Flow Meter (Ultra-sonic) and Step-test Valve of  $\phi 200$

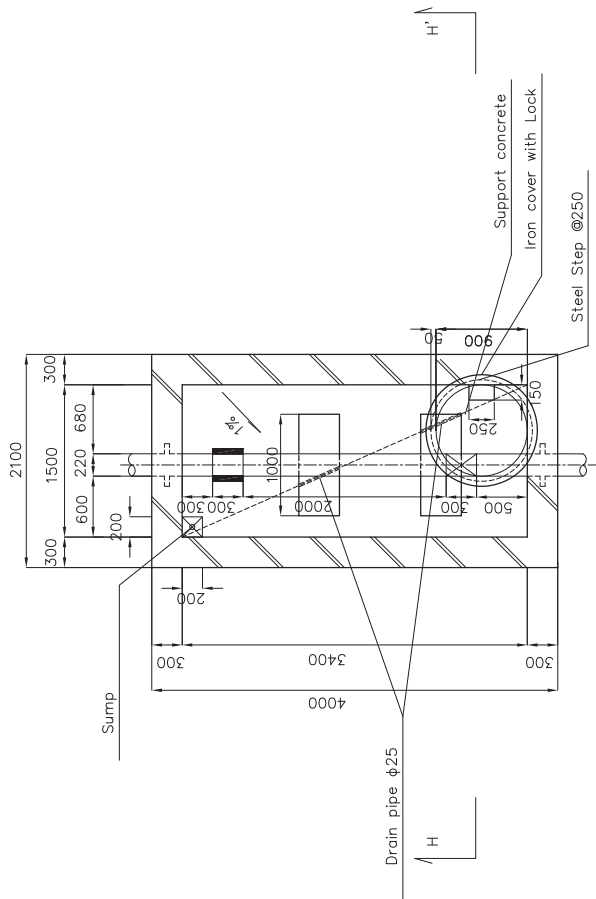


I-I' cross section

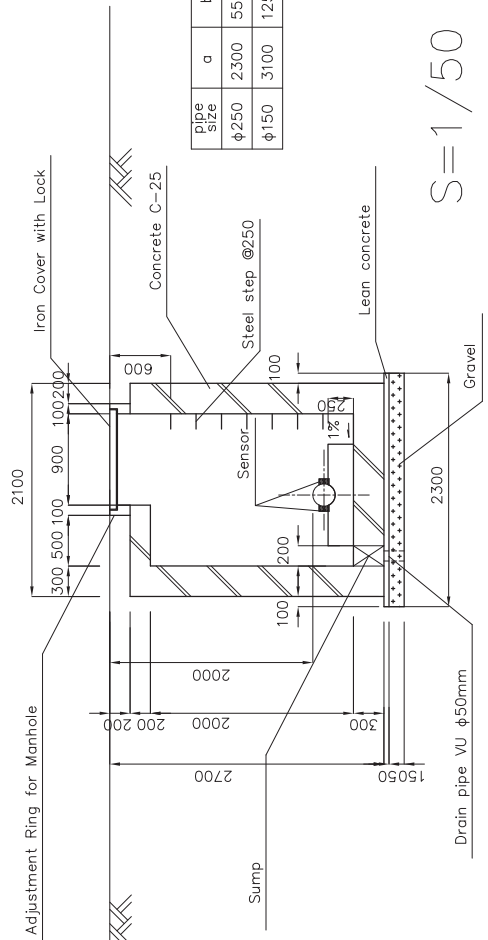


unit:mm

| Pipe Size  | a    | b    | c    | d   | e   |
|------------|------|------|------|-----|-----|
| $\phi 250$ | 2300 | 550  | 3100 | 272 | 628 |
| $\phi 150$ | 3100 | 1250 | 3800 | 168 | 732 |



H-H' cross section

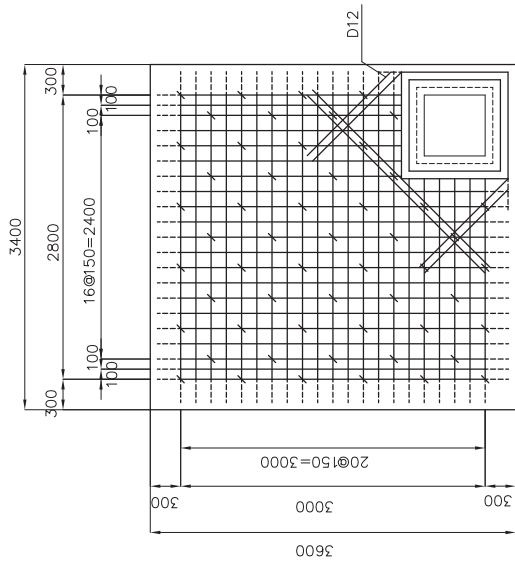


$S=1/50$

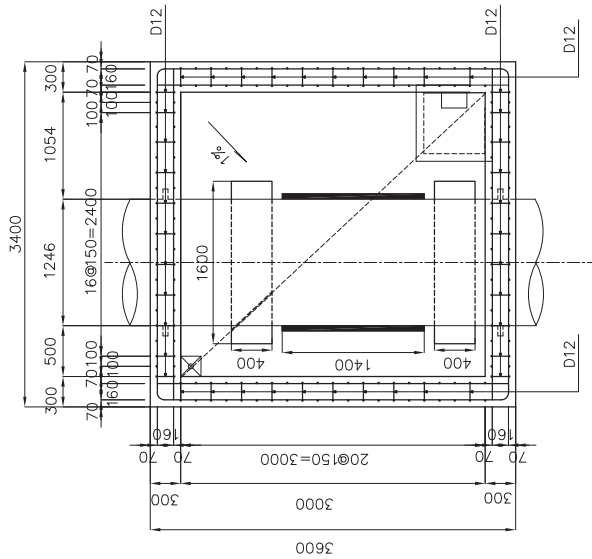
No.11-1

Bar Arrangement of Bulk flow Meter chamber of  $\phi 1200$

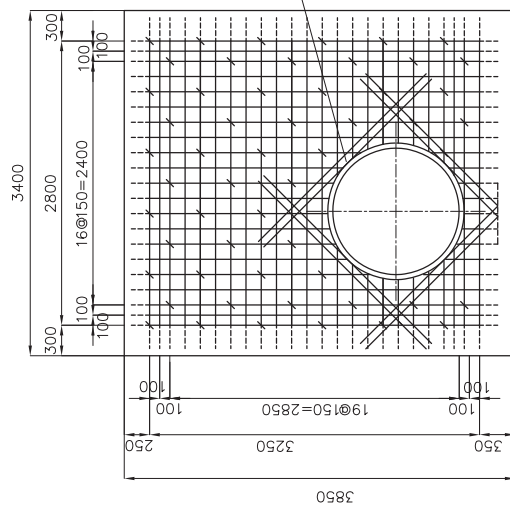
1-1'



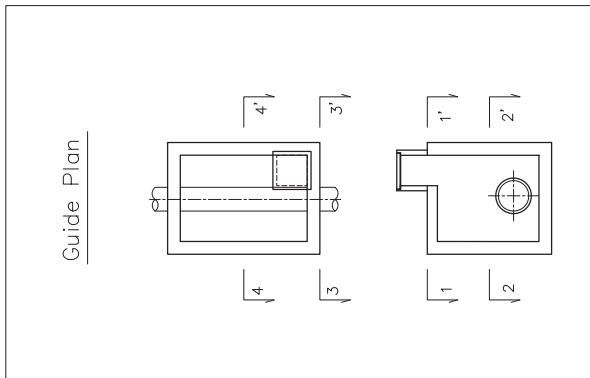
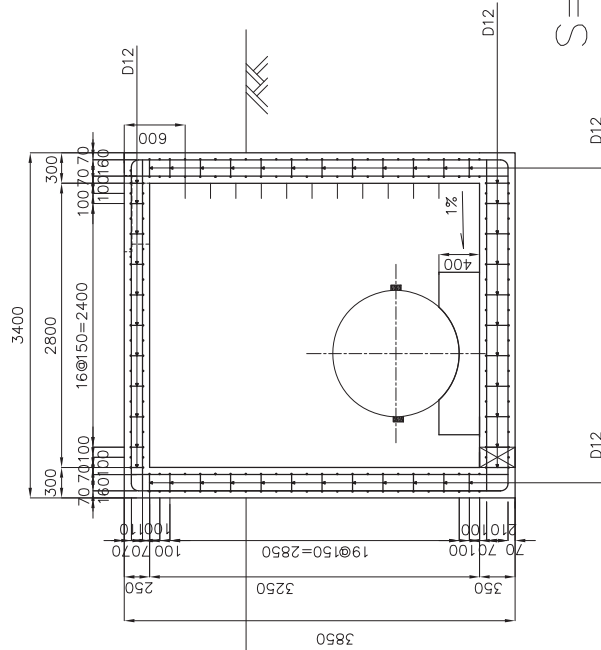
2-2'



