Proposal
for
Reform and Reorganization of Administrative Area of Branch Office

June 7, 2023
JICA Expert Team

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1. Background

1.1 Background of this proposal

In the Kathmandu Valley of Nepal, the water supply facilities are owned by the Kathmandu Valley Water Supply Management Board (KVWSMB), and Kathmandu Upatyaka Khanepani Limited (KUKL) is responsible for operating the water supply service under a license issued under a lease agreement.

The water demand of the 2.7 million people in the Kathmandu Valley is estimated to be 370 MLD, and the annual average water supply of KUKL is 126 MLD. Taking into account the estimated 26% leakage rate, the effective water supply volume is estimated to be 81MLD. As a result, water services are unevenly distributed, and many customers do not have access to water despite having a contract and are forced to have a service every few days or limited water supply hours. The overall service provided by KUKL is not equitable, as the lack of sufficient water supply forces customers to use alternative sources of water, such as using water tankers with additional payments or using groundwater of poor quality.

While the fundamental reason for the lack of improvement in water supply services is the absolute shortage of water sources, KUKL has not been able to fully fulfil its role as a water utility in terms of water quality management, water treatment plant operation and maintenance, water distribution management, non-revenue water management and customer service, and has been slow to establish an internal human resource development system.

In the past, water quality management has not been a high priority for KUKL, as the solution to absolute water shortages has been a top priority for KUKL. However, after the completion of the Melamchi Water Supply Project, which is described below, it is expected that the level of customer demand for water quality will increase, and it will be necessary to enhance the technical capacity for appropriate water quality management and to establish appropriate operation and maintenance techniques for the water treatment plants.

Considering this situation, JICA launched a project in March 2021 with the aim of supporting the transformation of water service operations into a virtuous circle through capacity development for KUKL's organization and staff.

This will also serve as technical assistance to achieve proper operation and management of the new Sundarijal water treatment plant, which was constructed with Japanese yen loans and ADB co-financing.

The final destination of this project can be understood in the following growth spiral.

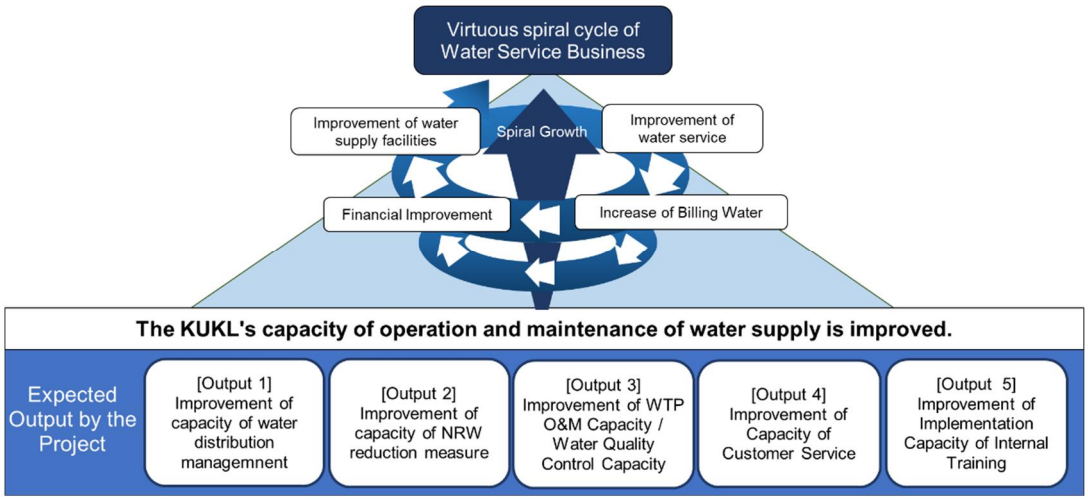


Figure 1.1.1 Growth Spiral of KUKL Water Supply Business

In January 2023, BDS packages 1-4 facilities were completed, and their operation and management responsibilities were entrusted to KUKL.

In addition, KUKL began operation and management of the new Sundarijal water treatment plant in March 2023, and KUKL itself should be responsible for the smooth operation and management of these facilities in the future.

On the other hand, the construction of the water distribution network within the ring road has been significantly delayed, and as of May 2023, the handover of the water distribution network has not been implemented.

The new distribution network consists of several water supply area with respective water injection point named “Service Reservoir Tank (SRT)” constructed in the BDS project, and the distribution network is divided into smaller areas called District Metered Areas (DMAs).

Each DMA is hydraulically independent and has no connections to adjacent DMAs. Therefore, by comparing the amount of water flowing into each DMA with the customer's meter reading, it is possible to determine the actual water loss in the DMA.

However, in order for KUKL to properly manage the new distribution network, there are issues that must be resolved in advance and KUKL's own organizational structure will need to be significantly reviewed.

This review must be completed before the DMA is handed over to KUKL (through KVWSMB) by PID, and the steps required include approval by KUKL's Board of Directors, agreement by the KVWSMB, notification to customers, and changes to the billing system at each branch office etc. are so big challenging for KUKL.

At this time, the DMAs is scheduled for completion and delivery in April 2023, with a grace period of less than one year. It is hoped that KUKL will seriously consider the matters proposed herein and work to reach a consensus with the relevant agencies so that work can begin as soon as possible.

1.2 Relation between Melamchi Water Supply Project and JICA Technical Cooperation Project

In order to improve the water supply situation in the Kathmandu Valley, the following three sub-projects are in progress, from the development of water sources to the construction of water transmission and distribution networks, and the installation of water pipes and meters in each household, using the co-financing by JICA and ADB.

- Melamchi Water Supply Project (Melamchi Water Diversion Tunnel, New Sundarijal WTP/ WTP 1 supported by JICA and WTP 2 supported by ADB)
- Construction of Bulk Distribution System (BDS)
- Distribution Network Improvement (DNI)

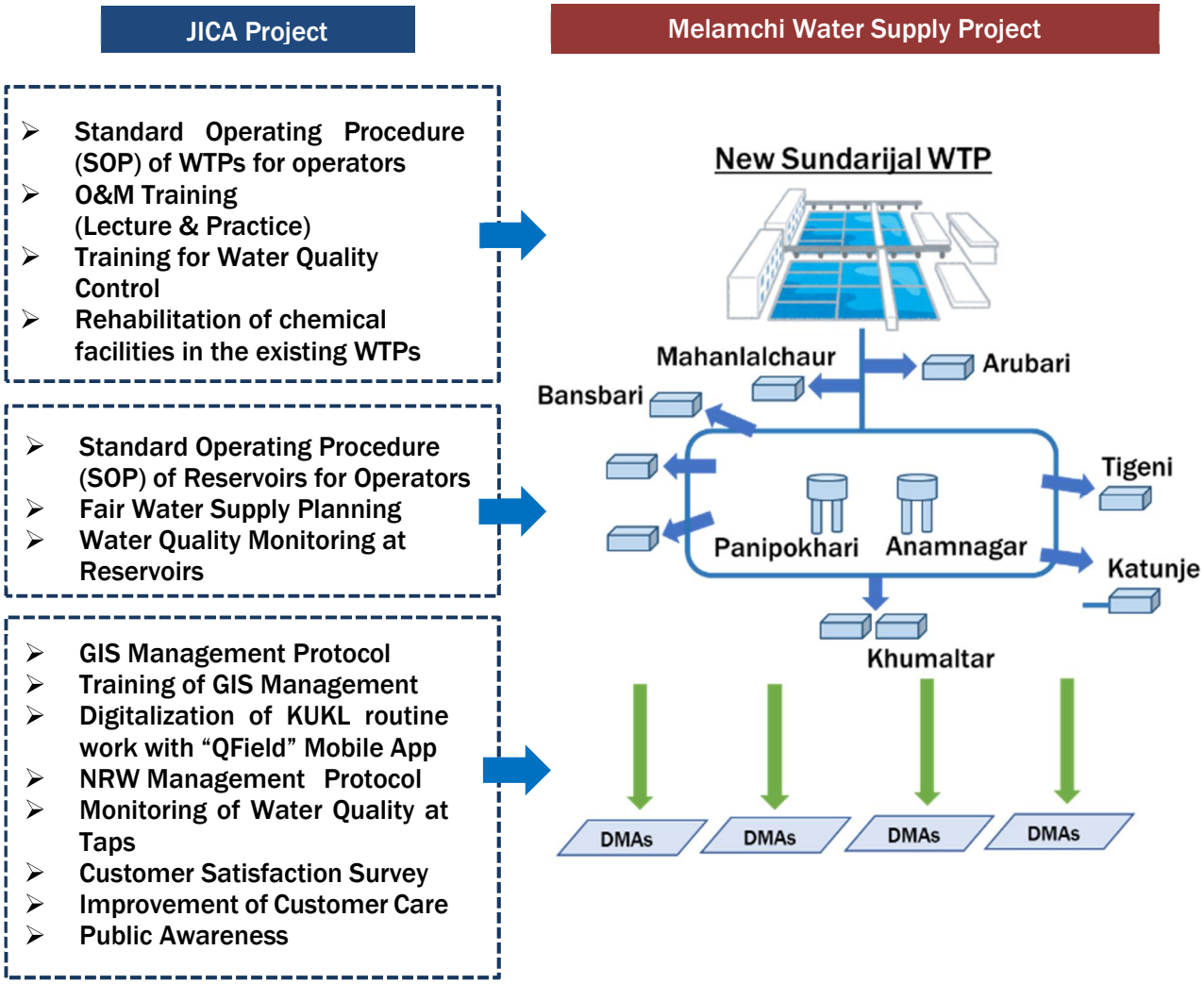


Figure 1.2.1 Relation between Melamchi Water Supply Project and JICA Project

1.3 Bulk Distribution System (BDS)

The BDS component will provide water supply to the Kathmandu Metro area using a combination of new water sources to be developed under Sub-Project 1 of the Melamchi Water Supply Project and other existing water sources.

In order to supply various areas within the Kathmandu Metro area, the new water treatment plant to be constructed at Sundarijal will be the starting point for the water pipelines, which will be routed through distribution reservoirs at Mahankalchaur, along the ring road and along the longitudinal route.

The distribution zones, called zones, are designed to be independent with scattered distribution reservoirs to ensure the stability of water pressure and supply.

