WATER SUPPLY

MANAGEMENT SYSTEM

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Under the Guidance of

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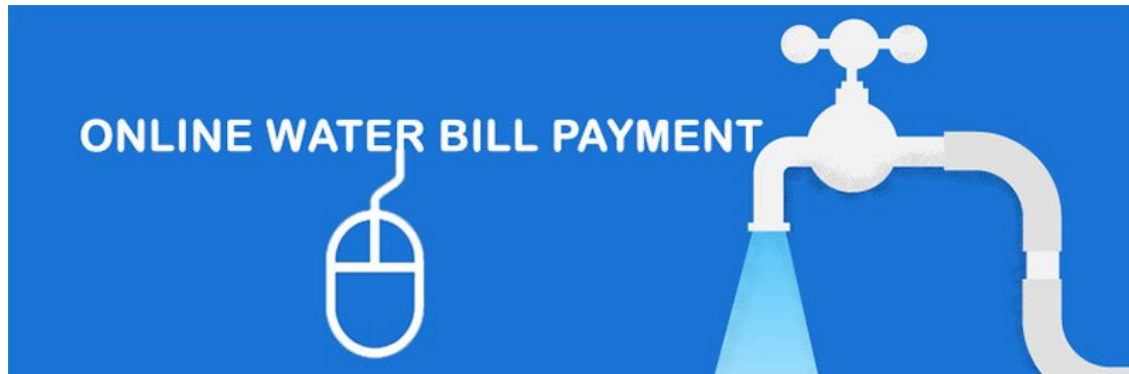
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INTRODUCTION

With a large population water is distributed to everyone, which is a huge task. Water supply facilities bring water from various locations after proper treatment including, groundwater, surface water (rivers and lakes), and the sea. Water is treated through desalination, purification, disinfection and chlorination. Tracking water supply quality and quantity has been an important issue. Many customers and the municipality would want to understand the framework of water supply. Municipality would like to understand the cost range behind water consumers, how water is distributed to different regions, where water is treated and to whom it is distributed. Municipality has to track the number of people having water connections in the area. Companies need information about water treatment facilities and sewage treatment facilities in order for them to get water connection and use it for their users and check whether water quality is good or not.

PROBLEM STATEMENT

Municipal water supply and sewage treatment
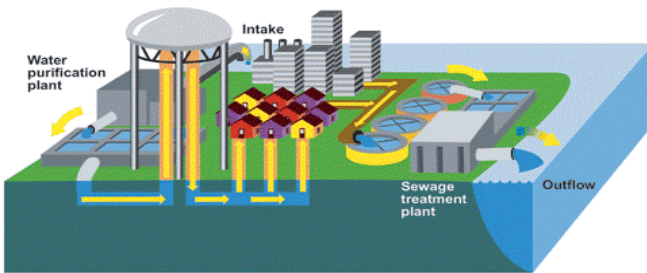
To understand the distribution of water supply, we have to create a database for water supply in MySQL. Primarily, this database would be used for a particular region. In this database, it shows how water supply information is flowing across different entities such as the people who access the water source, how water source is treated by the water treatment plant before providing it to the customers, and how wastewater is treated by the sewage plant. The meter Reader installed in the houses will measure the water consumption and customers will be able to view and pay the water bill from the comfort of their home without having to wait in the long queue. Therefore, we aim to bring the solution which can help increase the transparency between the customers and the Municipality.

SYSTEM ARCHITECTURE
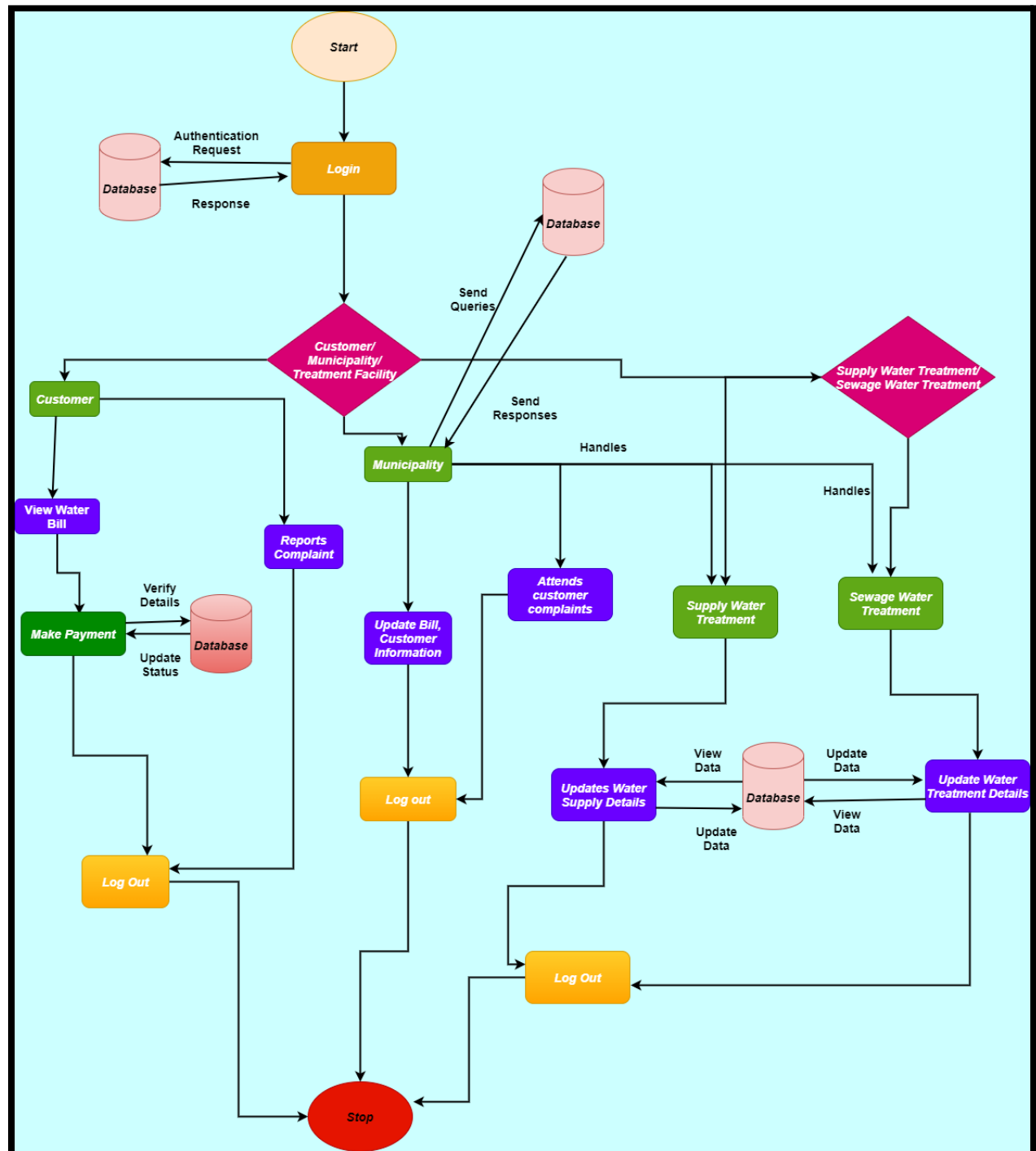
FUNCTIONAL REQUIREMENTS