3-3'



4-4'

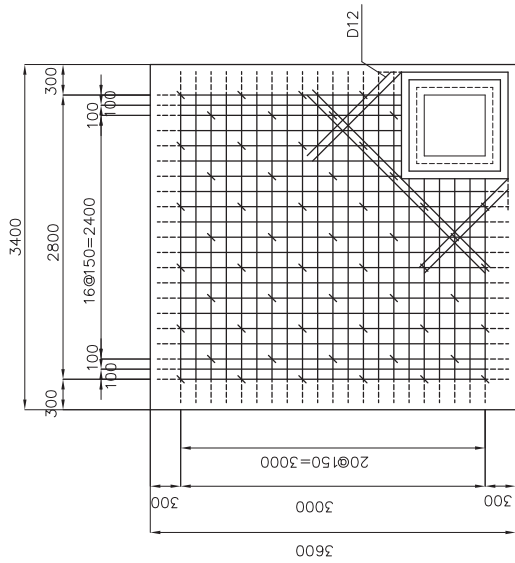


S=1/50

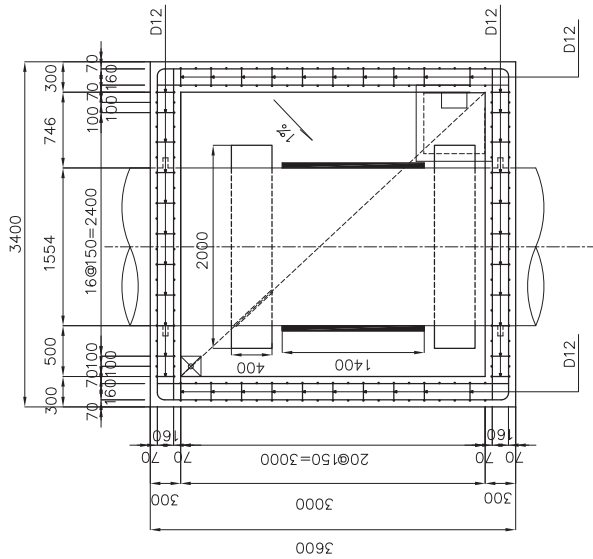
No.11-2

Bar Arrangement of Bulk flow Meter chamber of  $\phi 1500$

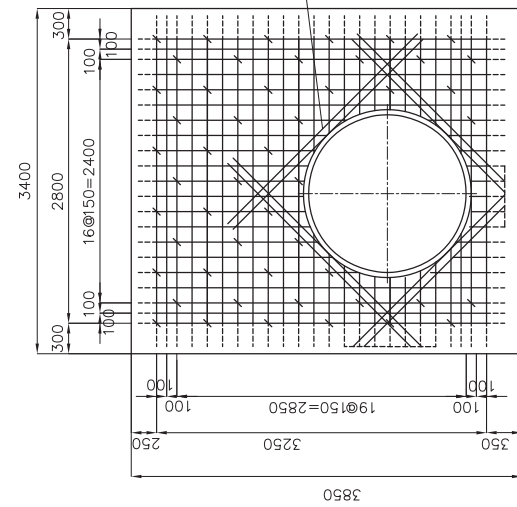
1-1'



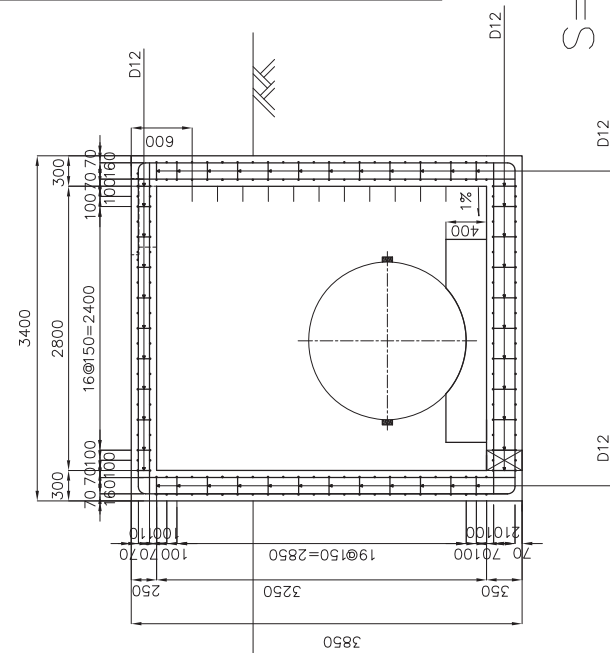
2-2'



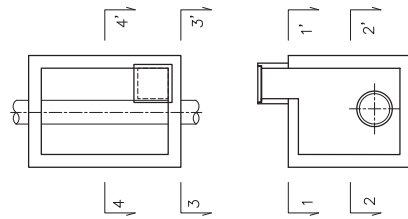
3-3'



4-4'



Guide Plan

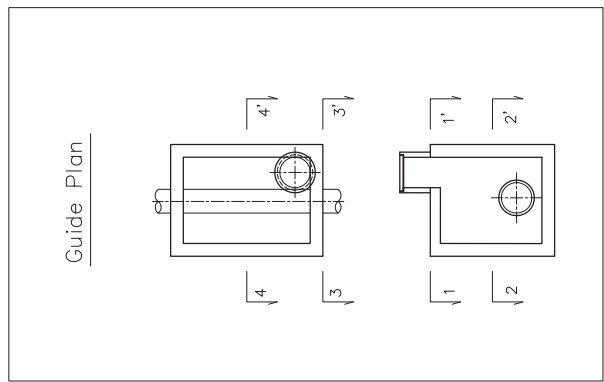
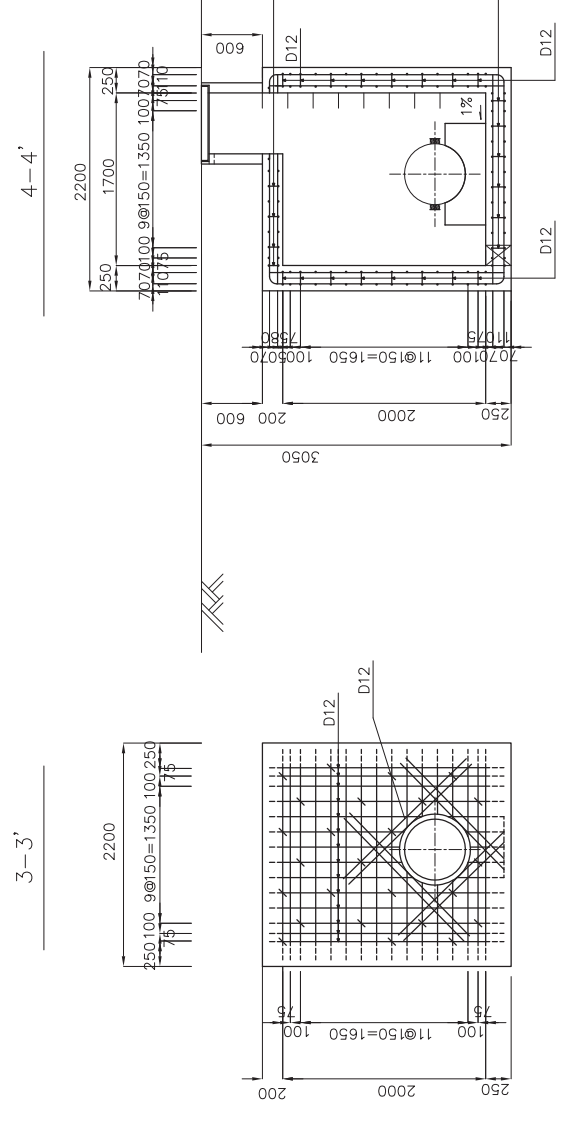
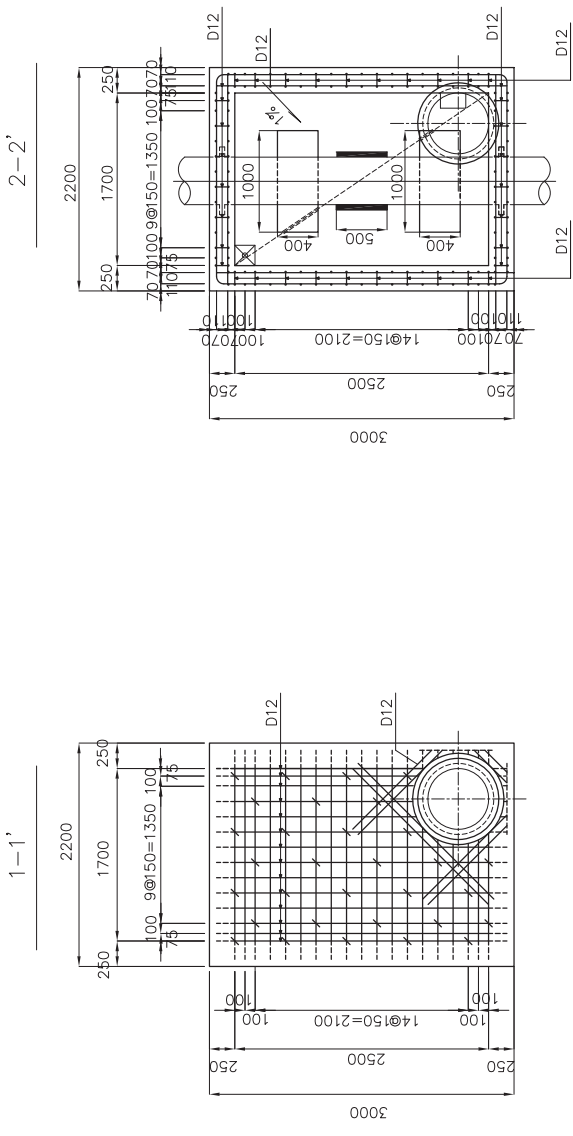