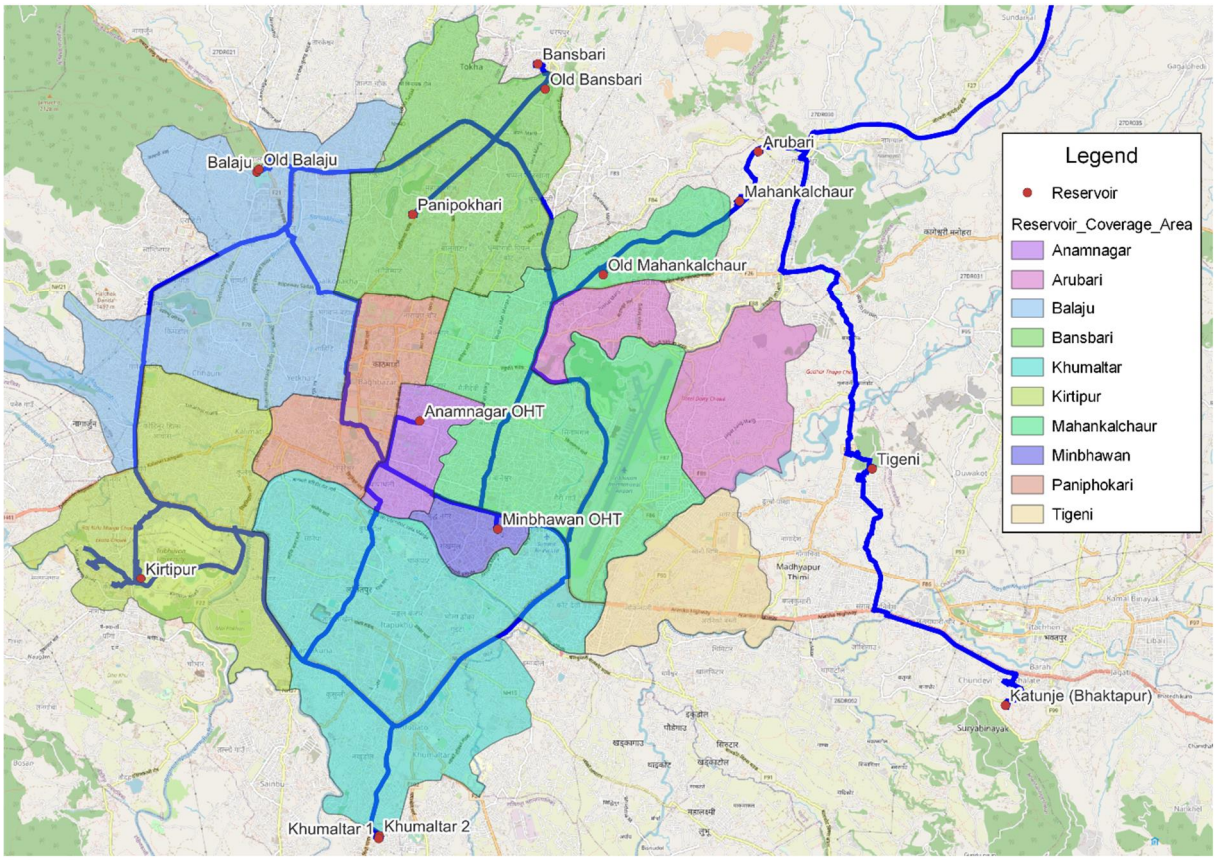


Figure 1.3.1 General Layout of Supply Zone by Reservoir Wise

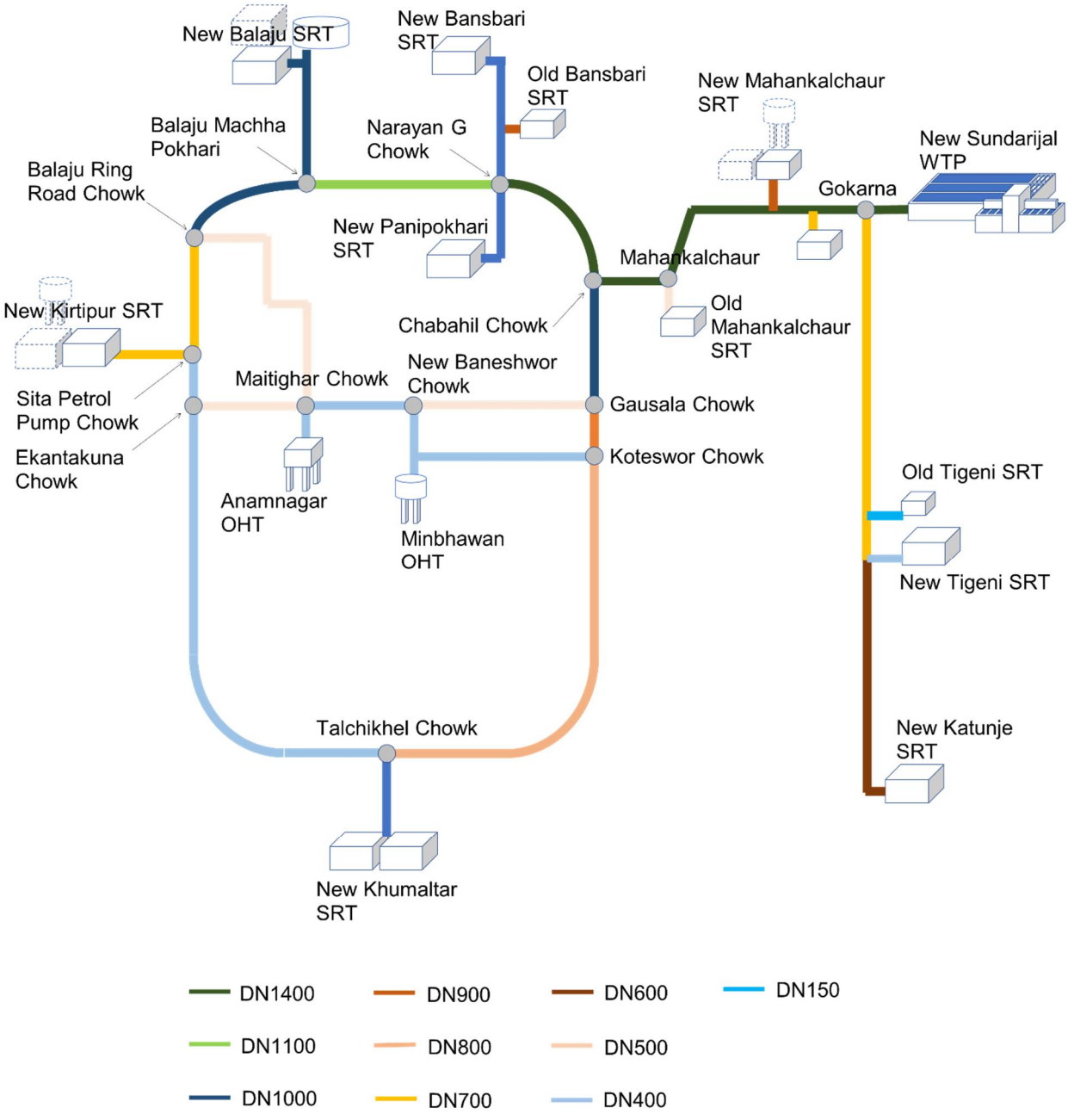


Figure 1.3.2 Schematic System of BDS Pipeline

1.4 Distribution Network Improvement (DNI)

DNI's component is the construction of a distribution network aimed at efficiently supplying water from the existing water treatment plant after renovation and the new Sundarijal water treatment plant constructed under the Melamchi Water Supply Project (Sub-Project 1).

- Rehabilitation and replacement of primary and secondary distribution mains.
- Rehabilitation and replacement of tertiary distribution networks.
- Replacement of cluster property connections with new metered connections.
- Installation of new tertiary distribution mains in areas currently not served; and
- Installation of a saddle and a ferrule of best quality at each existing tapping point and a service meter at every service connection.

The construction of the water distribution network in the Ring Road will be progressively switched from the old distribution system to the new distribution system after the new Sundarijal WTP starts operation.

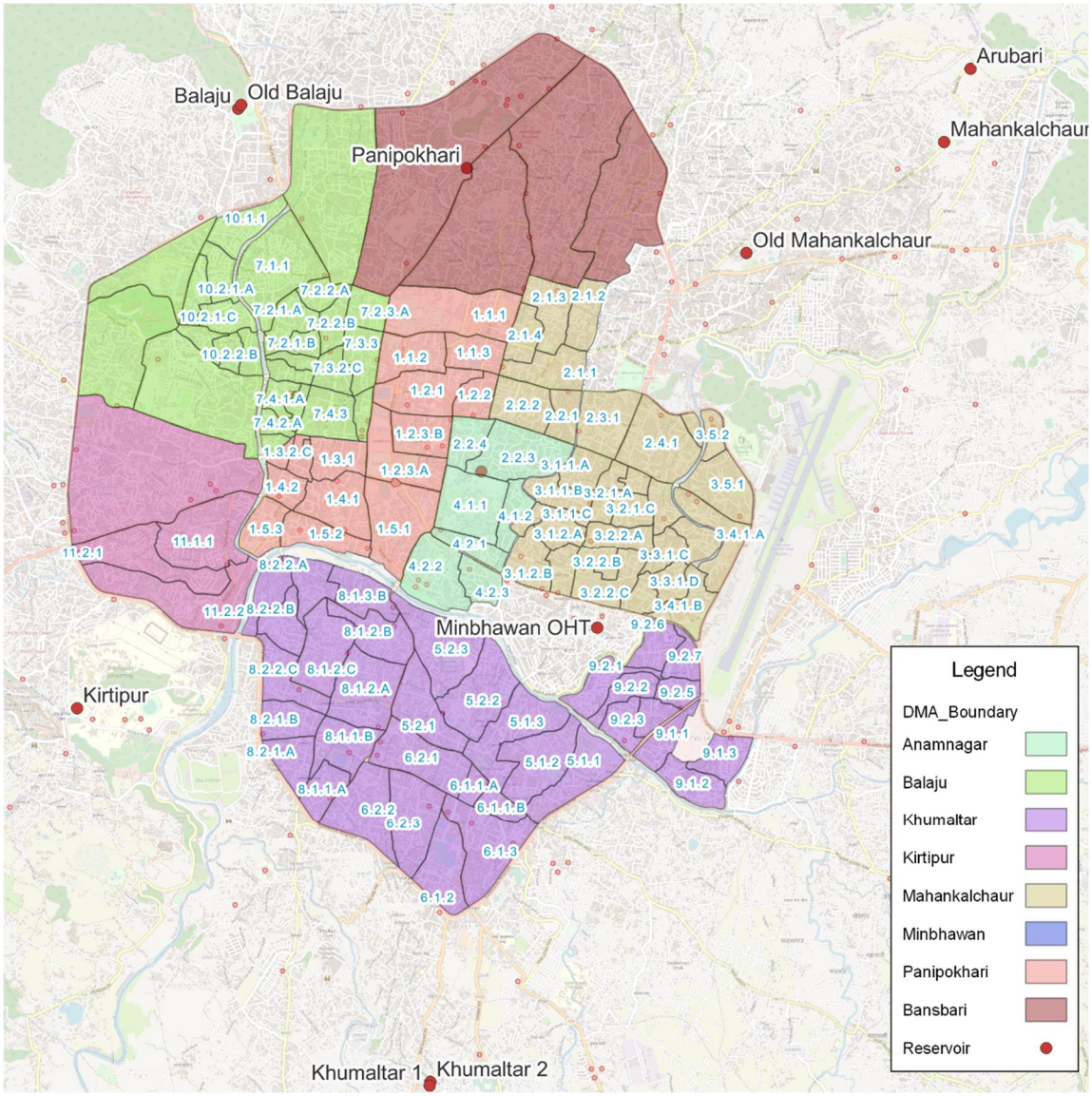


Figure 1.4.1 General Layout of DMAs

2. Importance of Reform and Reorganization of Branch Administrative Area

2.1. Water Distribution Management

The Capital Investment and Asset Management Program (CIAMP), proposed by ADB in its technical assistance TA-4893-NEP in 2010, calculated the water demand in and around Kathmandu as follows.