Stakeholders:

1. Municipality

2. Customers

Functionalities:

1. One customer can have one water connection.
2. Industrial (such as the leather industry), commercial (such as malls and theatres) and domestic users will have different criteria for water supply.
3. Each customer is identified by customer id using which they can access their water bill and make payment.
4. Each customer will be provided a standard amount of water and for standard duration.
5. Customers will be able to view water supply details by providing their customer_id.
6. Water sources (like river, lake or reservoir) will be treated by the treatment plant for purification before supplying it to the customers.
7. The treatment plant will supply treated water to the consumer for use through pumps and pipes.
8. Payment of water bills can be made through debit cards or credit cards.
9. Each customer can view their water bill with details such as water consumption, total cost, tax levied and period of consumption.
10. Wastewater discharged by the customers will travel to sewage for filtration.
11. The meter will record water consumption for each customer.
12. Customers can register their complaints with the municipality.
13. Municipality will reply to customer complaints.
14. Municipality will manage sewage and water treatment plants from which it can keep track of water quality and quantity supplied to customers.

ENTITIES AND THEIR RELATIONSHIPS

Entities:

Municipality

Customers:

       A. Domestic
       B. Industry
       C. Commercial

Water Bill

Meter Reader

Water Treatment Plant

Sewage Treatment

Sewage Treatment Plant

Complaints

Water Source

Relationships:

(Water treatment facility) treats (Water Source) **(many: 1)**

(Water treatment facility) provides water to (Customers) **(1: many)**

(Municipality) replies to (Complaints) **(1: many)**

(Water Bill) read by (Meter Reader) **(1:1)**

(Customer) generates (Sewage) **(many: many)**

(Customer) pays (Water Bill) **(1:1)**

(Sewage) treated by (Sewage Treatment Plant) **(many: 1)**

(Sewage Treatment Plant) maintained by (Municipality) **(many: 1)**

(Water Treatment facility) handled by (Municipality) **(many: 1)**

(Customer) reports (Complaints) **(many: many)**

EER DIAGRAM

URL:https://viewer.diagrams.net/?highlight=0000ff&edit=_blank&layers=1&nav=1#G1c0V5U
B5Mk35TAMkSBOxmEtRpVsyMCC2H
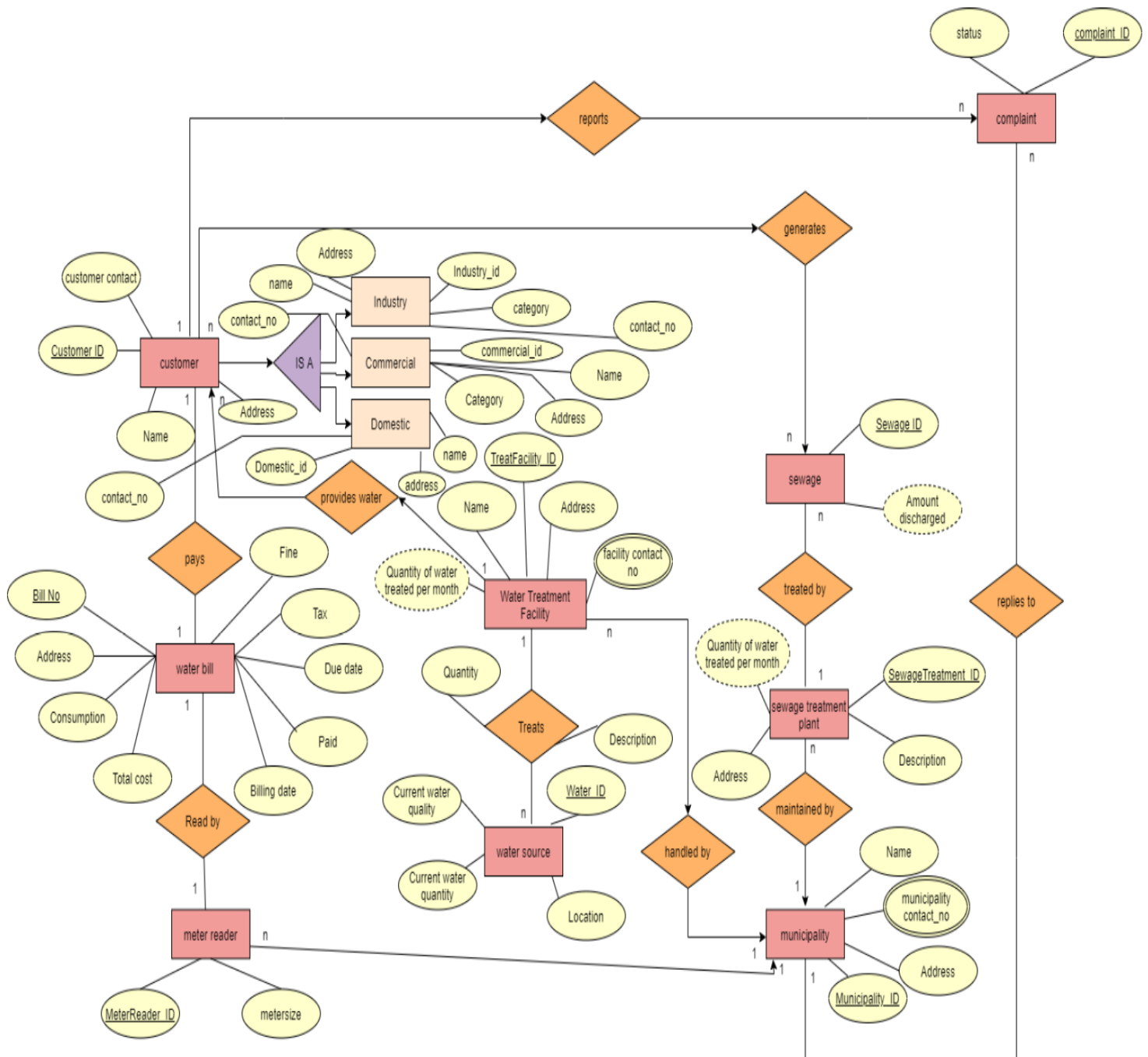
RELATIONAL SCHEMA

Primary key
Foreign key

1) Water Bill

Bill No	address	consumption	total cost	billing date	fine	status	due date	tax	**Customer_id**

2) Meter Reader

MeterReader_id	metersize	**Bill no**

3) Customer

Customer_id	**TreatmentFacility_id**

4) Industry

Industrial_id	category	name	address	Contact_no	**Customer_id**

5) Commercial

Commercial_id	category	name	address	contact_no	**Customer_id**

6) Domestic

Domestic_id	name	address	contact_no	**Customer_id**

7) Complaint

Complaint_id	status	**Customer-id**	**Municipality_id**

8) Water Treatment Facility

TreatmentFacility_id	Name	Address	**Municipality_id**

9) Water Source

WaterSource_id	location	currentwaterQuantity	currentwaterQuality	**TreatmentFacility_id**