S=1/50





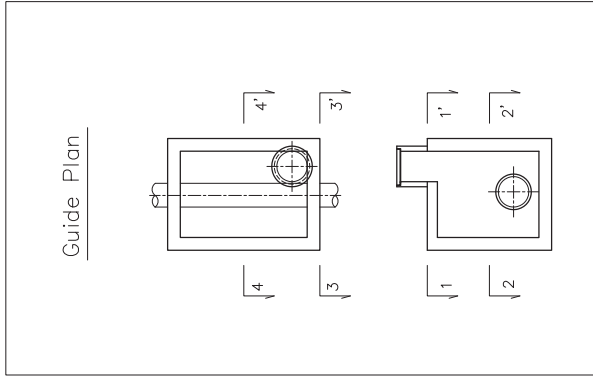
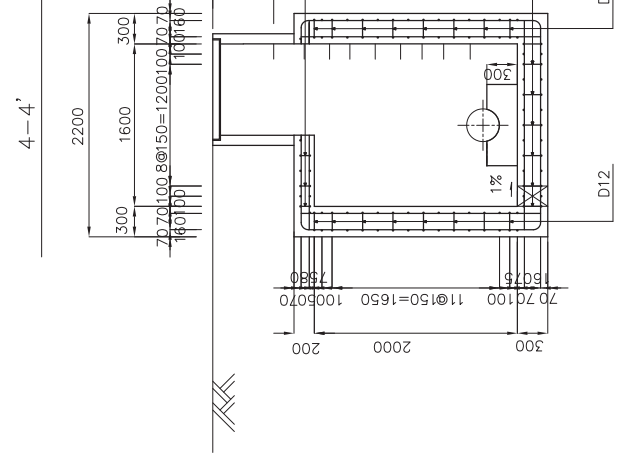
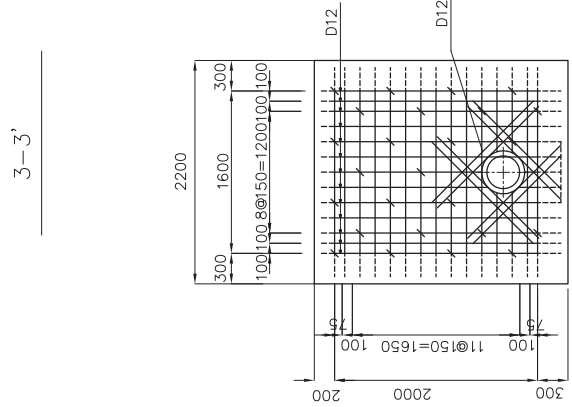
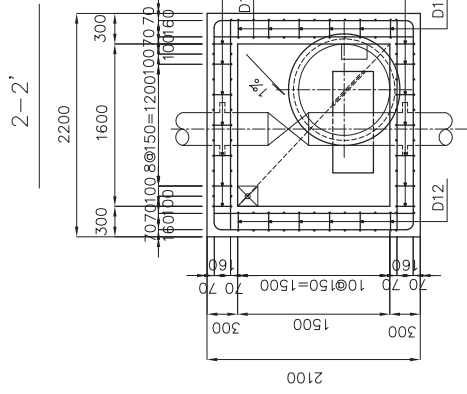
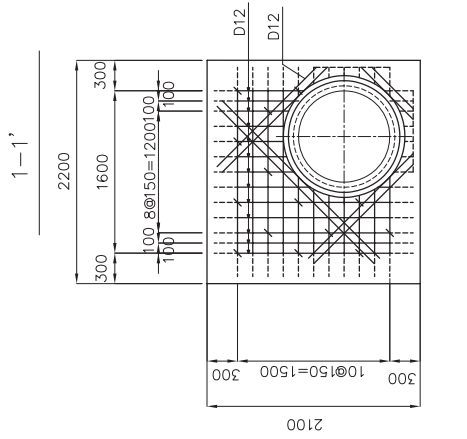
Bar Arrangement Drawing of Chamber of Flow Meter (Ultra-sonic) of  $\phi 450$



S=1/50

Bar Arrangement Drawing of Chamber of Isolation Valve of  $\phi 300$

No.2

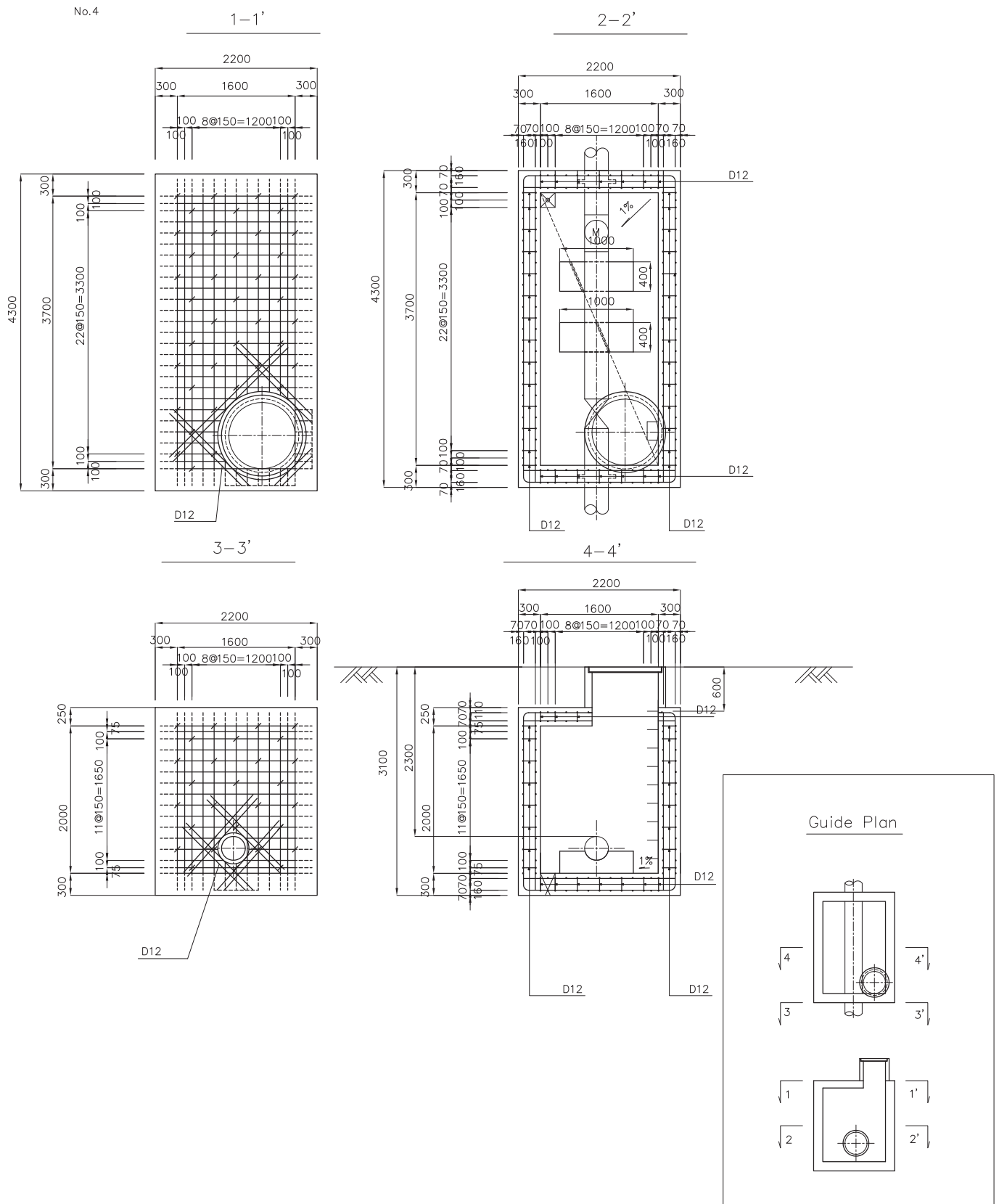


S=1/50





Bar Arrangement of Camber of Flow Meter (Mechanical) and Maintenance Values of  $\phi 300$