Table 2.1.1 Water demand and production planning by water supply area

	Zone	Estimated population in 2025	Water demand (MLD)	Planned Production		Deficit	
				Wet season	Dry season	Wet season	Dry season
A	Kathmandu Metro	3,616,000	493.29	522.30	539.24	+29.01	+45.95
B	Kathmandu Northeast	537,000	71.08	80.33	44.02	+9.25	-27.06
C	Kathmandu North	196,000	23.71	14.00	13.25	-9.71	-10.06
D	Kirtipur	67,000	6.59	10.00	6.8	+3.41	+0.21
E	Patan South	400,000	48.36	58.00	33.23	+9.64	-15.13
F	Bhaktapur	267,000	30.29	15.80	21.18	-14.49	-9.11
G	Pharping	34,000	3.76	1.50	0.80	-2.26	-2.96
H	Shankhu	12,000	1.31	1.50	0.50	+0.19	-0.81

Source: CIAMP

In the new distribution network, the water supply can be managed by DMA wise. On the other hand, the maximum amount of water supplied by the BDS is 170 MLD for the time being.

The water demand within the ring-road is 493 MLD, while the Melamchi Water Supply Project plans to provide 510 MLD of water supply in the future. However, at present, only water intake from the Melamchi River has been realized, and its available volume of 170 MLD can only meet 34% of the demand.

Therefore, for the time being, the limited amount of water must be supplied efficiently, and this requires an accurate understanding of each DMA's water demand and customer needs to ensure equitable water distribution. In addition, each branch office must maintain and manage the facilities such as pipes, valves, and flow meters in the DMAs in its administrative area by their own staffs. The following is a procedure for planning water distribution by DMA wise:

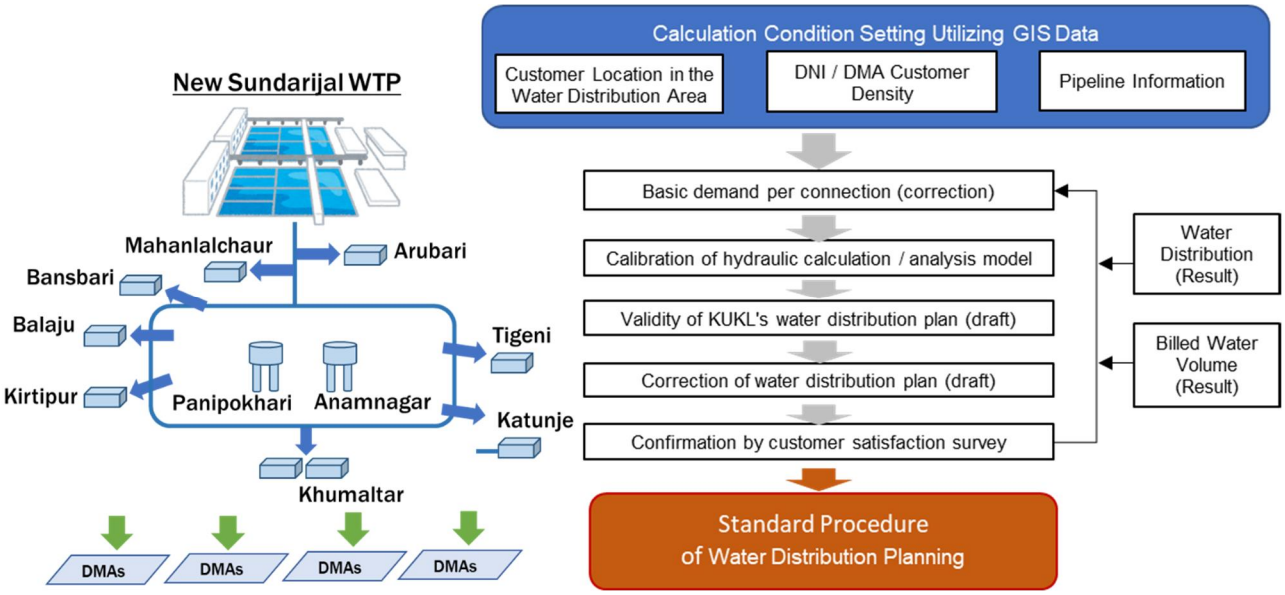


Figure 2.1.1 Approach to Optimize Water Distribution Planning

However, the boundaries of the newly developed DMAs are defined by topographical and hydrological conditions and do not exactly coincide with the boundaries of the current branch administrative area.

Therefore, if the management responsibility for the DMA is shifted to KUKL with the current branch office structure, it will be difficult not only to maintain the facility but also to monitor the water consumption of customers.

If each branch office does not have an accurate list of customers within the DMA, it will not be able to accurately record the amount of water used by its customers.

To resolve this issue, the current branch administrative area and its boundaries must be identified, the administrative boundaries must be changed if necessary, and the barriers to the management of the new water distribution network must be resolved before the DMA is handed over.

2.2. Non-Revenue Water Management

The new water distribution pipe network is divided into DMA units. Each DMA is hydraulically independent, and no connections exist to adjacent DMAs. The volume of incoming water in each DMA can be measured by bulk meters, and meters are also installed in the sub-DMAs to measure the volume of incoming water.

As an example, the bulk meter installations for DMA4.1 and DMA4.2 are shown below.

Table 2.2.1 Balk Meter and its target DMA

Bulk meter	DN	Target
DMA 4 Main	400mm	DMA 4.1.1 / DMA 4.1.2 / DMA 4.2
DMA 4.1.1	200mm	
DMA 4.1.2	150mm	
DMA 4.2 Main	400mm	DMA 4.2.1 / DMA 4.2.2 / DMA 4.2.3
DMA 4.2.1	200mm	
DMA 4.2.2	250mm	
DMA 4.2.3	150mm	

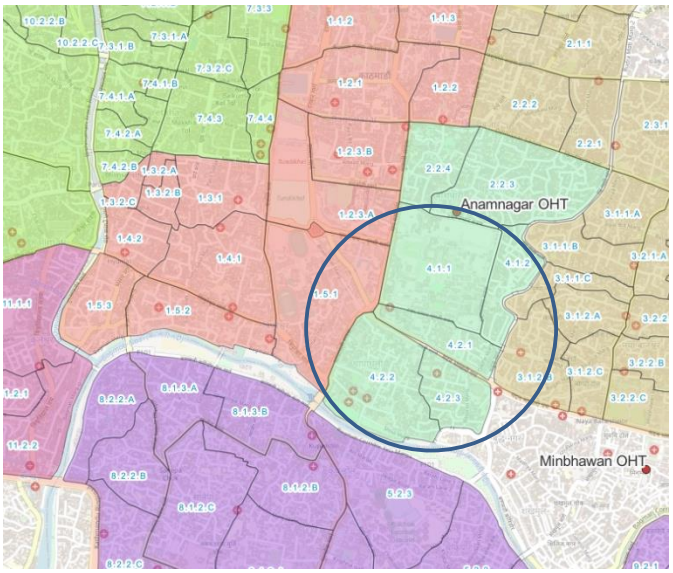


Figure 2.2.1 Location of DMA 4.1 & DMA 4.2

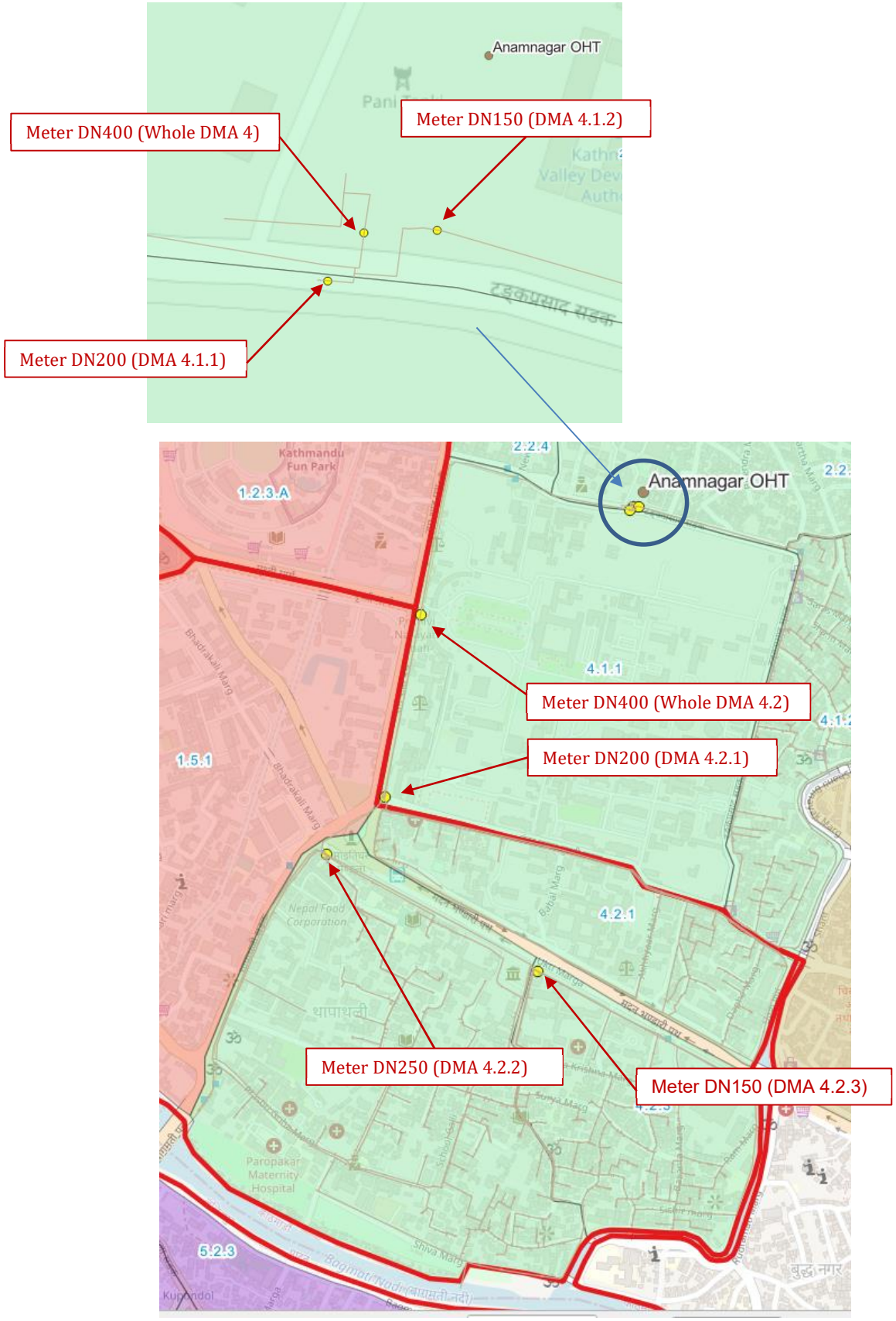


Figure 2.2.2 Location of Bulk Meter in DMA 4.1 & DMA 4.2

Each branch office must read the bulk meters of the DMAs under its administration monthly and compare them to the water consumption of the customers in the DMA to determine the status of water loss.

The steps required to manage non-revenue water are listed below.

Since the NRW ratio is one of the important performance indicators for water services provider, a section must be established at the head office to compile the data submitted by each branch office, analyze the causes of NRW and develop comprehensive countermeasures.