10) Municipality

Municipality_id	Name	Address

11) Sewage Treatment Plant

SewageTreatment_id	name	Description	Address	**Municipality_id**

12) Sewage

Sewage_id	**SewageTreatment_id**

13) Generates

Generates_id	**Customer_id**	**Sewage_id**

14) Facility contact no

fac_contact_id	**TreatmentFacility_id**	Facility contact no

15) Municipality contact no

mun_Contact_id	**Municipality_id**	Municipality contact no

16) Treats

treat_id	**TreatmentFacility_id**	**WaterSource_id**	quantity	description

17) Reports

reportid	**Customer_id**	**municipality_id**	description	status

TYPES OF KEYS

1. Water bill

primary key	foreign key	candidate key	alternate key
Bill_no	Customer_id	1)billno, customer_id 2)customer_id 3)bill_no 4)billno, address	1) billno, customer_id 2)customer_id 3)billno, address

2. Meter Reader

primary key	foreign key	candidate key	alternate key
MeterReader_id	Bill_no	1)billno, metereader_id 2)billno 3)meterreader_id	1)billno, metereader_id 2)billno

3. Customer

primary key	foreign key	candidate key	alternate key
Customer_id	TreatmentFacility_id	1)customer_id 2)TreatmentFacility_id 3) customer_id, TreatmentFacility_id	customer_id,Treatment Facility_id

4. Industry

primary key	foreign key	candidate key	alternate key
industrial_id	Customer_id	1)industrial_id 2)Customer_id 3) Customer_id, industrial_id 4) industrial_id, name 5) industrial_id,contactno	1) Customer_id, industrial_id 2) industrial_id 3) industrial_id, name 4) industrial_id,contactno

5. Commercial

primary key	foreign key	candidate key	alternate key
Commercial_id	Customer_id	1)Customer_id 2) Commercial_id 3) Customer_id, Commercial_id 4) Commercial_id, name 5) Commercial_id, contactno	1) Customer_id, Commercial_id 2) Commercial_id, name 3) Commercial_id, contactno 4) Customer_id

6. Domestic

primary key	foreign key	candidate key	alternate key
Domestic_id	Customer_id	1)Customer_id 2)domestic_id 3) Customer_id, domestic_id	1) Customer_id,domestic_id 2) Customer_id

		4) domestic_id, name 5) domestic _id, contactno	3) domestic_id, name 4) domestic _id, contactno

7. Municipality

primary key	foreign key	candidate key	alternate key
Municipality_id	-	1)Municipality_id, name 2)Municipality_id, address 3)name, address 4)Municipality_id	1)Municipality_id, name 2)Municipality_id, address 3)name, address

8. Complaint

primary key	foreign key	candidate key	alternate key
Complaint_id	Municipality_id Customer-id	1)Complaint_id 2)Municipality_id 3)Customer-id 4)Complaint_id, Municipality_id 5)Complaint_id, Customer-id	1)Municipality_id 2)Customer-id 3)Complaint_id, Municipality_id 4)Complaint_id, Customer-id

9. Water treatment facility

primary key	foreign key	candidate key	alternate key
TreatmentFacility_id	Municipality_id	1)TreatmentFacility_id, name 2)TreatmentFacility_id 3)TreatmentFacility_id, address 4)TreatmentFacility_id, Municipality_id	1)TreatmentFacility_id, name 2)TreatmentFacility_id, address 3)TreatmentFacility_id, Municipality_id

10. Water Source

primary key	foreign key	candidate key	alternate key
WaterSource_id	TreatmentFacility_id	1)WaterSource_id, TreatmentFacility_id 2)WaterSource_id 3)WaterSource_id, location	1)WaterSource_id, TreatmentFacility_id 2)WaterSource_id, location

11. Sewage Treatment Plant

primary key	foreign key	candidate key	alternate key
SewageTreatment_id	Municipality_id	1)SewageTreatment_id 2)SewageTreatment_id,Municipality_id 3)SewageTreatment_id,address 4)SewageTreatment_id	1)SewageTreatment_id 2)SewageTreatment_id, Municipality_id 3)SewageTreatment_id,address

12. Sewage

primary key	foreign key	candidate key	alternate key
Sewage_id	SewageTreatment_id	1)Sewage_id 2)Sewage_id,SewageTreatment_id	Sewage_id,SewageTreatment_id

13. Generates

primary key	foreign key	candidate key	alternate key
Generates_id	Customer_id, Sewage_id	1)Generates_id 2)Generates_id, Sewage_id	Generates_id, Sewage_id

14. Facility contact no

primary key	foreign key	candidate key	alternate key
Fac_contact_id	TreatmentFacility_id	1) Fac_contact_id, TreatmentFacility_id 2) TreatmentFacility_id 3) Fac_contact_id	1) Fac_contact_id, TreatmentFacility_id 2) TreatmentFacility_id

15. Municipality contact no

primary key	foreign key	candidate key	alternate key
Mun_Contact_id	Municipality_id	1) Mun_Contact_id 2) Municipality_id 3) Mun_Contact_id, Municipality_id	1) Municipality_id 2) Mun_Contact_id, Municipality_id

16. Treats

primary key	foreign key	candidate key	alternate key
Treat_id	TreatmentFacility_id, WaterSource_id	1)Treat_id 2) Treat_id,quantity 3) Treat_id, WaterSource_id 4) Treat_id, TreatmentFacility_id	1)Treat_id,quantity 2) Treat_id, WaterSource_id 3) Treat_id, TreatmentFacility_id

17. Reports

primary key	foreign key	candidate key	alternate key
Report_id	Customer_id, municipality_id	1) Report_id, Customer_id 2) Report_id, municipality_id 3) Report_id 4) municipality_id 5) Customer_id	1) Report_id, Customer_id 2) Report_id, municipality_id 3) municipality_id 4) Customer_id

CODD'S RULE

Rule 1 − Rule of Information

The data stored in a database, may it be user data or metadata, must be a value of some table cell. Everything in a database must be stored in a table format. It says that relational databases should store the data in the form of relations.

All information is to be represented as stored data in cells of the table. So, in our project all the information is stored in the form of a table like customer, water bill etc. For example,

Customer table

Customer_ID	Name	Billing Amount
001	Chhavi	542
002	Arunda	465
003	Madhuri	789

Rule 2 − Rule of Guaranteed Access

Every single data element (value) is guaranteed to be accessible logically with a combination of table-name, primary-key (row value), and attribute-name (column value). No other means, such as pointers, can be used to access data.

From the above table, we can access customer details by using a primary key like customer ID to access the water bill.