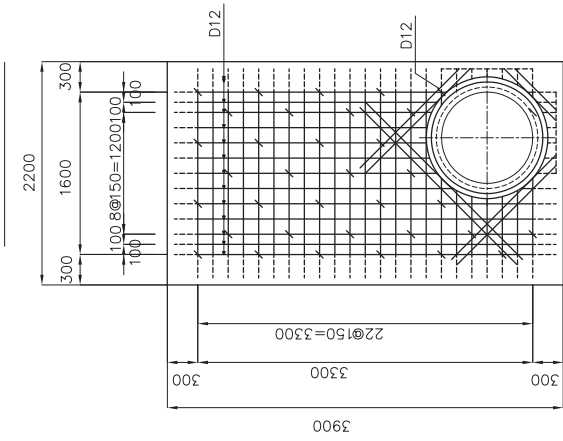
$S=1/50$



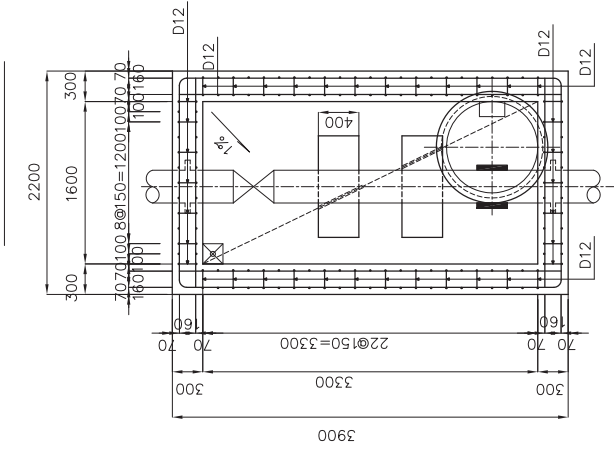


Bar Arrangement of Chamber of Flow Meter (Ultra-sonic) and Step-test Valve of  $\phi 300$

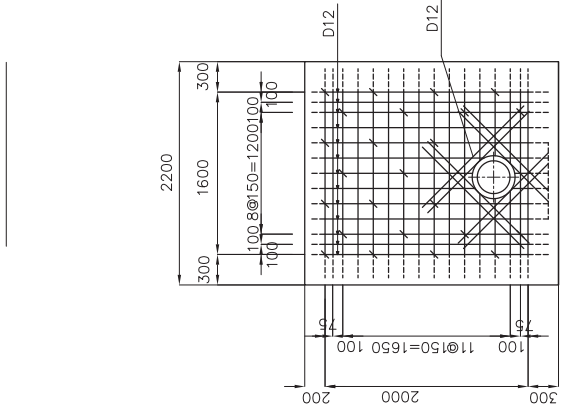
1-1'



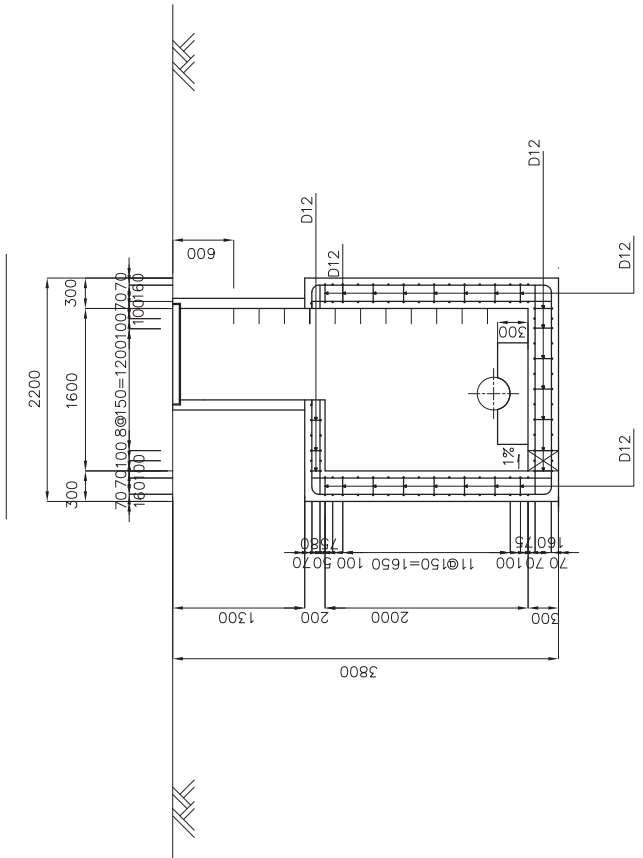
2-2'



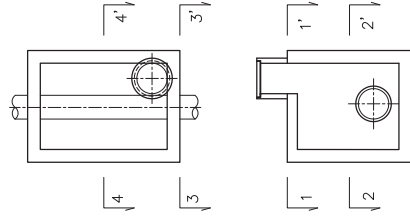
3-3'



4-4'



Guide Plan



S=1/50

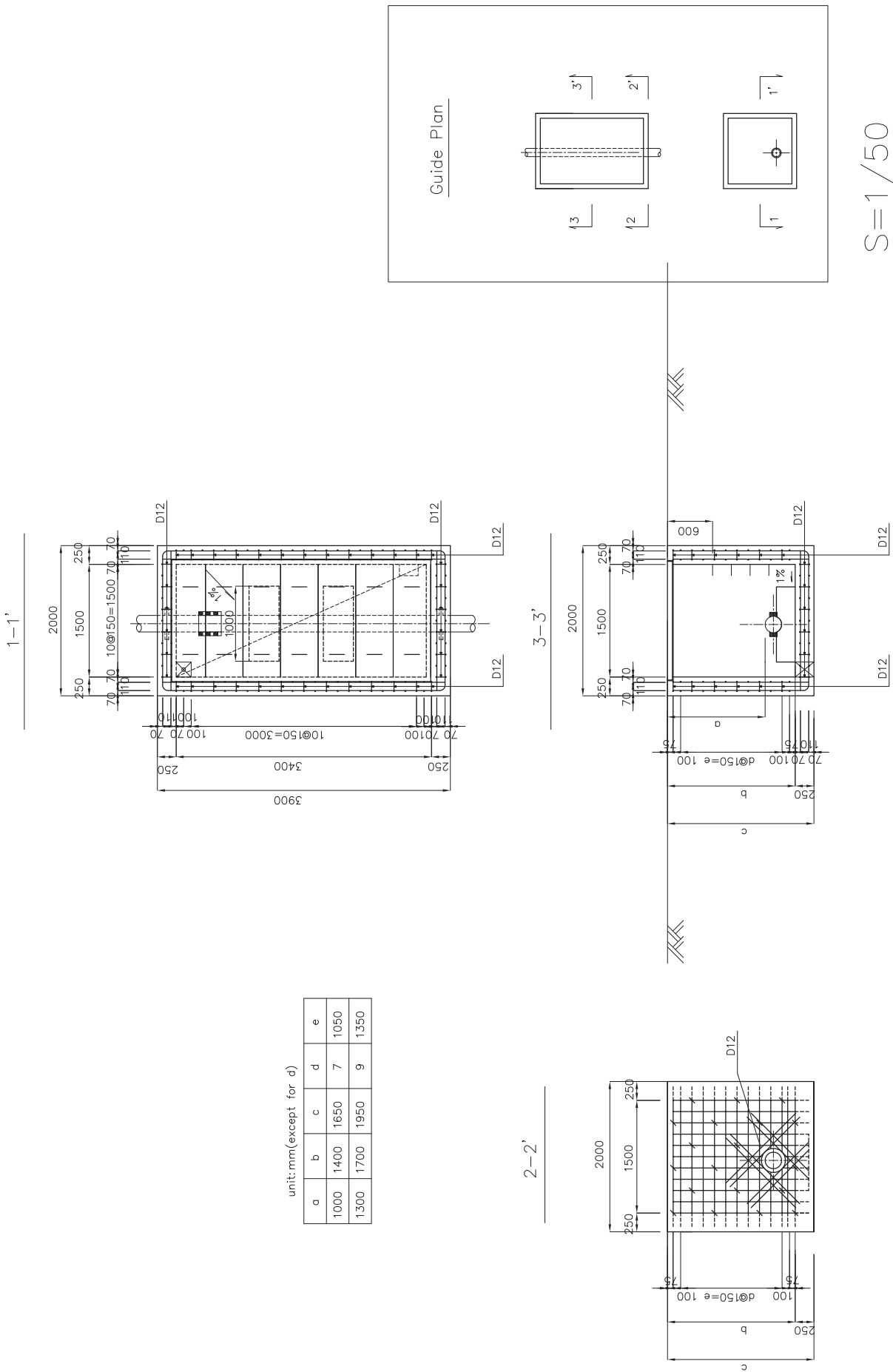








Bar Arrangement of Chamber of Flow Meter (Ultra-sonic) of  $\phi 200$  for Step-test



unit:mm(except for a)

| a    | b    | c    | d | e    |
|------|------|------|---|------|
| 1000 | 1400 | 1650 | 7 | 1050 |
| 1300 | 1700 | 1950 | 9 | 1350 |