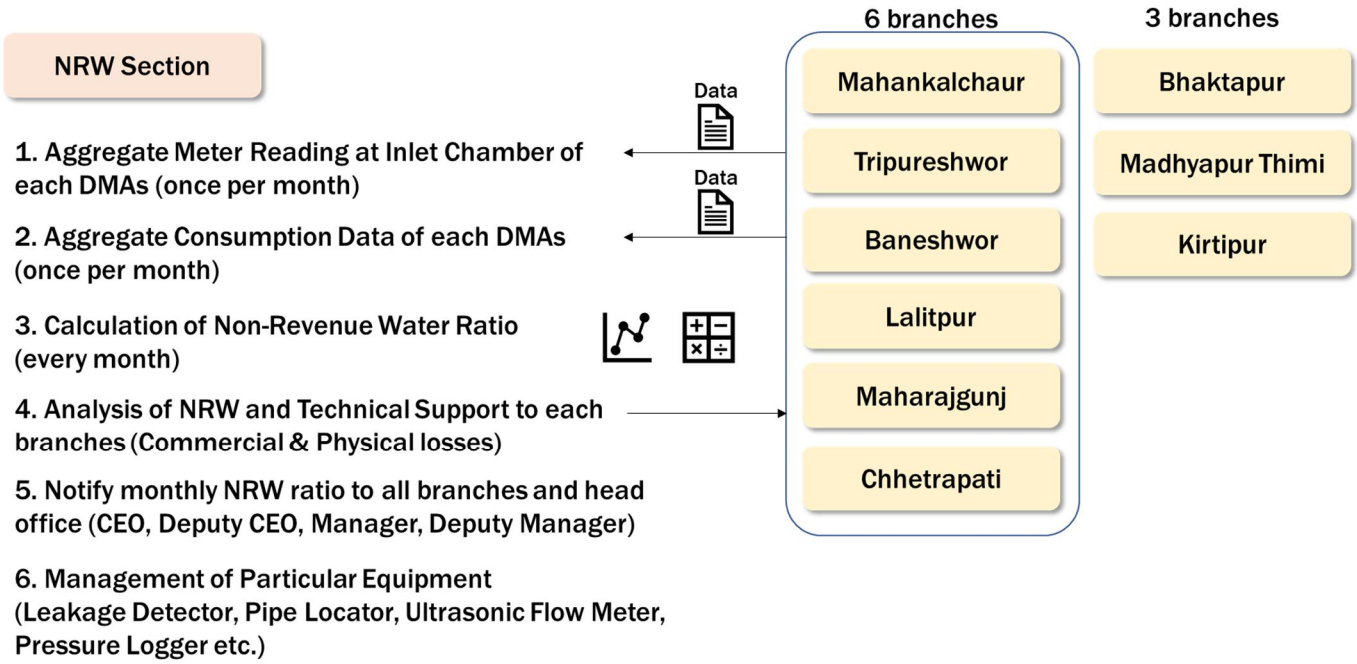


Figure 2.2.3 Basic Procedure of NRW Management

2.3 Operation of Water Distribution Network with GIS

When each DMA is completed and turned over to KUKL, GIS data showing the location of water supply facilities and customers is provided by the PID. Then, KUKL shall use GIS to perform daily management of the new water distribution network,

When new customers are registered after the completion of the DMA, the information should be obtained as GIS data, and the GIS information for the water supply facilities maintained by the branch office should be updated without delay.

For this purpose, the administrative area of each branch office must be changed to match the DMA before the GIS data is officially handed over, and the DMA to be controlled by the branch office must be clarified in advance.

The original GIS data is always stored on a server PC at the head office, and each branch office accesses the server from a dedicated PC to download the latest GIS data. When a branch office updates its GIS data in daily management, it must upload all necessary data to the server PC.

When branch offices acquire GIS data in the field, a GIS application (QField) installed on tablet devices distributed to each supervisor must be utilized, and all customer locations, water supply facility locations, leak locations, etc. should be collected as GIS data.

In addition, a dedicated RTK-GNSS positioning device will be used to locate detailed facilities and acquire them as GIS data.

GIS data collection and its management responsibilities are listed below.

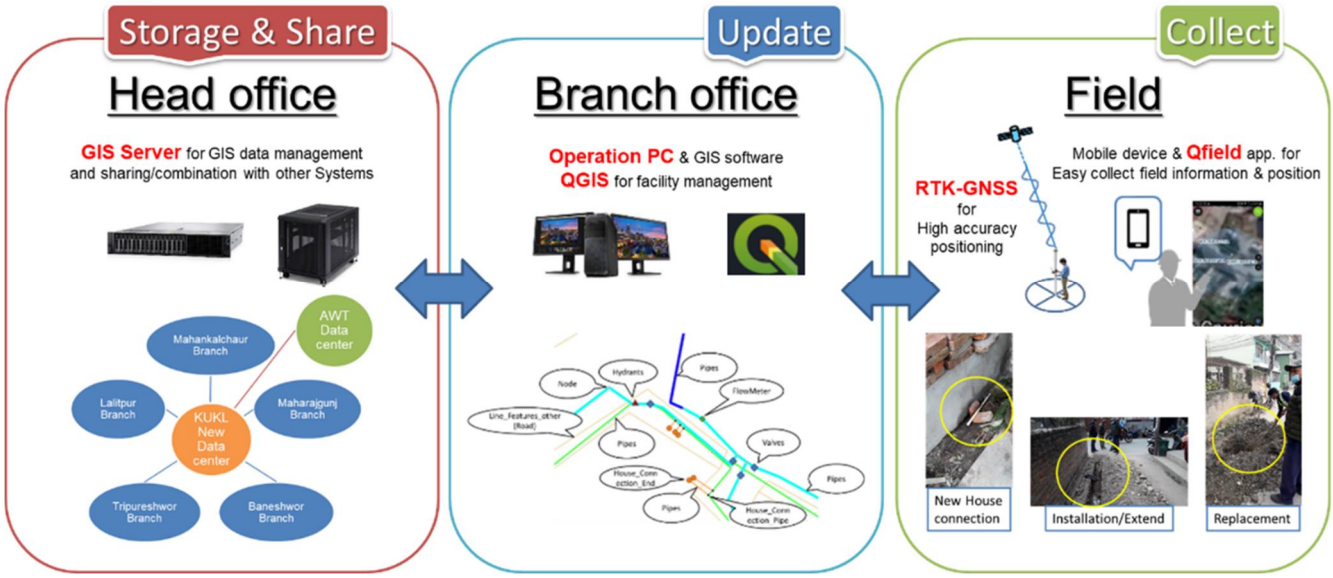
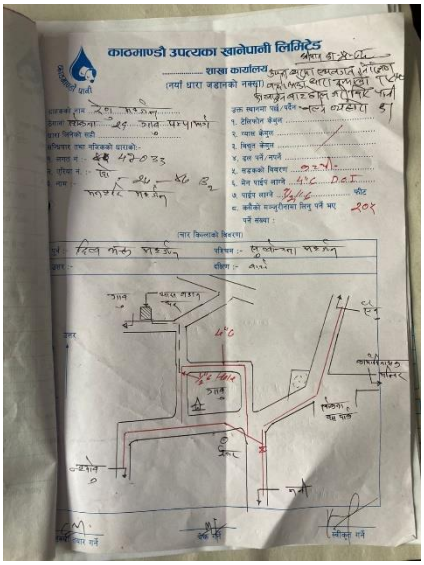


Figure 2.3.1 GIS Management Policy

[Old Format of Customer Registration Sheet]



[New Format of Customer Registration Sheet]

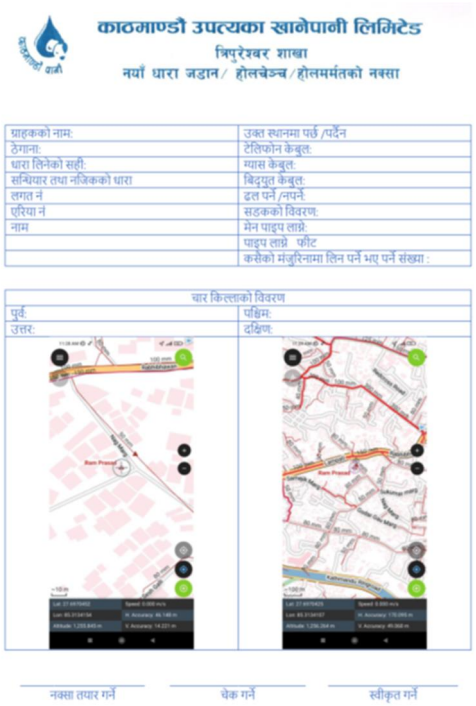


Figure 2.3.2 Digitalizing of daily work in branch office

3. Reform and Reorganization Plan of Branch Administrative Area

3.1 Border of Administrative Area

As we have mentioned, the new distribution network must be managed on a DMA basis, but the current branch management areas do not completely coincide with the DMA boundaries.

In addition, the DMA is hydraulically independent, and the area covered by the water distribution basins constructed by the BDS is also defined. In other words, the starting point of the water supply to each DMA, the distribution reservoir, is also predetermined, and it is indispensable to base the management of the water supply situation in the DMA on the area starting from the distribution reservoir.

The following map shows the current administrative area of the branch office overlaid on the DMA location.

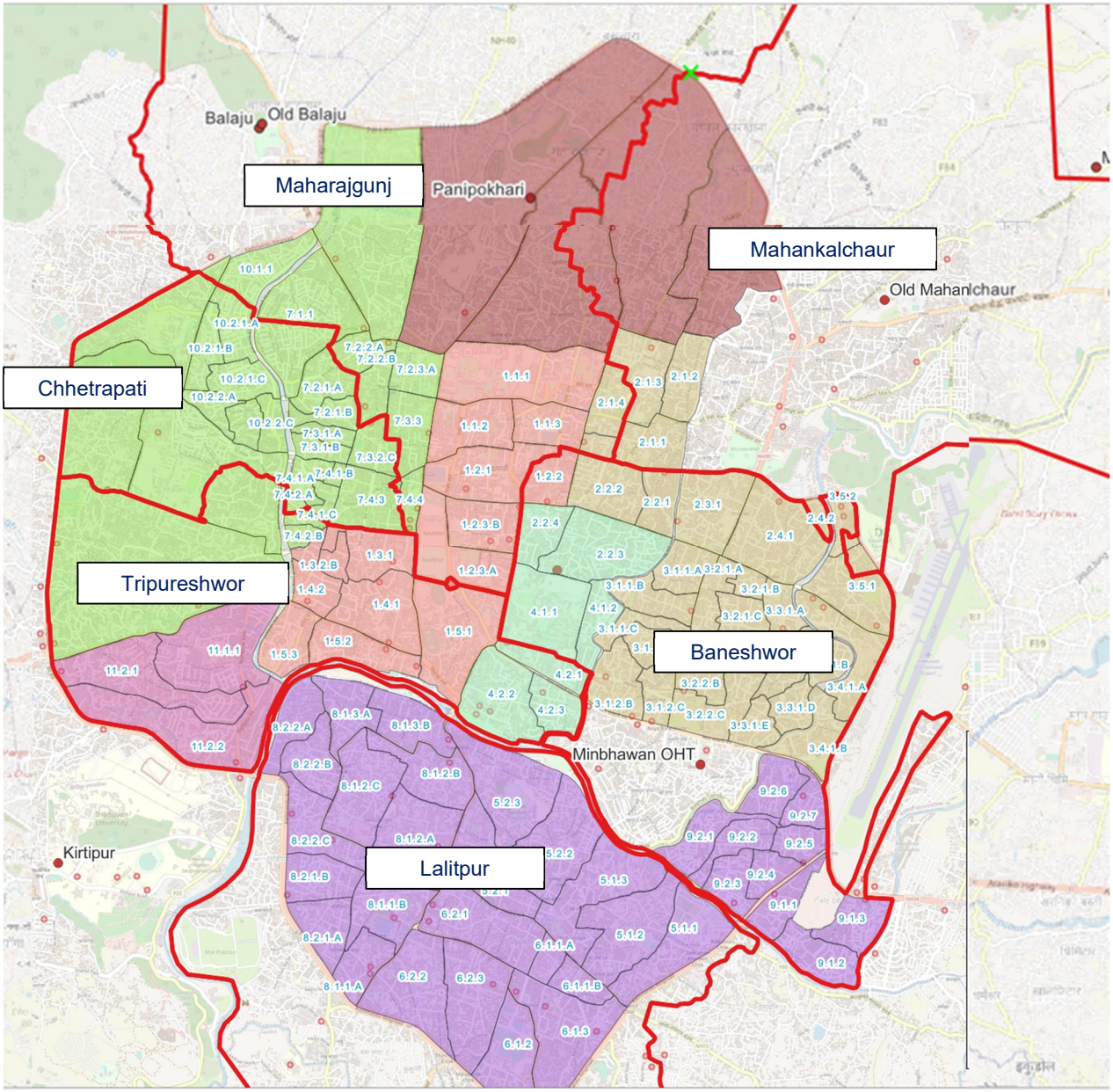


Figure 3.1.1 Current Administrative Area of Branch Office

The problems facing the current administrative area of the branch offices are as follows:

- DMAs covered by Balaju SRT is divided into 3 branches administrative area of Tripureshwor, Chhetrapati and Maharajguinj.
- DMAs covered by Kirtipur SRT belongs to Tripureshwor branch administrative area.
- Some DMAs covered by Mahankalchaur SRT belongs to 2 branches administrative area of Baleshwar and Maharajgunj.
- DMAs covered by Panipokhari SRT is divided by 2 branch administrative areas of Maharajgunj and Tripureshwor.
- DMAs covered by Anamnagar OHT is divided into 2 branch administrative areas of Baneshwor and Tripureshwor.
- The northern area within the ring road where the DMA will be developed in the future will be covered by Bansbari SRT, but those areas are currently divided into two branch administrative areas of Maharajgunj and Mahankalchaur.
- DMA 9 is located in the Khumaltar SRT supply area, but now those DMAs are within the Baneshwor branch's administrative area.
- Much of the current administrative area of the Baneshwor branch is now the future water distribution area of the Mahankalchaur SRT.

In addition, the following are areas where the current administrative areas of the branch offices do not coincide with the boundaries of the DMAs.

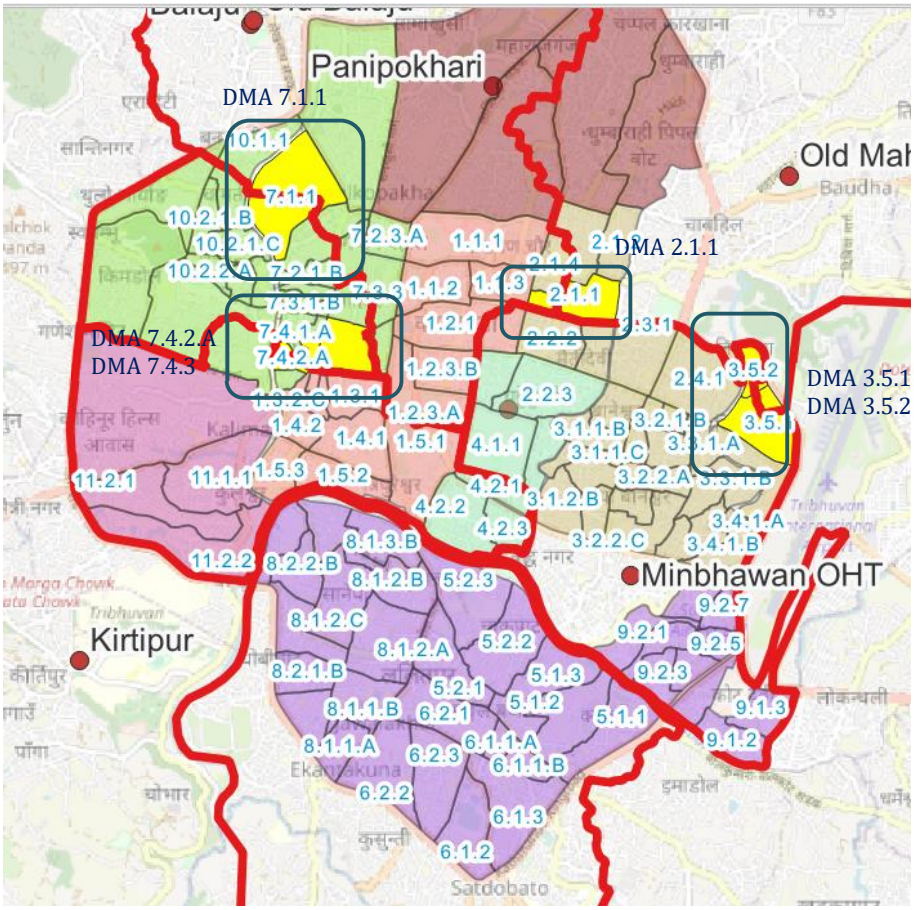


Figure 3.1.2 DMAs where the boundaries of the DMA do not coincide with the administrative area of the branch office