Rule 3 - Systematic Treatment of NULL Values

The NULL values in a database must be given a systematic and uniform treatment. This is a very important rule because a NULL can be interpreted as one the following − data is missing, data is not known, or data is not applicable.

In the water supply database, the customers who have made their payment will pay no fine. Hence the table will store NULL for such columns. SQL treats NULL values differently, in calculation they are sometimes ignored which does not really affect the result. Any arithmetic operation performed on NULL will result in NULL.

Due to the constraints such as not null and primary key columns cannot be left blank which helps to avoid inconsistency in the database. Below is an example,

Create table Water_Bill (int bill_no primary key, address varchar (50) not null, int total_cost not null,billing_date date, int fine, status varchar(10) not null, due_date date, int customer_id, foreign key(customer_id) references customer(customer_id));

Rule 4 - Active Online Catalog

The structure description of the entire database must be stored in an online catalog, known as a data dictionary, which can be accessed by authorized users.

Our entire database is created and manipulated using MySQL language. Users can use the same query language (SQL) to access the catalog which they use to access the database itself.

For example: SELECT * FROM CUSTOMER; CUSTOMER is the table which has the table definitions that the user owns and has access. It is queried using the same SQL query that we use in the database.

Rule 5 - Comprehensive Data Sublanguage Rule

Database can only be accessed through a language that supports data definition, data manipulation, and transaction management operations.

SQL follows data manipulation, data definition, data control, and transaction control languages. We are using SQL language for creating the database through which all insertion, deletion and updation can be done by the administrator. SQL is a structured query language which support creating tables / views/ constraints/indexes, accessing the records of tables/views (SELECT), manipulating the records by insert/delete/update, provides security by giving different level of access rights (GRANT and REVOKE) and integrity and consistency by using constraints.

AQL language cannot be used to manipulate our database and it is considered as violation.

Rule 6 - View Updating Rule

Views should reflect the updates of their respective base tables and vice versa. A view is a logical table which shows restricted data. Views generally make the data readable but not modifiable. Views help in data abstraction.

We can join tables to retrieve information from the database but that will not affect the actual table. For e.g., we can join customer table and water treatment plant table to get information about the water quality.

select c.name, t.quality from customer c, water_treatment_plant t where t.customer_id = c.customer_id

Rule 7- High-Level Insert, Update, and Delete Rule

A database must support high-level insertion, updation, and deletion. This must not be limited to a single row, that is, it must also support union, intersection and minus operations to yield sets of data records.

SQL supports Union and Intersection of two tables. For example, joining the tables MUNICIPALITY, WATER TREATMENT FACILITY we can get the details of every customer. We can update the entire table by just a single query. For e.g. **update water_bill set tax=15;** this statement will update tax for each customer.

Rule 8: Physical Data Independence

The data stored in a database must be independent of the applications that access the database. Any change in the physical structure of a database must not have any impact on how the data is being accessed by external applications.

For e.g. If the file name for the table of our database is changed in the memory. The user will be able to access the data as he was accessing before it will not affect the table or the user viewing the table. Hence, it satisfies this rule.

Rule 9: Logical Data Independence

The logical data in a database must be independent of its user's view (application). Any change in logical data must not affect the applications using it.

For example, if two tables are merged or one is split into two different tables, there should be no impact or change on the user application. In our database if the WATER SOURCE table is further divided into river and groundwater tables, we can still join the tables to execute the queries that will not affect the user application.

Rule 10: Integrity Independence

A database must be independent of the application that uses it. All its integrity constraints can be independently modified without the need of any change in the application. This rule makes a database independent of the front-end application and its interface.

We will be using MySQL for the backend where all the data is retrieved from the system.
It is independent of Front-end applications. SQL supports integrity constraints as it does not allow duplicate primary key and by specifying the domain constraints we can make sure that only valid data is entered in the record for e.g., we cannot enter text in the phone number nor can we define a foreign key which is not present as a primary key in another table.

Rule 11: Distribution Independence

The end-user must not be able to see that the data is distributed over various locations. Users should always get the impression that the data is located at one site only. This rule has been regarded as the foundation of distributed database systems.

Our database is located on a SQL server handled by different members but this will not affect the actual user experience. The user will be able to use the application efficiently irrespective of the location of the database servers.

Rule 12: Non-Subversion Rule

If a system has an interface that provides access to low-level records, then the interface must not be able to subvert the system and bypass security and integrity constraints.

For e.g., if we update a customer's phone number it will perform update only for that customer and only for his phone number, other details will not get corrupted due to this change and the entire database will remain intact.

Anomalies

Insertion Anomaly- There are no insertion anomalies in the relation schema.

Deletion Anomaly- There are no deletion anomalies in the relation schema.

Updation Anomaly-There is no updation anomalies in the relation schema.