Annex 12:

Examination Report on Current Condition of  
Bulk Flow Rate Measurement at LUD





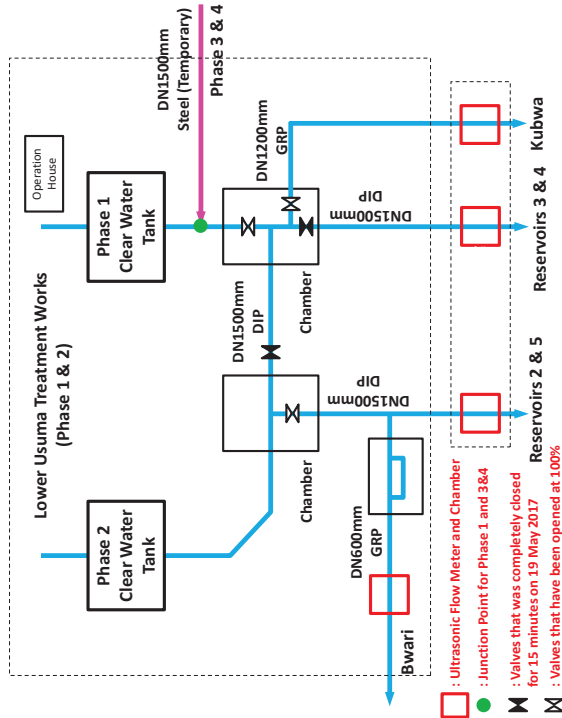
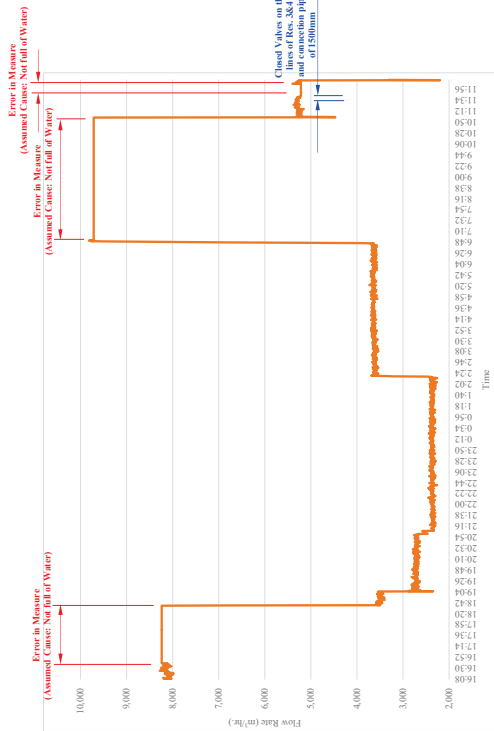


Figure 2 Location of Valves closed around the Bulk Flow-meters

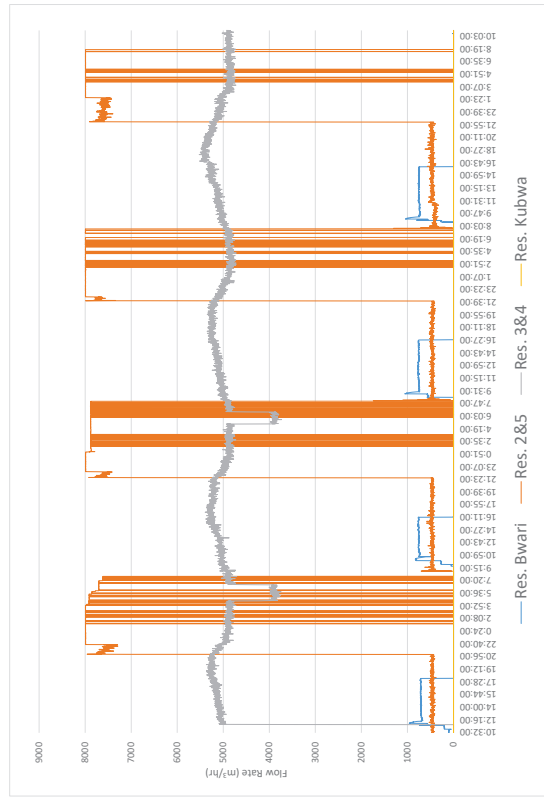


Source: Project Team  
Figure 3 Flow Rate in the Transmission Line of Res. Kubwa measured by a Potable Flow-meter (18-19 May 2017)

4. Measuring of Flow Rate in Four Transmission lines

Project Team monitored flow rate of four transmission lines from 29 May at 10:32 to 2 June at 10:55. Figure 4 shows fluctuation of their flow rates for 96.38hrs (About four days). Characteristics of flow rate for each transmission line is as follows:

- **Res. Bwari Line:** Intermittent Flow was observed due to intermittent pump operation. Pump was suspended for about 66 hours out of 96.38 hours, that is, the pump is not operated daily for 16.43 hours in average.
- **Res. 2&5 Line:** Water flow was observed almost all day, but transmission line was not full of water for 7.1 hours out of 96.38 hours, that is, the transmission line is not full of water daily for 1.78 hours in average.
- **Res. 3&4 Line:** Transmission line was full of water for all day.
- **Res. Kubwa Line:** Water was supposed to flow, as the flow rate was verified by measurement of a potable flow-meter as stated in '3.2', but flow rate was not observed through measurement of a stationary ultra-sonic flow-meter at all due to the defects on its cable, sensor, etc.



Source: Project Team  
Figure 4 Flow Rate in Four Transmission Lines measured by Stationary Bulk Flow-meters (29-30 May 2017)

5. Result of Examination

Flow rate in the transmission line of Res. Kubwa was recorded by a potable ultra-sonic flow-meter, but it was not done by a stationary ultra-sonic flow-meter. Therefore, the stationary ultra-sonic flow-meter



on Res. Kubwa line should be checked by a supplier. The cable which had been connected to the main unit of Res. Kubwa line was connected to that of Res. 3&4 line. Flow rate was not observed on the main unit of Res. 3&4. Accordingly, it is considered that cables and or sensors of the stationary ultra-sonic flow-meter on Res. Kubwa line broken down.

Meanwhile, even though the potable ultra-sonic flow-meter functioned well on Res. Kubwa line, flow rate was not measured for about 33% of the whole measuring time (see Figure 3). In addition, flow rate of Res. 2&5 was not measured for 1.6hrs (seven percentages of total measuring time) out of 23.25hrs. In other word, as long as the transmission is not full of water, it is too difficult to measure daily flow rate accurately by using the ultra-sonic flow-meter.

#### 6. Suggestion

There are two cases in order to fill up water in the transmission line of Res. 2&5 and Res. Kubwa.

As shown in Figure 5, **Case-1** is that water should be supplied from Phase 3 & 4 Clear Water Tank to Phase 1 Clear Water Tank effectively. Specifically, it is suggested that the transmission line of Phase 3 & 4 which has been connected to the other transmission line of Phase 1 should be switched over to Phase 1 Clear Water Tank directly, so that water flow may not be affected by water pressure other flow at the junction point.

Meanwhile, as shown in Figure 6, **Case-2** is that water should be supplied from Phase 3&4 Clear Water Tank to Res. Kubwa line. It is suggested that the transmission line of Phase 3 & 4 which has been connected to the other transmission line of Phase 1 should be switched over to Res. Kubwa line directly.

See Annex for detail examination.