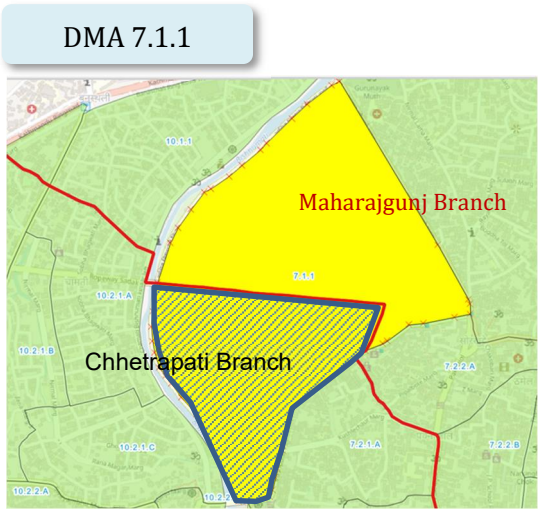


Figure 3.1.3 Detail of DMA 7.1.1

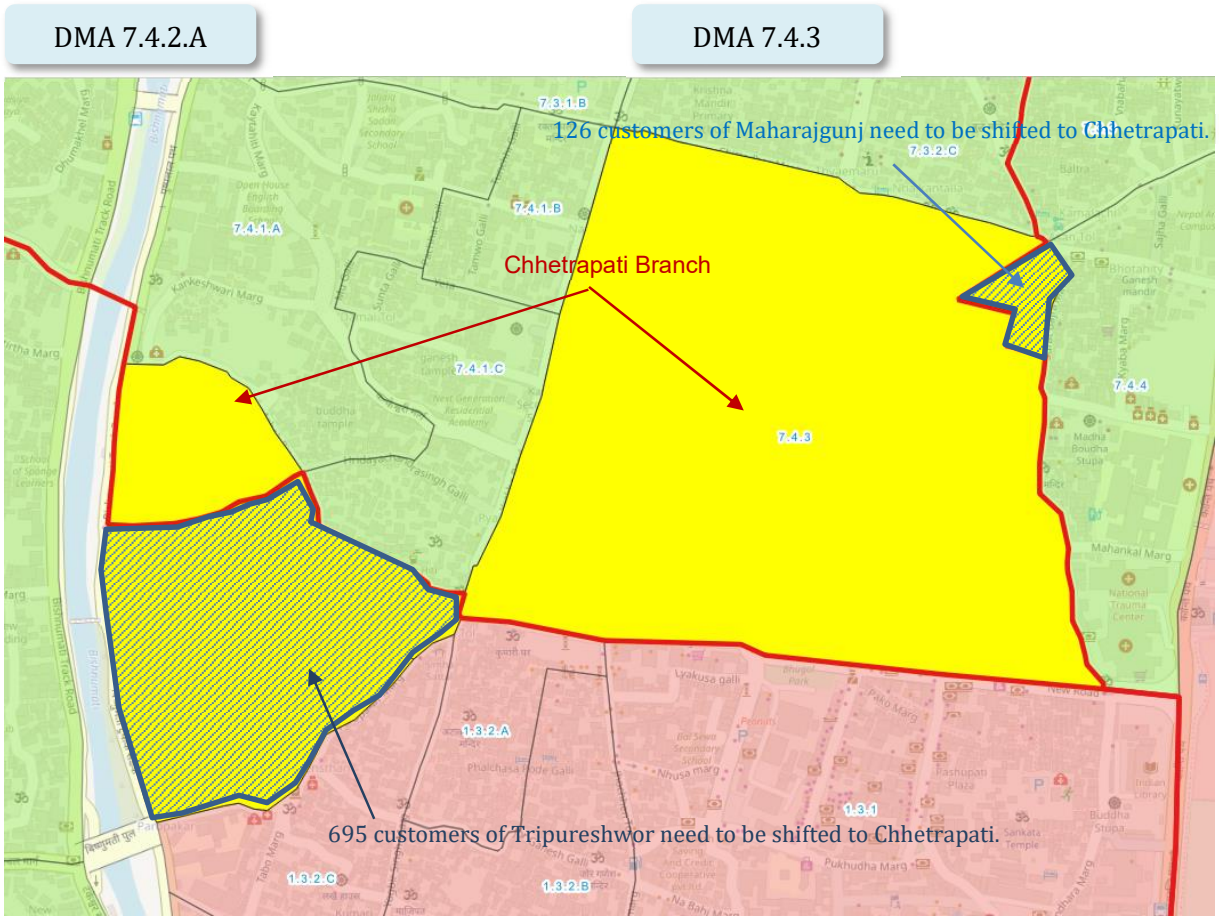


Figure 3.1.4 Detail of DMA 7.4.2.A & DMA 7.4.3

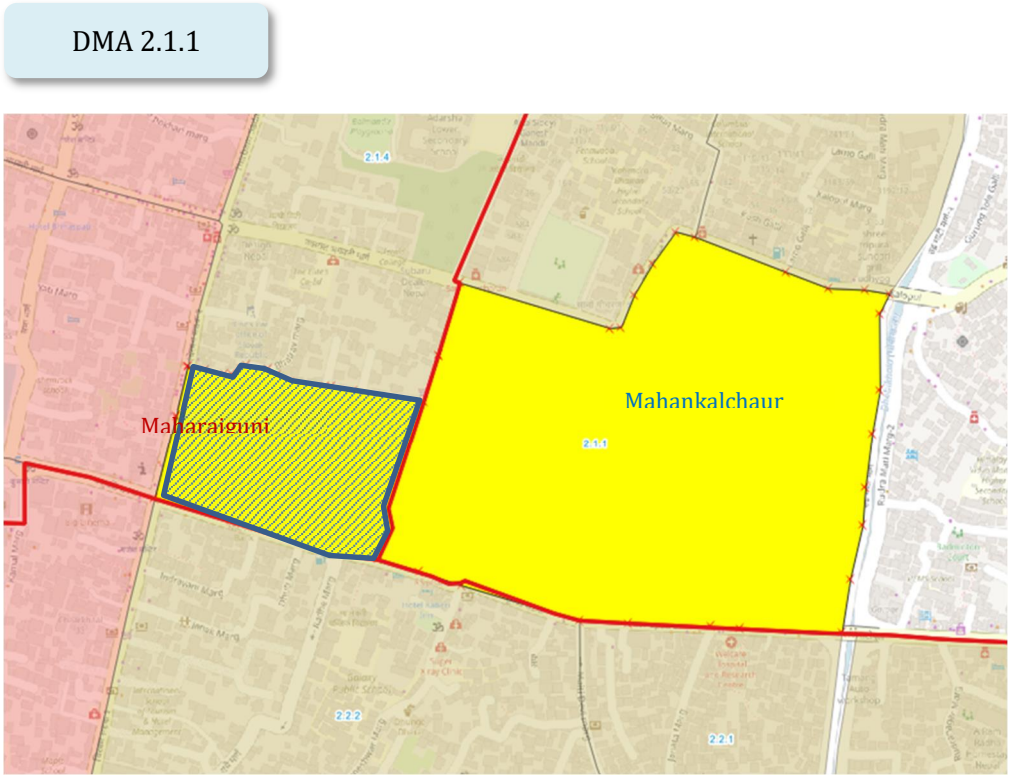


Figure 3.1.5 Detail of DMA 2.1.1

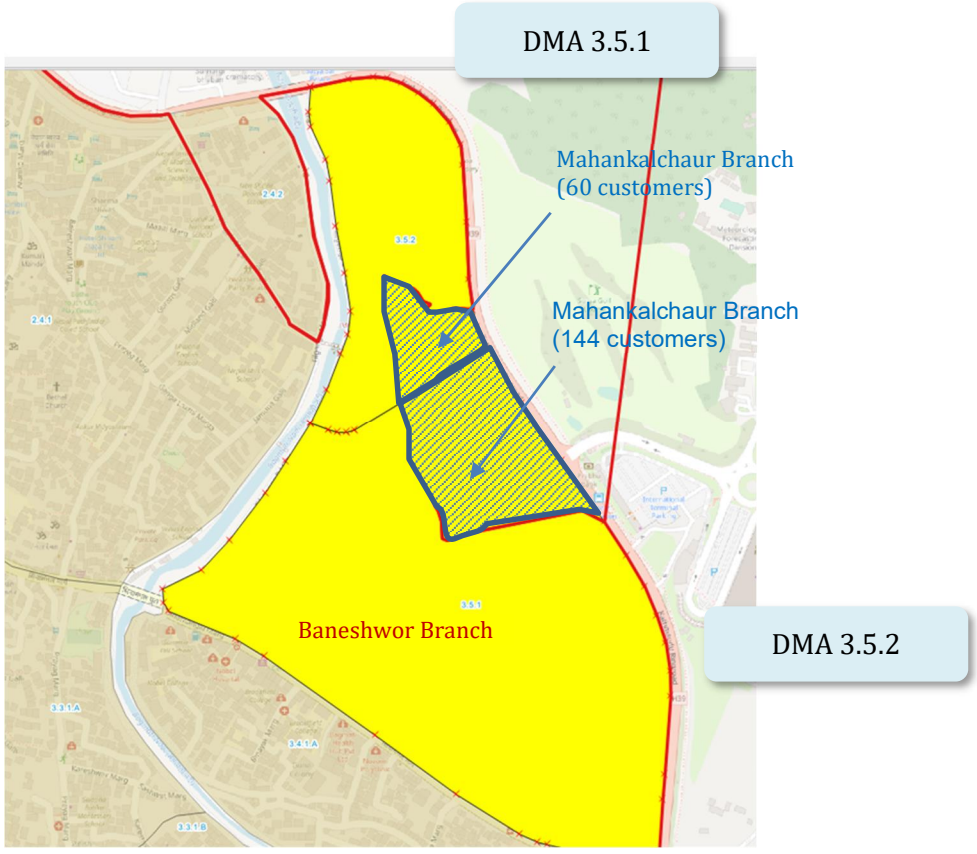


Figure 3.1.6 Detail of DMA 3.5.1 & DMA 3.5.2

There are two ways to change the administrative boundaries of a branch office: emergency and drastic.

(1) Emergency response

The emergency response is to modify the administrative areas of the branches to conform to the boundaries of the six DMAs described above, while keeping the current administrative areas of the branches as much as possible.

[Advantage]

- There is no need to make major changes to the current management structure of the branch office.
- Minimize customer transfers between branches.

[Disadvantage]

- The administrative areas of different branches remain within the same water supply area covered by a service reservoir tank.
- Need to coordinate with different branches when changing operation of a service reservoir tank.
- Due to the involvement of different branches in the operation of one service reservoir tank, the management of the service reservoirs need to be done centrally at the head office.

(2) Drastic response

A drastic response is to redefine the name and administrative area of the branches based on the water supply area starting by reservoir wise. This is most desirable when considering future expansion of DMA.

[Advantage]

- The service reservoir operations are facilitated because the water supply area of the service reservoir coincides with the administrative area of the branch office. No need to coordinate with multiple branches to change operation way of reservoir tank.
- The water quality monitoring at customer taps conducted by respective branch office will be facilitated because the water supply area covered by service reservoir will coincide with the administrative area of the branch.

[Disadvantage]

- Drastic reorganization and consolidation of branch offices is needed.
- If the name of the branch office is also changed, the IDs of all customers must be changed.

Considering the current situation, JICA Expert Team recommends drastic response.

The Melamchi Water Supply Project will continue and will provide 510 MLD of water supply in the future, and KUKL must maintain the water supply system within the Kathmandu Valley under its own organizational responsibility.

If we limit ourselves to emergency measures at this time, KUK will face similar challenges again in the future when DMA maintenance is expanded beyond the ring road.

A number of new customer registrations will occur as customers' water meters are renewed

through the Melamchi Water Supply Project and water service pipes are installed in all the residences that were not previously official customers.

With the new Sundarijal Water Treatment Plant in full operation, the water supply volume is expanding significantly, and customer satisfaction with KUKL is beginning to improve.

Furthermore, this is the best time to initiate a drastic reorganization of the branch offices, as it is easier to request cooperation from customers and change IDs.