Functional Dependency

1) Water Bill

2) Meter Reader

FULL DEPENDENCY

_MeterReader_id_	metersize	**Bill no**

metersize

MeterReader_id

Bill no

3) Customer

FULL DEPENDENCY

Customer_id	**TreatmentFacility_id**

Customer_id

TreatmentFacility_id

4) Industrial

FULL DEPENDENCY

Industrial_id	category	name	address	Contact_no	Customer_id

5) Domestic

FULL DEPENDENCY

Domestic_id	name	address	contact_no	Customer_id
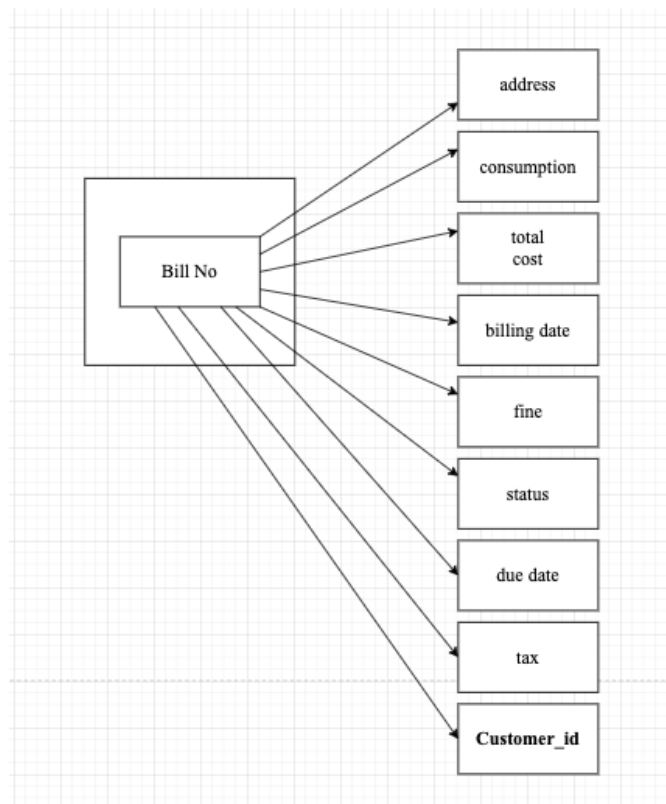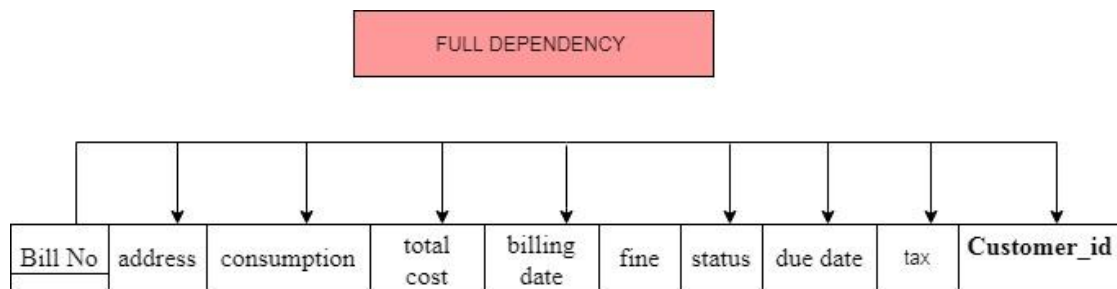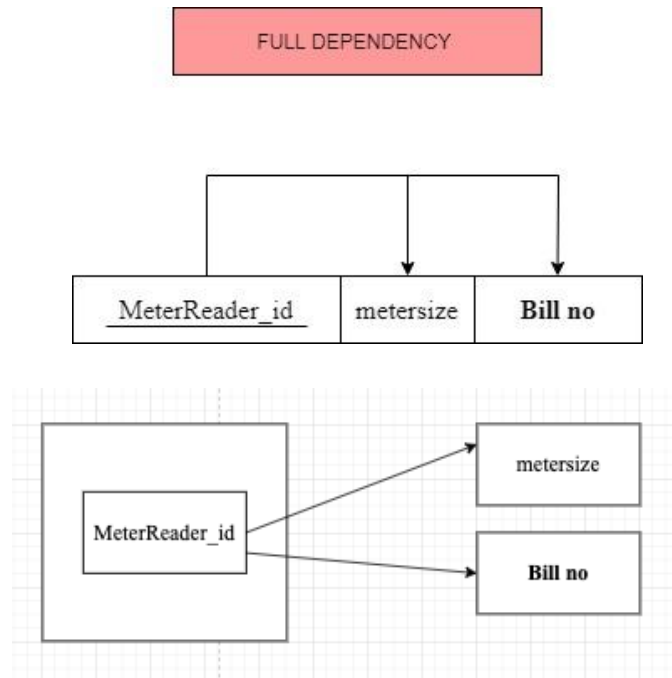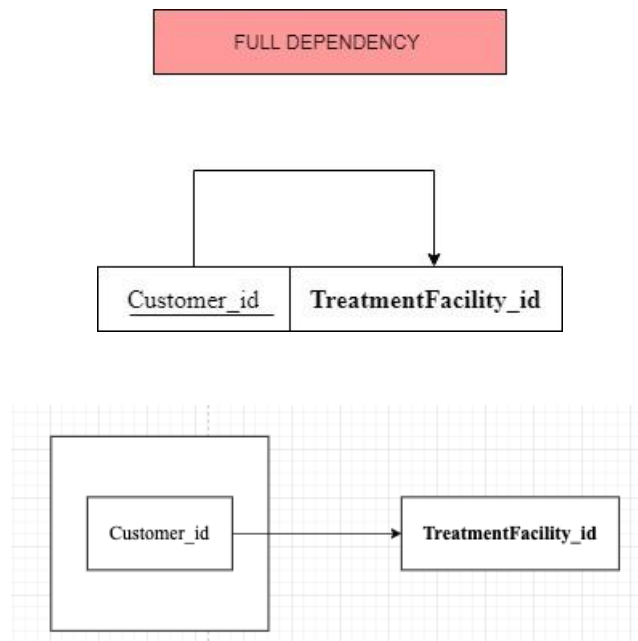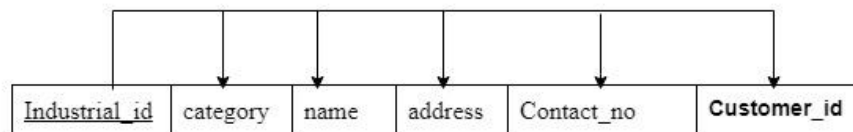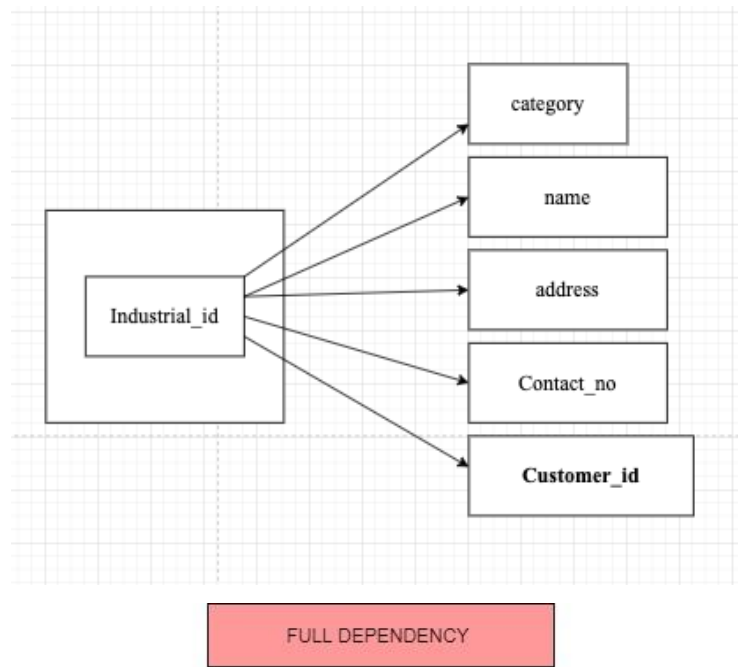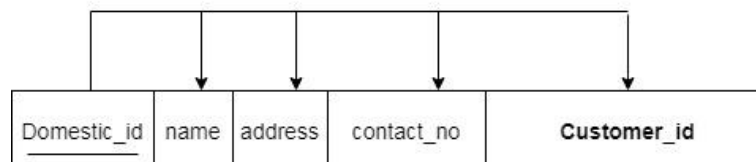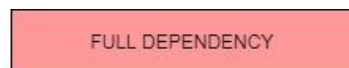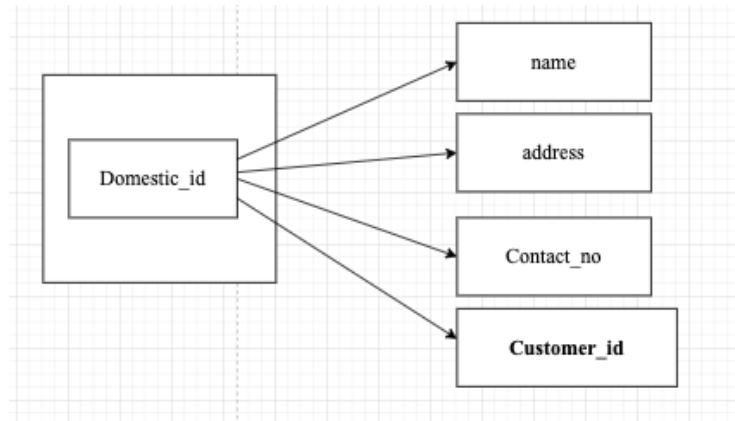
6) Commercial