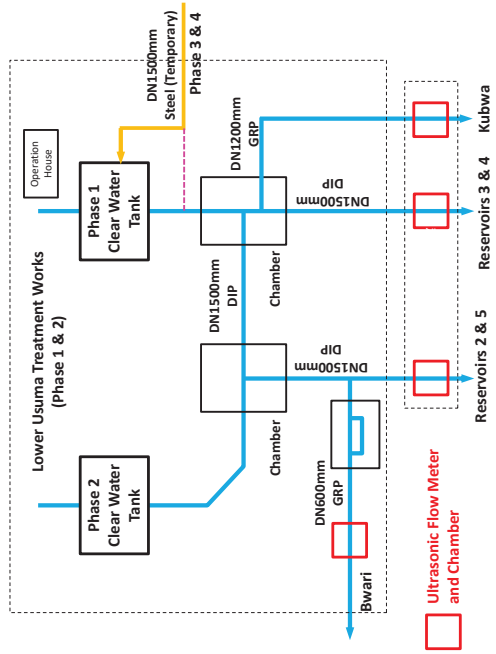


Figure 5 Connection of Transmission lines of Phase 3&4 to Phase 1 Clear Water Tank (Case-1)

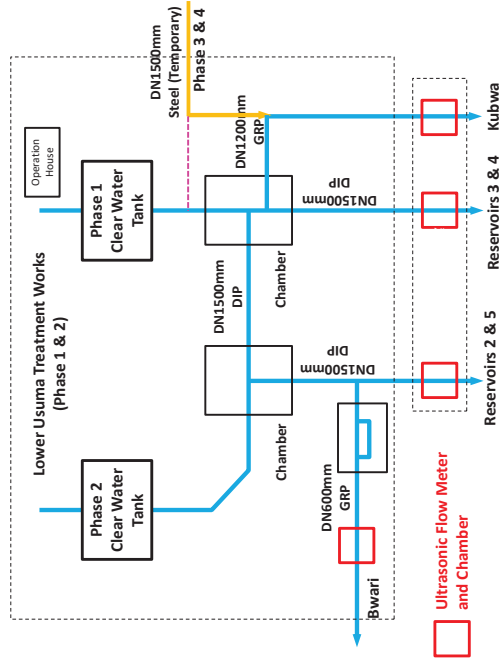


Figure 6 Connection of Transmission lines of Phase 3&4 to Res. Kubwa Line (Case-2)

**Annex:**

**A.1 Examination in detail**

**A.1.1 Leveling Survey**

The Project Team conducted leveling survey at six points (No.1 to No.6) which are shown in Figure A.1. Table A.1 shows elevation of the survey points.

- : Proposed Case-1
- : Proposed Case-2
- - - : Existing Pipelines



**Figure A.1 Location Map**

**Table A. 1 Elevation at Survey Points**

| No.  | Survey Points   | Elevation (m) |
|------|---|---------------|
| B.M. |   | 558.848       |
| No.1 | Top elevation of outlet pipe at Phase 2 clear water tank  | 557.348       |
| No.2 | Elevation of junction point on the existing DIP pipelines where temporary steel pipelines connect | 557.320       |
| No.3 | Elevation of internal edge of top slab at Phase 1 clear water tank                                | 562.685       |
| No.4 | Bottom elevation at Phase 1 clear water tank  | 558.015       |
| No.5 | Top elevation of outlet pipe at Phase 3 clear water tank  | 555.537       |
| No.6 | Top elevation of the reservoir 3&4 transmission pipeline around air valve                         | 556.858       |

Note: Elevation was figured out based on the temporary bench mark. Namely, the elevation is NOT absolute data.  
Source: Project Team

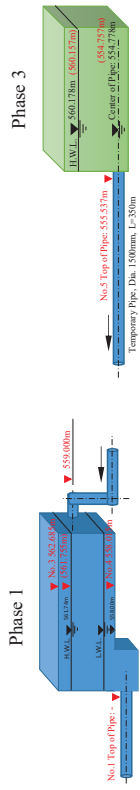
**A.1.2 Analysis on Flow Rate**

**(1) Case-1**

Steel (temporary) pipes of 1500mm are connected from Phase 3 & 4 Clear Water Tank to Phase 1 Clear Water Tank as shown in Figure A.2. Water flows in gravity from Phase 3 & 4 Clear Water Tank. Table A.2 shows the theoretical flow rate. If water level at Phase 3 Clear Water Tank is around H.W.L., water

A1

of about 320,000m<sup>3</sup>/day is supplied to Phase 1 Clear Water Tank.



**Figure A.2 Case of Normalization of Water Flow**

Note: Elevation highlighted in black is one which was shown in the tender document. Other elevation highlighted in red is one which was surveyed.

Source: Project Team

**Table A.2 Theoretical Water Flow Rate from Phase 3 Clear Water Tank of Phase 3 to Phase 1 Clear Water Tank**

| Water Level at Phase 3 Clear Water Tank (m) (a) | Elevation of Inlet at Phase 1 Water Tank (m) (b) | Differences (m) (c) = (a)-(b) | Distance between Inlet at Phase 3 and Outlet at Phase 3 (d) | Gradient (e) = (c) / (d) | Pipe Diameter (mm) (f) | Flow Rate (m <sup>3</sup> /day) (g) = $(0.27853 \times 100 \times (f) / 1000)^{2.63} \times (e)^{1.85} \times 86400$ | Rate of Operation to Design Capacity of Phase 3&4 |
|---|--|-------------------------------|---|--------------------------|------------------------|--|---|
| 560.157   | 559.0  | 1.157                         | 350   | 0.0033                   | 1500                   | 319,524  | Operation of about 67%                            |
| 559.657   | 559.0  | 0.657                         | 350   | 0.0019                   | 1500                   | 237,155  | Operation of about 49%                            |

Source: Project Team

**(2) Case-2**

Steel (temporary) pipes of 1500mm are directly connected from Phase 3 & 4 Clear Water Tank to Res. Kubwa Line. Water flows in gravity from Phase 3 & 4 Clear Water Tank towards distribution areas. Since elevation of the top of pipes at the connecting points is about 556.858m, water level of at least 557.858m at Phase 3&4 Clear Water Tank will be required to supply water in consideration with water loss.

**A.2 Capacity of Water Supply Facilities**

**A.2.1 Design Capacity and Water Production**

As shown in Table A.3, currently, water production at Usama Treatment Plant is about 366,000m<sup>3</sup>/day in average, accounting for only 51% of total design capacity. The remaining 354,000m<sup>3</sup>/day has not been produced yet, because construction of transmission pipelines for Phase 3 and 4 has not been completed.

**Table A.3 Design Capacity of Water Treatment Plant and Current Water Production (As of Middle of May 2017)**

| Phase        | Design Capacity (m <sup>3</sup> /day) a) | Current Water Production (m <sup>3</sup> /day) b) | % of Total Production Capacity c) = b) / a) x 100 |
|--------------|--|---|---|
| Phase 1      | 120,000                                  | 108,000   | 90%   |
| Phase 2      | 120,000                                  | 108,000   | 90%   |
| Phase 3      | 240,000                                  | 75,000  | 31%   |
| Phase 4      | 240,000                                  | 75,000  | 31%   |
| <b>Total</b> | <b>720,000</b>                           | <b>366,000</b>                                    | <b>51%</b>  |

Source: Usama Water Treatment Plant (Head of Phase 3& 4)

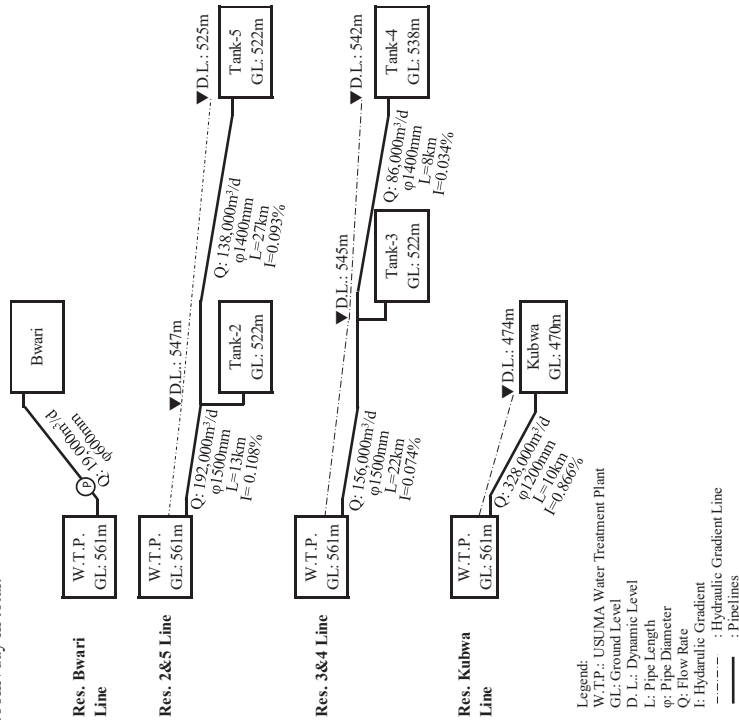
Note: Current water production was figured out based on flow rate at clear water tanks

A2

### A.2.2 Flow Capacity of Transmission Pipelines

Until transmission pipelines of Phase 3 & 4 are laid completely, treated water will have been supplied through the existing transmission pipelines such as Res. Bwari, Res. 2&5, Res. 3&4 and Res. Kubwa line.

Project Team analyzed actual flow capacity of their pipelines. The results of analysis is shown in Figure A.3. Flow capacity from W.T.P. to Res. Bwari, Tank-2, Tank-3 and Res. Kubwa is 19,000m<sup>3</sup>/day, 192,000m<sup>3</sup>/day, 156,000m<sup>3</sup>/day and 328,000m<sup>3</sup>/day respectively, that is, there is the flow capacity of 695,000m<sup>3</sup>/day in total.