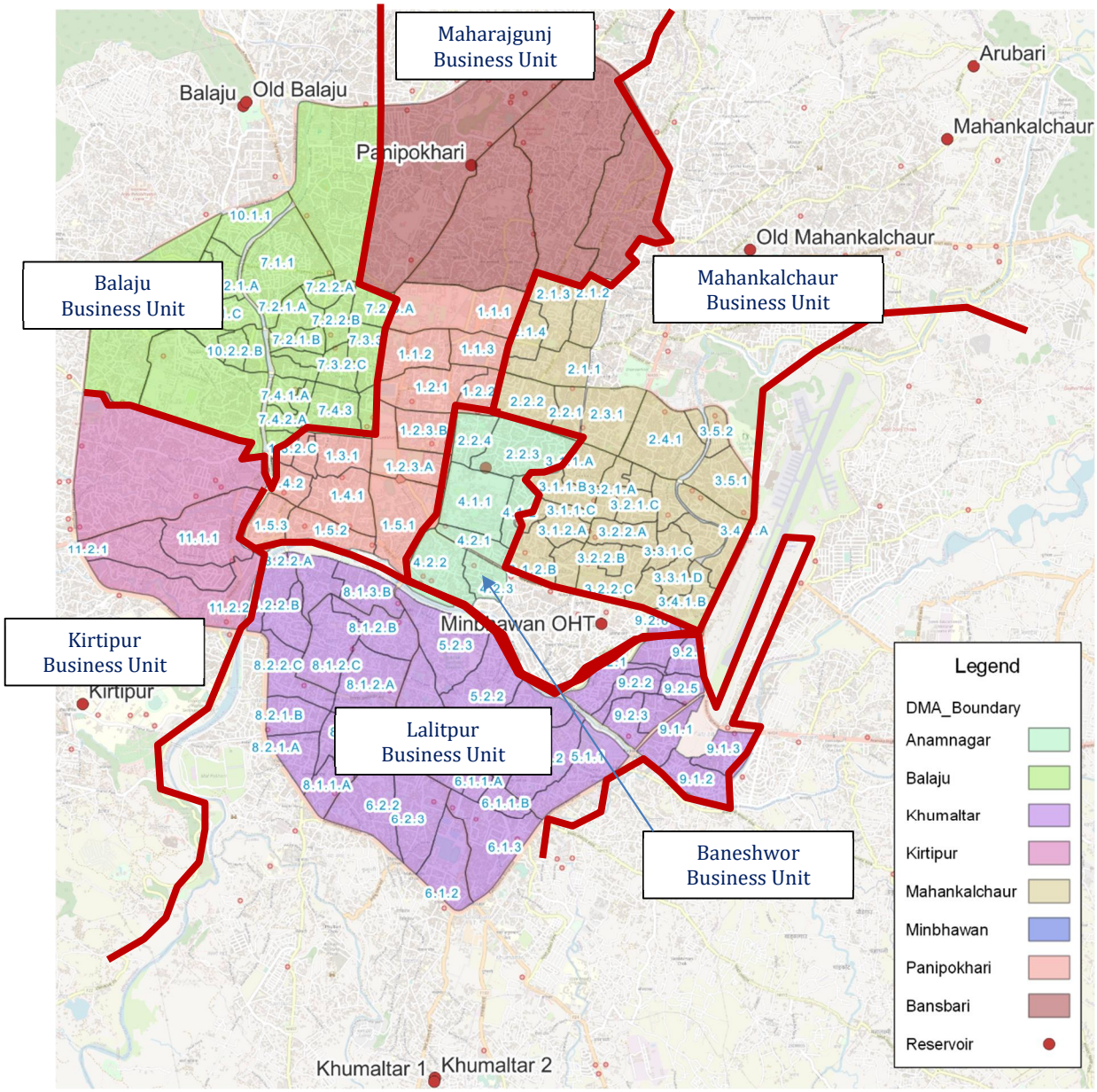


Figure 3.1.7 Drastic Reform Plan of Branch Administrative Area

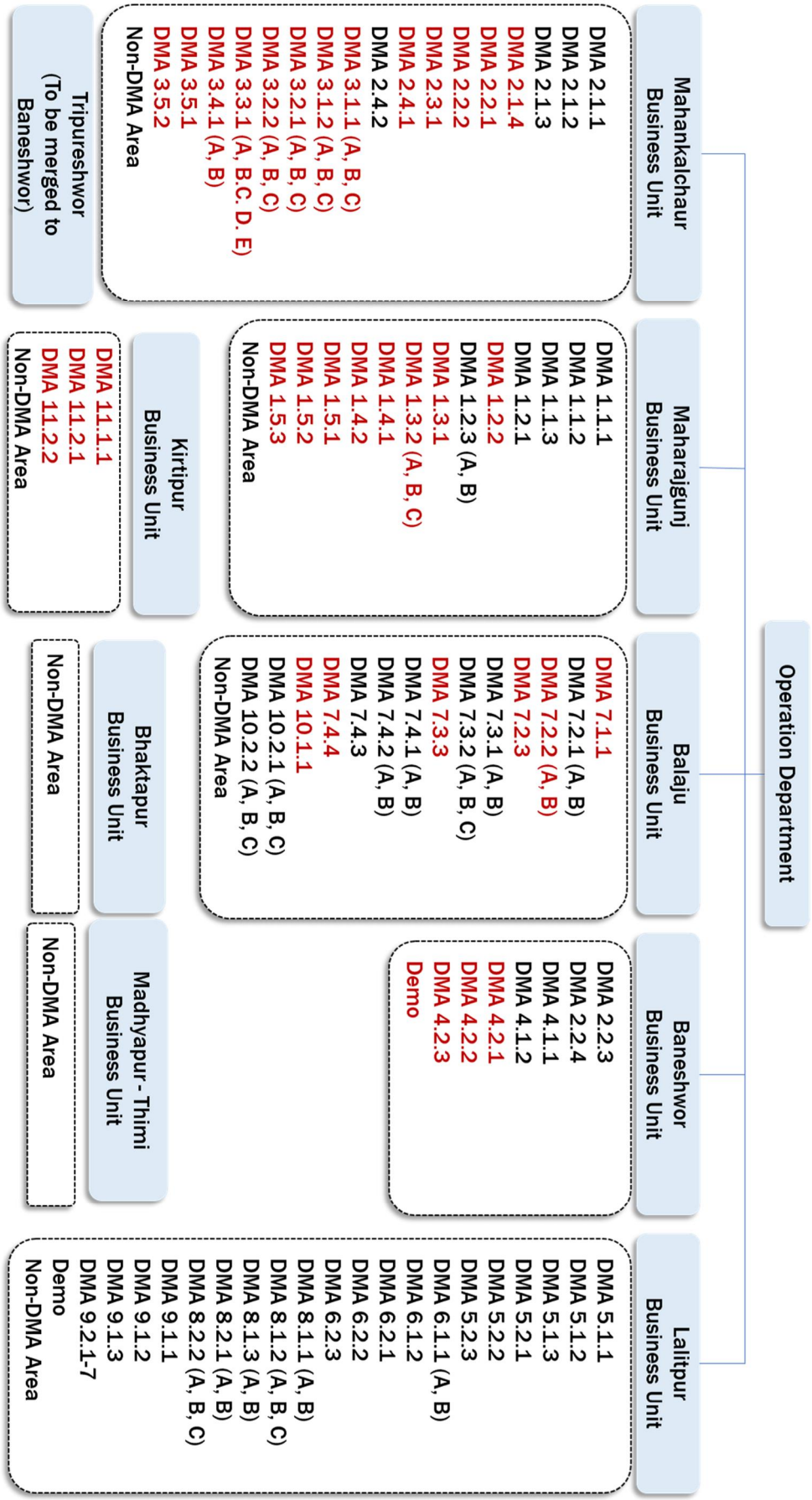


Figure 3.1.8 Allocation of DMAs to new business unit administration

3.2 Detail of Boundary Determination of New Administrative Area

Table 3.2.1 Detail for Determination of New Administrative Area

New Business Unit	Detail of boundary	DMA
Mahankalchaur BU	Bhatkeko Pul – Dhungedhara Marg – Hadigaun Marg – Krishna Mandir – Thatu Marg – Bishalnagar Marg – Bhatbhateni – Thirbam Sadak – Tangal Marg - Ganesthan Mandir – Tangle Marg – Thirbam Sadak 3 – Bhagwati Mandir - Thirbam Sadak 3 - Ram Mandir – Dillabazar Sadak – Dillabazar Marg – Seto Pul – Dhobikhola – Shanti Binayak Marg – Radha Krishna Mandir - Kwality Party Place – Madan Bhandari Path – Tinkune – Kathmandu Ring Road – Pashupati Sadak - Rato Pul – Rudra Mati Marg – Kalo Pul – Dhobikhola - Bhatkeko Pul	DMA 2.1.1 DMA 2.1.2 DMA 2.1.3 DMA 2.1.4 DMA 2.2.1 DMA 2.2.2 DMA 2.3.1 DMA 2.4.1 DMA 2.4.2 DMA 3.1.1 (A, B, C) DMA 3.1.2 (A, B, C) DMA 3.2.1 (A, B, C) DMA 3.2.2 (A, B, C) DMA 3.3.1 (A, B.C. D. E) DMA 3.4.1 (A, B) DMA 3.5.1 DMA 3.5.2
Maharajgunj BU	Gongabu Chowk – Samakhusi Marg – Kali Mata Mandir – Lekhnath Sadak – Narayan Gopal Sadak – Kanti Path – Newroad – Ganga Path – Kathmandap Restaurant – Maru Tol – Paropakar Marg – Bishnumati Pul – Bishnumati Track Road – Kanak Oil Store – Transformer Marg – Bishnumati Marg – Jubilant College – Bagmati Marg – Bagmati Pul – Thapathali Sadak – Maitighar Mandala – Ram Saha Path – Putali Sadak – Dillibazar Sadak – Ram Mandir – Thirbam Sadak 3 – Tangal Marg – Tangal Ganeshsthan Mandir – Thirbam Sadak – Bhatbhateni – Bishalnagar Marg – Thatu Marg – Krishna Mandir – Hadigaun Marg – Dhungedhara Marg – Bhatkeko Pul – Dhobikhola – Kathmandu Ring Road – Sukedhara Bus Stop – Dhumbarahi Bus Stop – Narayan Gopal Chowk – Gangabu Chowk	DMA 1.1.1 DMA 1.1.2 DMA 1.1.3 DMA 1.2.1 DMA 1.2.2 DMA 1.2.3 (A, B) DMA 1.3.1 DMA 1.3.2 (A, B, C) DMA 1.4.1 DMA 1.4.2 DMA 1.5.1 DMA 1.5.2 DMA 1.5.3
Balaju BU	Gongabu Chowk – Samakhusi Marg – Kali Mata Mandir – Lekhnath Sadak – Rishi Ayurvedic Medical Hall – Kanti Path – Newroad – Ganga Path – Kathmandap Restaurant - Maru Tol – Paropakar Marg – Bishnumati Pul – Tankeshwar Sadak – Dhaukhel Marg – Ganeshman Singh Path – Soltimod Sadak – Kalankisthan Sadak – Soltimod Chowk – Ravibhawan Sadak – Lampati – Kalanki Sadak– Kathmandu Ring Road – Sitapaila Chowk – Banasthali Ring Road Track Right – Balaju Ring Road Track Right – Kathmandu Ring Road – Gongabu Chowk	DMA 7.1.1 DMA 7.2.1 (A, B) DMA 7.2.2 (A, B) DMA 7.2.3 DMA 7.3.1 (A, B) DMA 7.3.2 (A, B, C) DMA 7.3.3 DMA 7.4.1 (A, B) DMA 7.4.2 (A, B) DMA 7.4.3 DMA 7.4.4 DMA 10.1.1 DMA 10.2.1 (A, B, C) DMA 10.2.2 (A, B, C) Non-DMA Area
Baneshwor BU	Seto Pul – Dillibazar Sadak – Putali Sadak – Ram Saha Path – Maitighar Mandala – Thapathali Sadak – Shree Gorakhnath Mandir – Bagmati River – Shiva Marg –	DMA 2.2.3 DMA 2.2.4 DMA 4.1.1

New Business Unit	Detail of boundary	DMA
	Dhobi Khola – Bijuli Bazar Pul – Namuna Marg – Dhobi Khola - Rudra Mati Marg – Seto Pul	DMA 4.1.2 DMA 4.2.1 DMA 4.2.2 DMA 4.2.3 Demo Area
Lalitpur BU	Koteshwor Chowk – Metropolitan Traffic Police Station – Ashwarya Marg – Kalo O.P. Marg – Araniko Highway – Manohara Nadi – Manohara Corridor – Balkumari Bridge – Kathmandu Ring Road – Gwarko Chowk – Satdobato Chowk – Bagmati River - Bagmati Corridor Yela Marg – Shankhamul Bridge – Buddha Mandir - Manohara Pul – Balkumari Pul – Janta Marg – Amaravati Marg – Janta Marg – Subidha Marg – Sat Marg – Madhan Bhandari Path – Kathmandu Ring Road – Koteshwor Chowk	DMA 5.1.1 DMA 5.1.2 DMA 5.1.3 DMA 5.2.1 DMA 5.2.2 DMA 5.2.3 DMA 6.1.1 (A, B) DMA 6.1.2 DMA 6.2.1 DMA 6.2.2 DMA 6.2.3 DMA 8.1.1 (A, B) DMA 8.1.2 (A, B, C) DMA 8.1.3 (A, B) DMA 8.2.1 (A, B) DMA 8.2.2 (A, B, C) DMA 9.1.1 DMA 9.1.2 DMA 9.1.3 DMA 9.2.1-7 Demo Area
Kirtipur BU	Ganeshman Singh Path – Kalimati Chowk - Ganeshman Singh Road – Soltimod Sadak – Soltimod Chowk – Ravibhawan Sadak – Lampati – Kalanki Sadak – Kalandi Chowk- Kathmandu Ring Road – Swastik Dental Hosptal – Balkhu Chowk – Bagmati River – Kuleshwor Secondary School – Teku Dovaan Marg – Bagmati Marg - Gyantirtha Marg – Ganeshman Singh Path	DMA Outside the Ring Road DMA 11.1.1 DMA 11.2.1 DMA 11.2.2

3.3 Operation of District Metered Area (DMA)

3.3.1 Definition of DMA

District Metered Area

District Metered Area means "a delimited area where water supply can be controlled by a flow meter.
The amount of water loss within a DMA over a period of time can be measured by measuring the inflow of water from one or more inlet points with a flow meter and subtracting the sum of the water consumption measured in all the customers inside a DMA.
There are three types of DMA as shown in the figure below:

Type 1:
DMA with one inflow point
Type 2:
DMA with multi-inflow points
Type 3:
DMAs with inflow points as well as outflow points to adjacent DMAs

The DMA planned for the Melamchi Water Supply Project is Type 1, which allows flow measurement at a single inflow point.