FULL DEPENDENCY

Commercial_id	category	name	address	contact_no	Customer_id
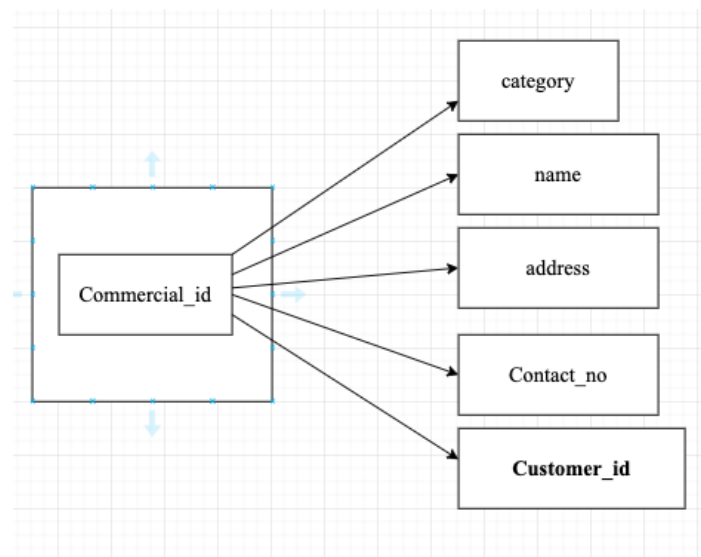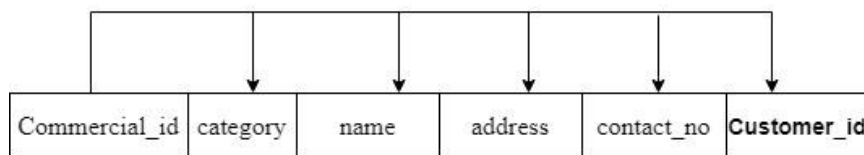
7) Complaint

FULL DEPENDENCY

Complaint_id	status	Customer-id	Municipality_id
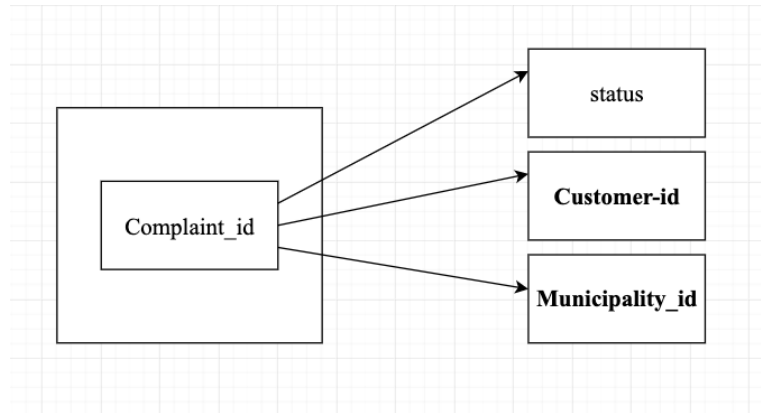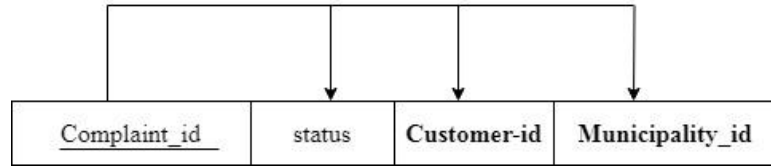
8) Water Treatment Facility

FULL DEPENDENCY

TreatmentFacility_id	Name	Address	Municipality_id
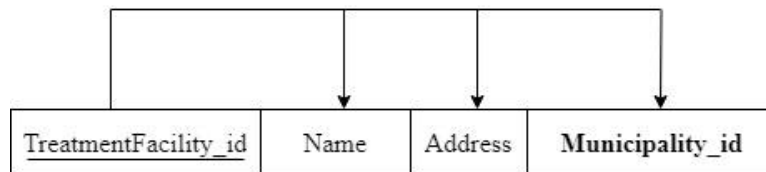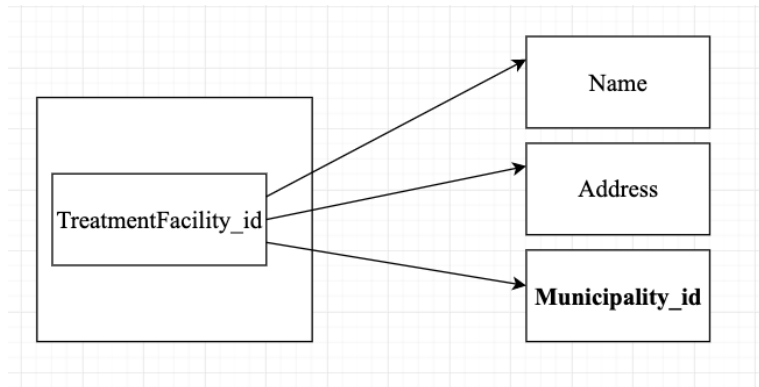
9) Water Source
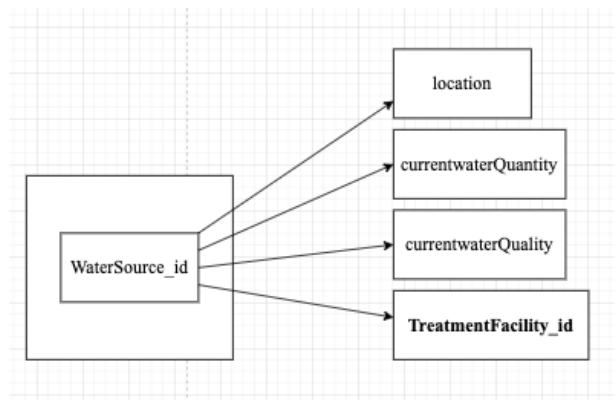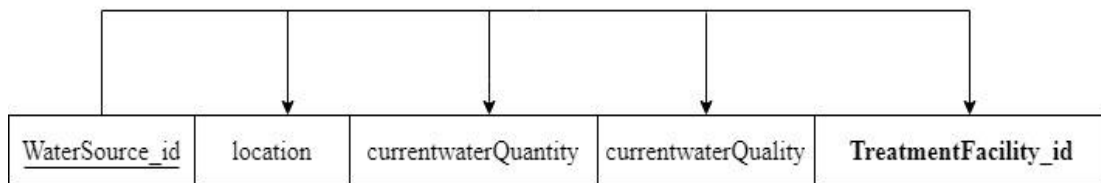
10) Municipality