Note:  
 - A bench mark of Ground Level (GL) which is shown in Figure A.3 is different from that of Table A.1, Table A.2 and Figure A.2.  
 - Hazen-Williams Equation was applied for this calculation.  
 - 110 was applied for Velocity Coefficient (C).  
 - Ground elevation of W.T.P. of 561m represents the elevation at the outlets of all the clear water tanks.  
 Source: Project Team

**Figure A.3 Flow Capacity of the Existing Transmission Pipelines**

### A.2.3 Increasing Water Production

Based on the analysis results, water production will be increased by 329,000m<sup>3</sup>/day (695,000m<sup>3</sup>/day-366,000m<sup>3</sup>/day) in terms of flow capacity of the transmission pipelines.

### A.3 Condition of Operation

#### (1) Case-1

In order to secure water of 329,000m<sup>3</sup>/day additionally, water level at Phase 3 & 4 Clear Water Tank must be operated around at H.W.L., as shown in Table A.2.

#### (2) Case-2

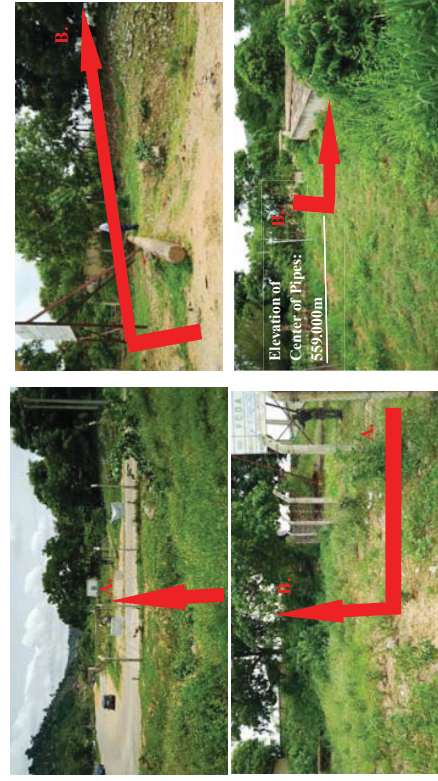
As the result of water flow measurement, maximum water flow of each line is as follows:

- Res. Bwari: 800m<sup>3</sup>/hr (about 19,000m<sup>3</sup>/d) (see Figure 4) =< 19,000m<sup>3</sup>/d (flow capacity)
- Res. 2&5: 8,000m<sup>3</sup>/hr (about 192,000m<sup>3</sup>/d) (see Figure 4) =< 192,000m<sup>3</sup>/d (flow capacity)
- Res. 3&4: 5,200m<sup>3</sup>/hr (about 125,000m<sup>3</sup>/d) (see Figure 4) =< 156,000m<sup>3</sup>/d (flow capacity)
- Res. Kubwa: 9,800m<sup>3</sup>/hr (about 235,000m<sup>3</sup>/d) (see Figure 3) =< 328,000m<sup>3</sup>/d (flow capacity)

### A.4 Route of Piping

#### (1) Case-1

The route between Phase 3 & 4 Clear Water Tank and Phase 1 Clear Water Tank proposed by Project Team was shown in Figure A.4.



**Figure A.4 Pipeline Route from Phase 3 Clear Water Tank to Phase 1 Clear Water Tank (Case-1)**

#### (2) Case-2

The route of Phase 3 & 4 Clear Water Tank which connects to Res. Kubwa line proposed by Project Team was shown in Figure A.5.



Figure A.5 Pipeline Route from Phase 3 Clear Water Tank to Res. Kubwa Line (Case-2)

### A.5 Feature of Case-1 and Case-2

Project Team examined advantage and disadvantage on Case-1 and Case-2 as shown in Table A.4.

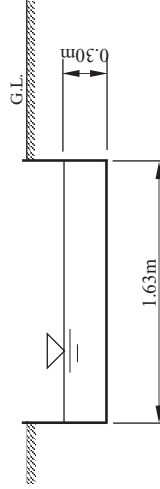
Table A.4 Features on Case-1 and Case-2

| Contents   | Case-1   | Case-2  |
|--|--|---|
| a) Construction period   | <b>Long</b>  | <b>Short</b>  |
| b) Construction cost   | <b>High</b><br>Pipe laying: 1500mm x 60m<br>Fitting: 90-degree bend of 1500mm or equivalent bend x at least 2 sets, cap of 1500mm x 1 set  | <b>Low</b><br>Pipe laying: 1200mm x 10m<br>Fitting: 90-degree bend of 1500mm or equivalent bend x at least 1 set, Tee of 1200mm x 1200mm x 1 set, cap of 1500mm x 1 set                                       |
| c) Workability of construction                                 | <b>Difficult</b>   | <b>Easy</b>   |
| d) Negative impact to water supply service during construction | <b>Small</b>   | <b>Large</b>  |
| e) Loss of water at clear water tank                           | <b>Large</b>   | <b>Small</b>  |
| f) Control of facility operation                               | <b>Difficult</b>   | <b>Easy</b>   |
| g) Operation of water supply service                           | <b>Water supplied from Phase 3&amp;4 Clear Water tank can be used extensively.</b><br>Water supplied from Phase 3&4 is not used for the transmission lines of Res. Bwari, Res. 2&5 and Res. 3&4. | <b>Water supplied from Phase 3&amp;4 Clear Water tank can be used only for Res. Kubwa line.</b><br>Water supplied from Phase 3&4 is not used for the transmission lines of Res. Bwari, Res. 2&5 and Res. 3&4. |
| <b>Overall Evaluation</b>                                      | <b>Fair</b>  | <b>Good</b>   |

End

### Wasted Water over-flow from Phase 3 &4

|                              |                         |                             |
|------------------------------|-------------------------|-----------------------------|
| a. Drain Distance:           |                         | 16.8 m                      |
| b. Time (average for twice): | $= (4.74s + 4.82s) / 2$ | 4.78 s                      |
| c. Flow Velocity:            | a. / b.                 | 3.51 m/s                    |
| e. Flow Area:                | See the below           | 0.49 m <sup>2</sup>         |
| f. Flow Rate:                | c. x e.                 | 1.72 m <sup>3</sup> /s      |
| g. Ditto (hourly)            | f. x 60 x 60            | 6,192 m <sup>3</sup> /hour  |
| h. Ditto (Daily)             | g. x 24hrs              | 148,608 m <sup>3</sup> /day |

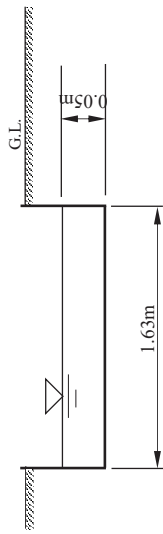


|   |                                     |   |                             |
|---|-------------------------------------|---|-----------------------------|
| i. Current Water Production at Phase 3&4: | 40% of Design Capacity of Phase 3&4 | $= ((240,000 \text{ m}^3/\text{day} + 240,000 \text{ m}^3/\text{day})) \times 40\%$ | 192,000 m <sup>3</sup> /day |
| j. Percentage of Wasted Water Flow Rate:  | h. / i.                             | $= 148,608 \text{ m}^3/\text{day} / 192,000 \text{ m}^3/\text{day}$                 | 77.4 %                      |