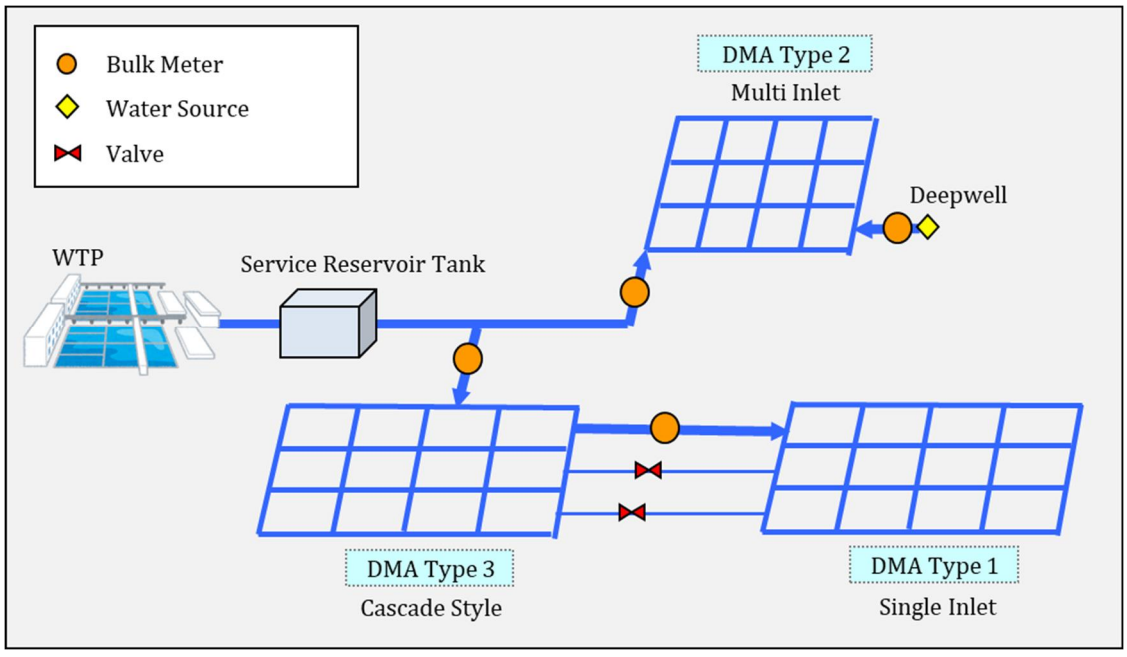


Figure 3.3.1 Different Type of DMA

3.3.2 Effective use of DMA

The purpose of constructing a DMA is as follows:

- Clarify the amount of water loss (NRW) by comparing the amount of water consumed to the amount of water flowing into the DMA within a given period of time.
- Measure the inflow volume during the late-night hours when water consumption is low, and roughly estimate the magnitude of the leakage occurring at each DMA.
- Calculate the evaluation indicator dividing NRW volume by number of connections in the DMA.
- Calculate the evaluation indicator dividing NRW volume by extension of pipe (km) in the DMA.
- Calculate the evaluation indicator dividing nighttime inflow by number of connections in the DMA.
- Calculate the evaluation indicator dividing nighttime inflow by extension of pipe (km) in the DMA.
- Rank DMAs with high leakage potential using indicators and identify DMAs that need to be prioritized for action.
- The amount of inflow water and consumed water in the DMA should be measured at least once a month.

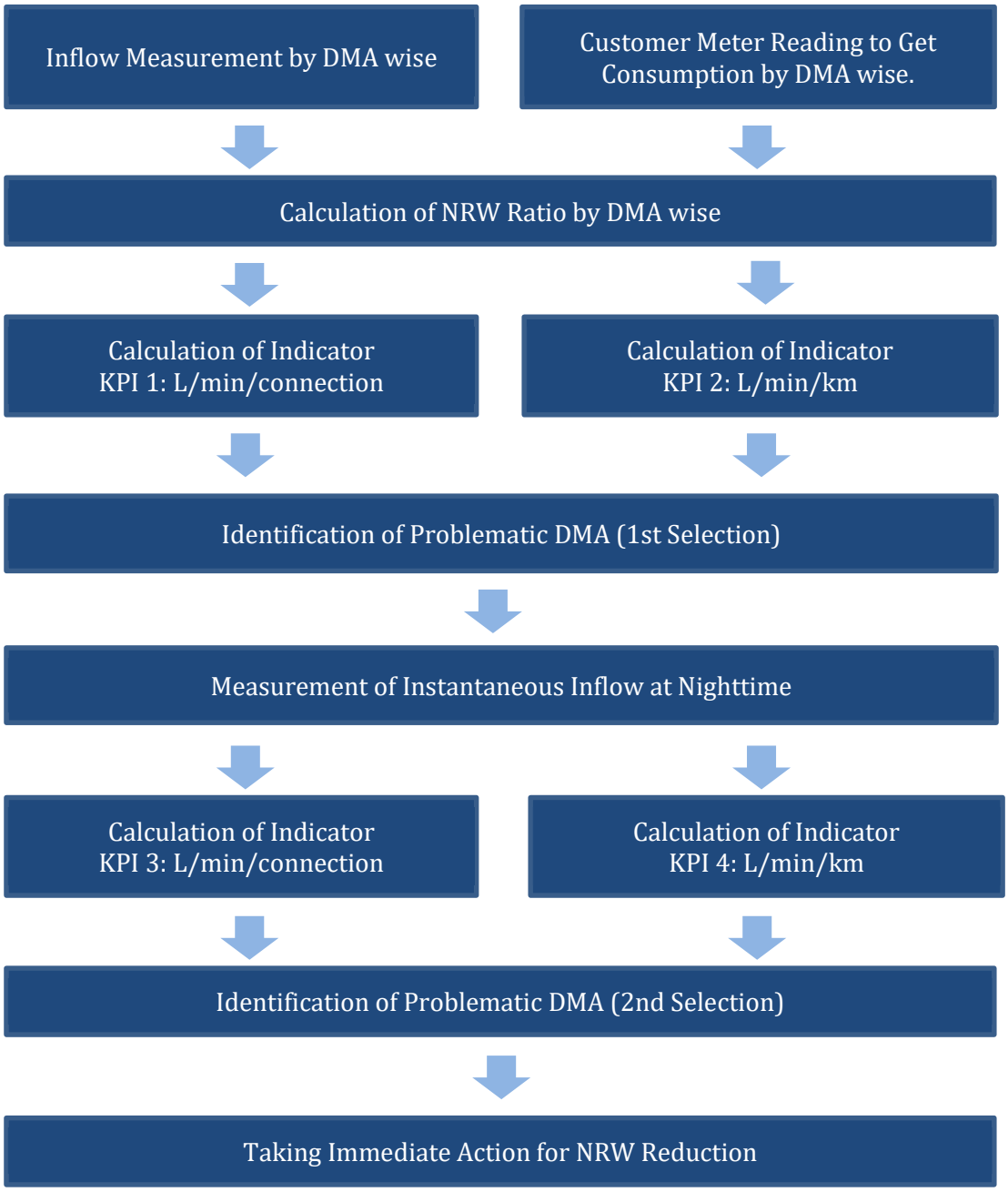
Minimum Night Flow (MNF) represents the smallest inflow of water that occurs for a short period of time during the late-night hours when customer water use is the lowest.

Generally, MNF measurements are performed on small sectors of 500-1000 customers, so this measurement cannot be performed on DMA units.

The flowmeter currently installed in the DMA is a Waltman-type velocity flowmeter, the purpose of which is to measure cumulative flow. Furthermore, the Waltman Type flowmeter is not suitable for measuring MNF because it cannot measure minute flow rates and has a slow response time.

After flow measurement of each DMA is continued and DMAs with extremely high potential for leakage or significantly high values of NRW are selected, the DMAs should be further divided into smaller sectors to determine the cause of leakage or NRW.

At that stage, there will be a need to utilize ultrasonic or electromagnetic flow meters to measure MNF for each small sector.



KPI: Key Performance Indicator

Figure 3.3.2 Steps of Effective Use of DMA

3.4 Creation of NRW Committee in Head Office

Once the DMA is officially handed over, KUKL itself is required to determine the water balance of the DMA and implement the necessary measure for NRW reduction.

Each branch or business unit will be required to measure the amount of water consumed- by its customers to ensure accurate billing based on meter reading record. In addition, measuring the inflow of water at each DMA to determine NRW ratio is necessary to assess the performance of the branch office.

However, since NRW is a key performance indicator for the organization, instead of placing the responsibility and countermeasures for NRW on each branch office, a specialized department at the head office should take responsibility for evaluating and analyzing NRW, presenting countermeasure proposals, and taking responsibility for strategic plan values and budget measures.

A specialized unit to be established at the Head Office will be responsible for analyzing the current status of NRW, formulating countermeasures and medium- to long-term strategies, as well as providing technical support to each branch office.

However, since budgetary measures and consensus building among the various departments are essential for effective countermeasures, approval of the plan must be carried out by the Committee.

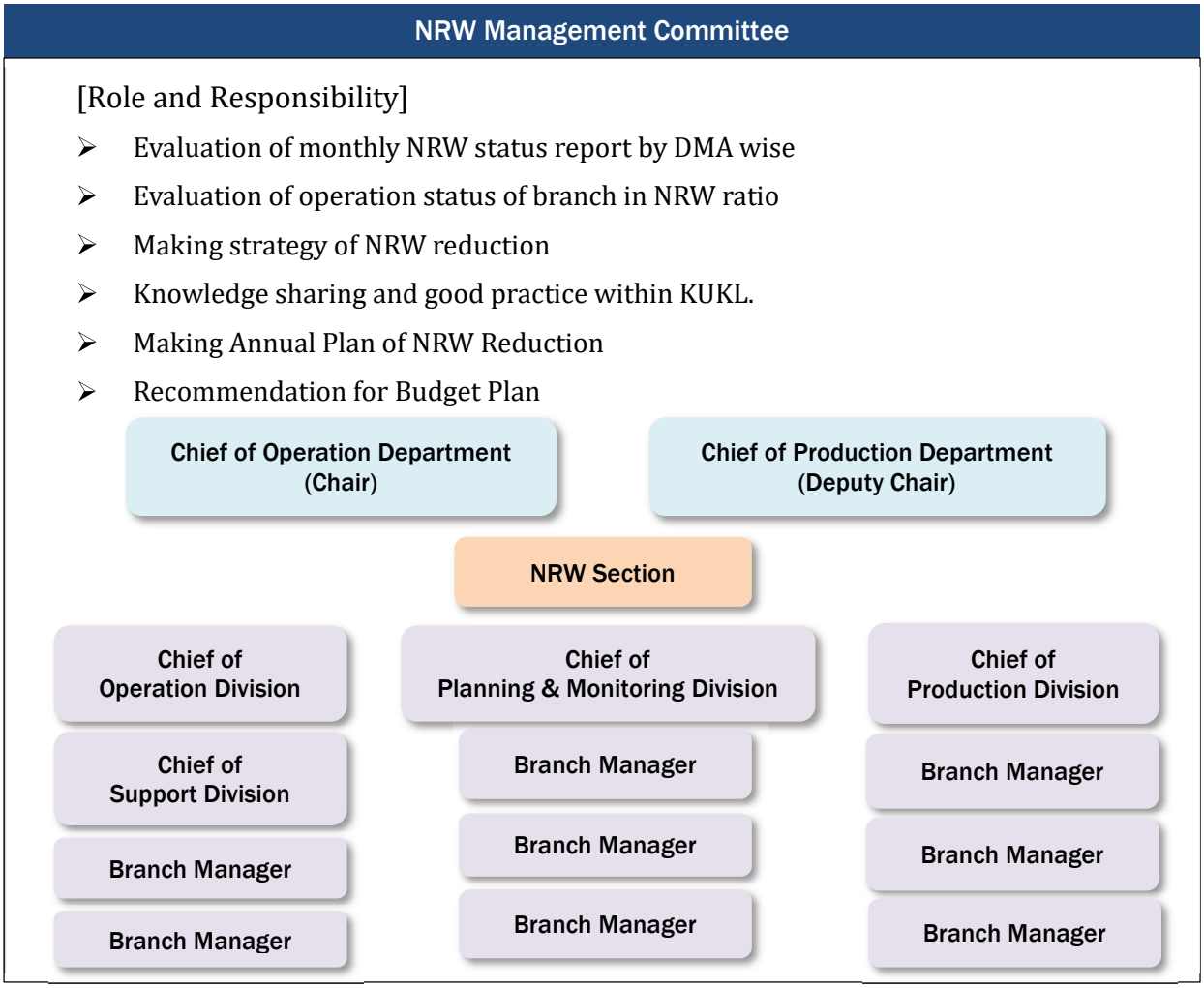


Figure 3.4.1 Composition of NRW Management Committee