FULL DEPENDENCY

Municipality_id	Name	Address
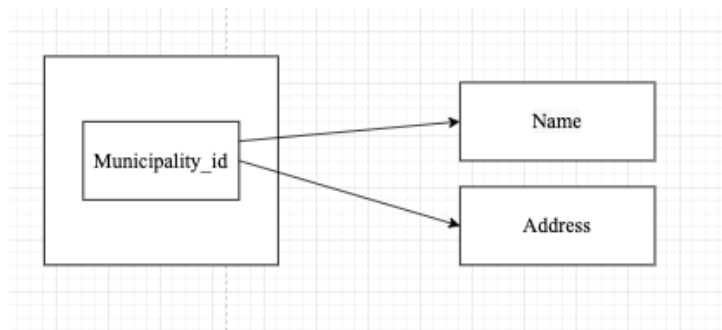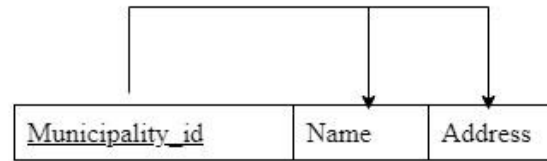
11) Sewage Treatment Plant

FULL DEPENDENCY

SewageTreatment	name	Description	Address	**Municipality_id**
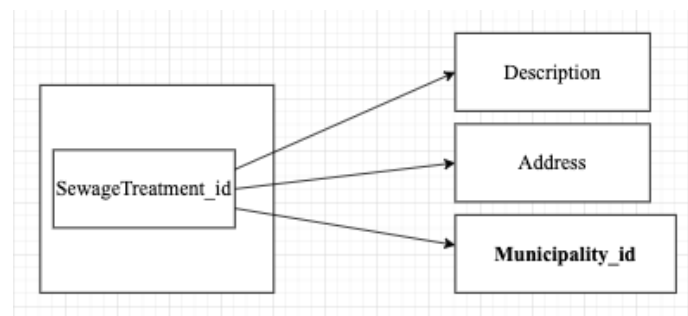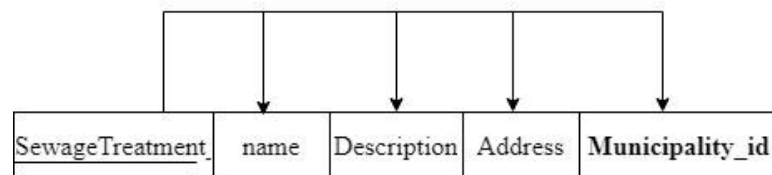
12) Sewage
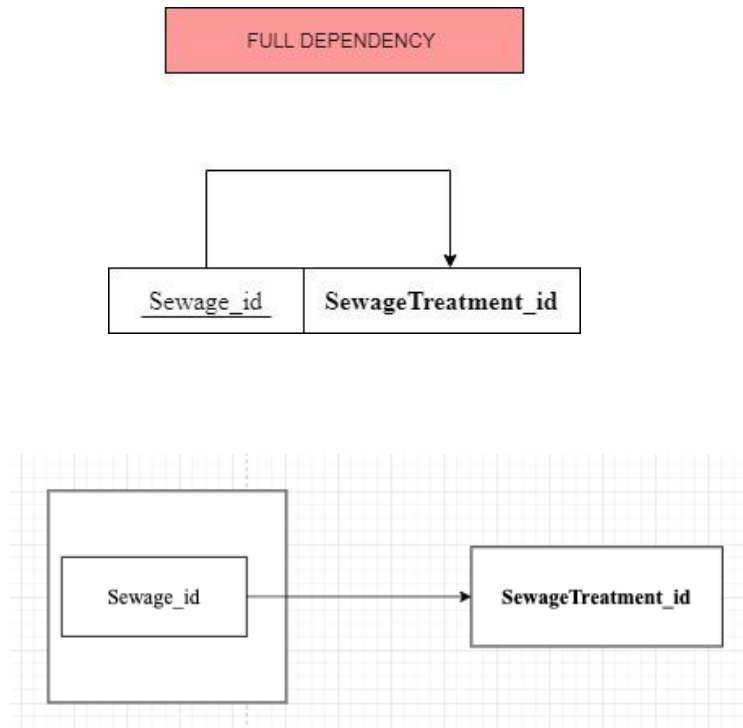
13) Generates

14) Facility Contact no.
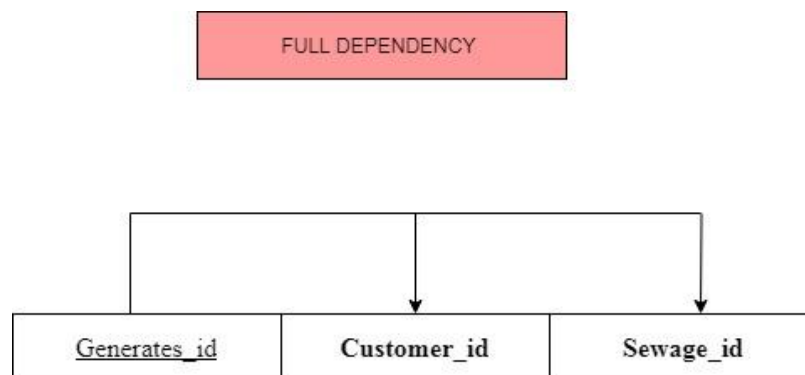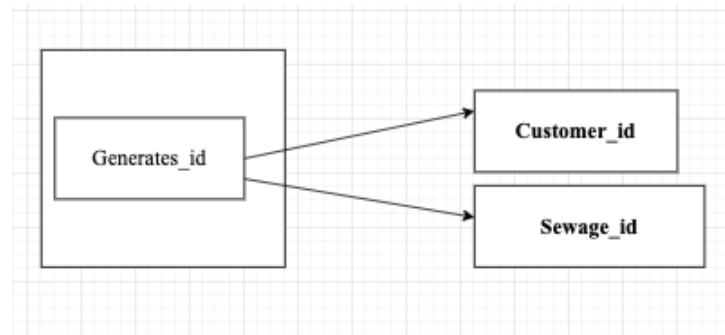
15) Municipality Contact no