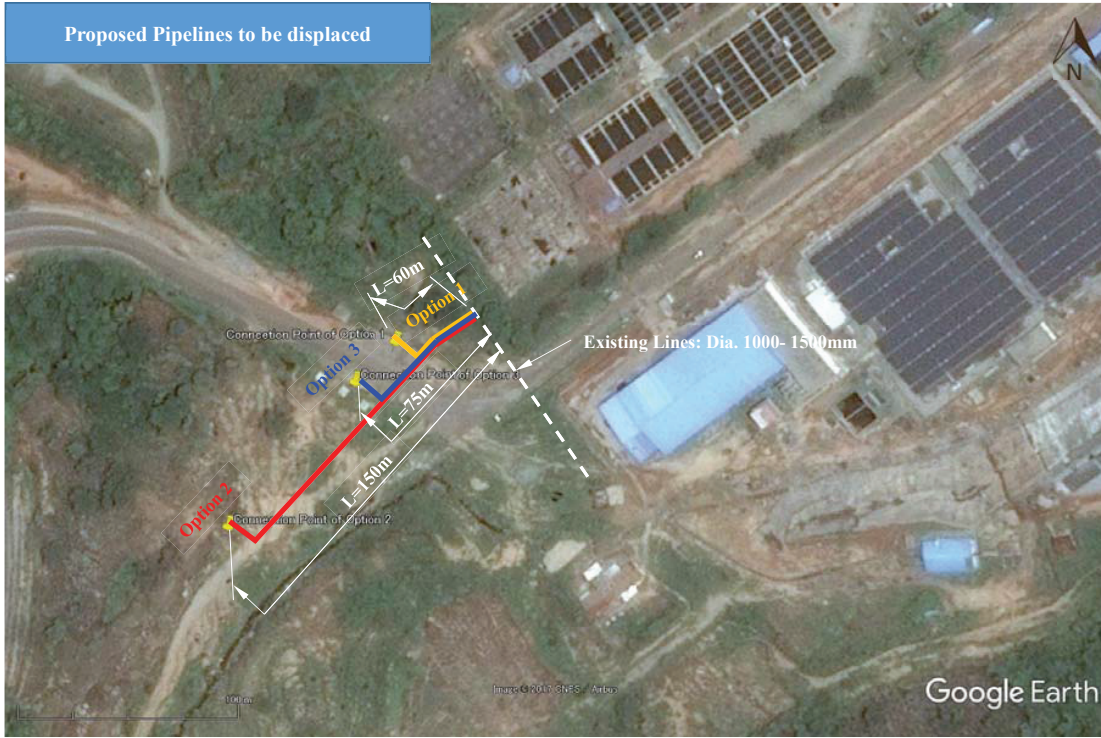
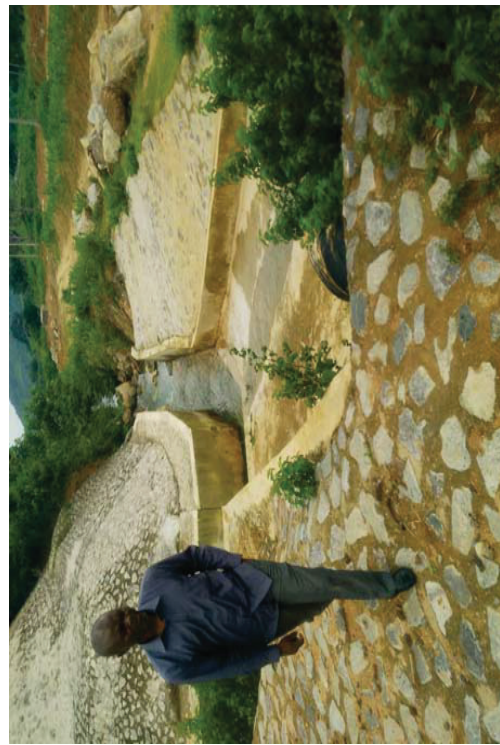


**Wasted Water over-flow from Phase 3 & 4**

|                              |                                    |                           |
|------------------------------|------------------------------------|---------------------------|
| a. Drain Distance:           |                                    | 12.8 m                    |
| b. Time (average for twice): | $= (15.63s + 11.93s + 12.17s) / 3$ | 13.24 s                   |
| c. Flow Velocity:            | a. / b.                            | 0.97 m/s                  |
| e. Flow Area:                | See the below                      | 0.08 m <sup>2</sup>       |
| f. Flow Rate:                | c. x e.                            | 0.08 m <sup>3</sup> /s    |
| g. Ditto (hourly)            | f. x 60 x 60                       | 288 m <sup>3</sup> /hour  |
| h. Ditto (Daily)             | g. x 24hrs                         | 6,912 m <sup>3</sup> /day |



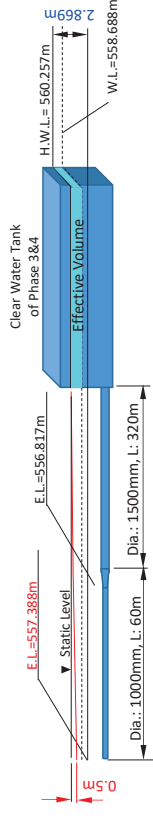
|   |   |                             |
|---|---|-----------------------------|
| i. Current Water Production at Phase 3&4: |   | 150,000 m <sup>3</sup> /day |
| j. Percentage of Wasted Water Flow Rate:  | $= \frac{6,912 \text{ m}^3/\text{day}}{150,000 \text{ m}^3/\text{day}}$ | 4.6%                        |



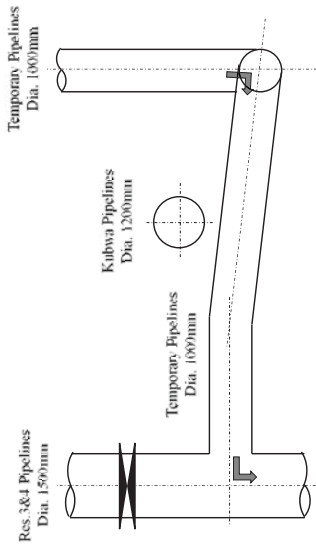


Flow rate from Phase 3&4 in case of that the temporary pipelines are connected to the Res.3&4 at the Upstream Point (Option 1)

| Water Elevation (m)   |         | Head Loss (m)           |         | Remarks |
|---|---------|-------------------------|---------|---------|
| Highest Point to be connected to the existing pipelines         | 557.388 | H.W.L. at Phase 3&4     | 560.257 |         |
| Water Production (33% of Design Capacity) (m <sup>3</sup> /day) | 156,000 | Line of 1000mm (L=60m)  | 0.3     | Total   |
|   |         | Line of 1500mm (L=320m) | 0.2     |         |
|   |         |                         | 0.5     |         |



Limited Water Level at Phase 3 &4: 557.388m + 0.8m (Head Loss) + 0.5m (Residual Head) = 558.688m  
 Effective Depth at Phase 3&4: H.W.L. - W.L. = 560.257m - 558.688m = 1.569m



**Proposed Temporary Pipelines crossing over Kubwa Pipelines**

**Compliment:**

**Comparison of Connections**

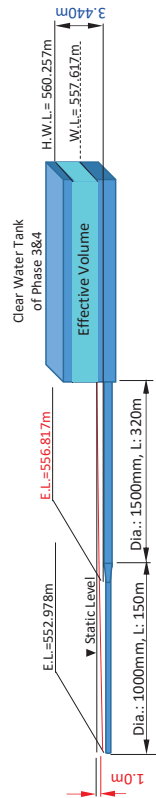
| Items                                  | Case 1 | Case 2 | Case 3 |
|--|--------|--------|--------|
| Construction Workability               | Medium | High   | Low    |
| Construction Cost                      | Medium | Low    | High   |
| Construction Period                    | Medium | Short  | Long   |
| Validity in Future Operation           | Low    | Low    | High   |
| Advantage in Procurement               | Medium | High   | Low    |
| Water Quality (In case of Non-Washout) | Less   | Better | Less   |
| <b>Evaluation</b>                      |        |        |        |

**Flow rate from Phase 3&4 in case of that the temporary pipelines are connected to the Res.3&4 at the Downstream Point (Option 2)**

| Water Elevation (m)                                     |         |                                      |
|---|---------|--------------------------------------|
| Highest Point to be connected to the existing pipelines | 556.817 | Differences (Virtual Effective Head) |
| H.W.L. at Phase 3&4                                     | 560.257 | 3.440                                |

| Water Production (33% of Design Capacity) (m <sup>3</sup> /day) |     | Head Loss (m)           |     | Remarks |
|---|-----|-------------------------|-----|---------|
| 156,000   | 0.8 | Line of 1000mm (L=150m) | 0.2 |         |
|   |     |                         |     | 1.0     |



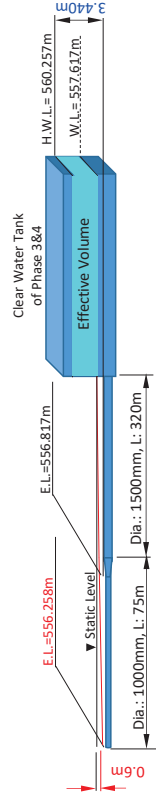
Limited Water Level at Phase 3 &4: 556.817m + 0.3m (Head Loss) + 0.5m (Residual Head) = 557.617m  
 Effective Depth at Phase 3&4: H.W.L. - W.L. = 560.257m - 557.617m = 2.640m

**Flow rate from Phase 3&4 in case of that the temporary pipelines are connected to the Res.3&4 at the Intermediate Point (Option 3)**

| Water Elevation (m)                                     |         |                                      |
|---|---------|--------------------------------------|
| Highest Point to be connected to the existing pipelines | 556.817 | Differences (Virtual Effective Head) |
| H.W.L. at Phase 3&4                                     | 560.257 | 3.440                                |

| Water Production (33% of Design Capacity) (m <sup>3</sup> /day) |     | Head Loss (m)          |     | Remarks |
|---|-----|------------------------|-----|---------|
| 156,000   | 0.4 | Line of 1000mm (L=75m) | 0.2 |         |
|   |     |                        |     | 0.6     |



Limited Water Level at Phase 3 &4: 556.817m + 0.3m (Head Loss) + 0.5m (Residual Head) = 557.617m  
 Effective Depth at Phase 3&4: H.W.L. - W.L. = 560.257m - 557.617m = 2.640m