FULL DEPENDENCY

mun_Contact_id	**Municipality_id**	Municipality contact no

mun_Contact_id → Municipality contact no

mun_Contact_id → **Municipality_id**
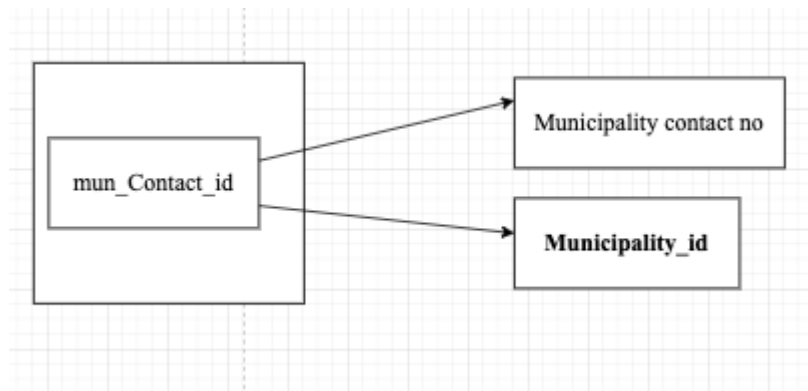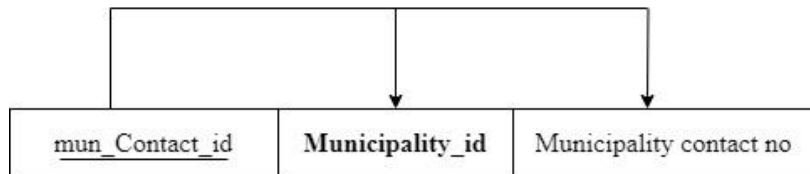
16) Treats

FULL DEPENDENCY

treat_id	**TreatmentFacility_id**	**WaterSource_id**	quantity	description
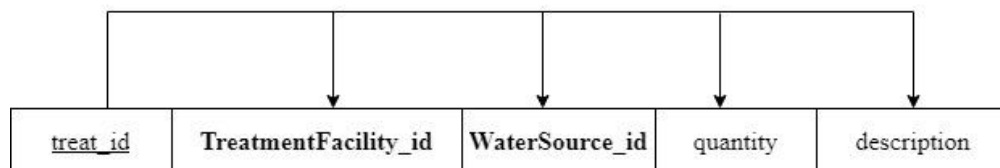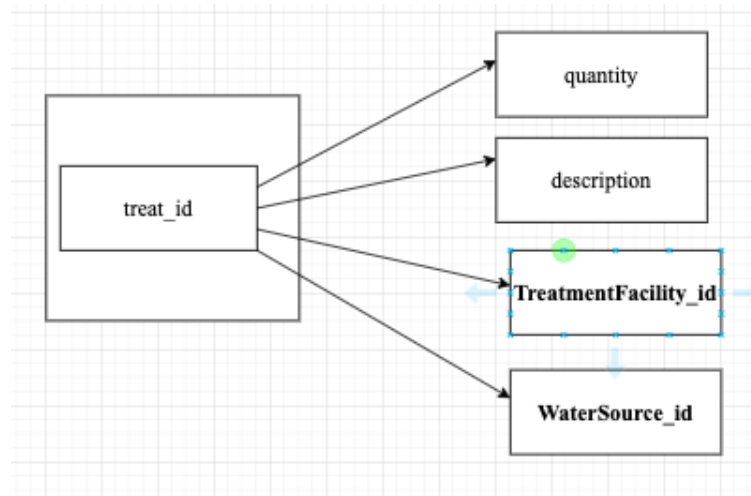
17) Reports

FULL DEPENDENCY

reportid	Customer_id	municipality_id	description	status
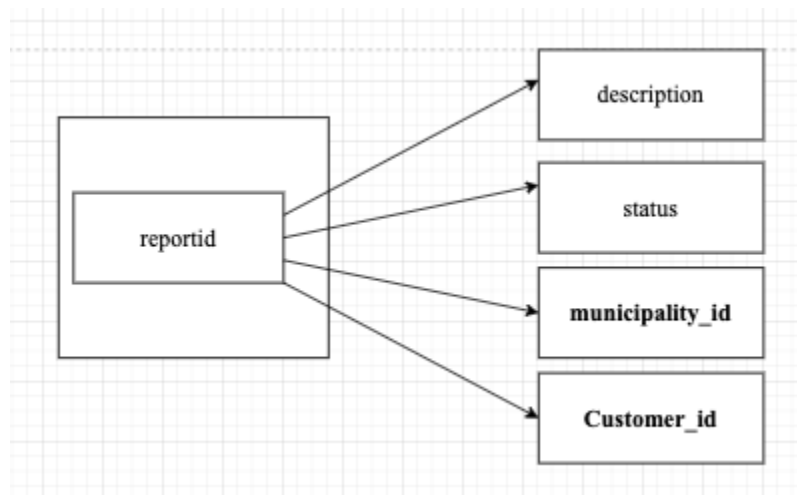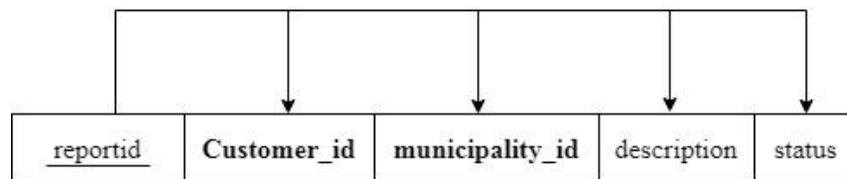
Normalization

Since there are no partial and transitive dependencies the tables are in 3NF format and the database is normalized.

DATA TABLES:

List of all tables

```
mysql> use water_supply_management;
Database changed
mysql> show tables;
+-------------------------------------+
| Tables_in_water_supply_management   |
+-------------------------------------+
| commercial                          |
| complaint                           |
| customer                            |
| domestic                            |
| facilitycontact_no                  |
| generates                           |
| industry                            |
| meterreader                         |
| municipality                        |
| municipalitycontact_no              |
| reports                             |
| sewage                              |
| sewagetreatmentplant                |
| treats                              |
| waterbill                           |
| watersource                         |
| watertreatmentfacility              |
+-------------------------------------+
17 rows in set (0.54 sec)
```

1) Commercial:

```
mysql> Select *from commercial;
+--------------+------------+---------------------+------------------------------+-------------------+-------------+
| commercialid | category   | name                | address                      | Customercontact_no | Customer_id |
+--------------+------------+---------------------+------------------------------+-------------------+-------------+
|            1 | Mall       | Pavilion mall       | SB road                      |          23089077 |           2 |
|            2 | hotel      | JW Marriott         | SB road                      |        9187678901 |           4 |
|            3 | Restaurant | Vaishali restaurant | Fergusson College Rd Rage Path |      9998791283 |          10 |
|            4 | Mall       | Phoenix Marketcity  | Viman Nagar Road Phoenix Road |       9876790554 |          12 |
+--------------+------------+---------------------+------------------------------+-------------------+-------------+
4 rows in set (0.10 sec)
```

2)Complaint

```
mysql> select *from COmplaint;
+--------------+----------+-------------+----------------+
| Complaint_id | status   | Customer_id | Municipality_id |
+--------------+----------+-------------+----------------+
|            1 | Attended |           1 |              1 |
|            2 | Pending  |           4 |              1 |
|            3 | Pending  |           7 |              1 |
|            4 | Attended |          11 |              1 |
|            5 | Attended |           2 |              1 |
|            6 | Pending  |           4 |              1 |
+--------------+----------+-------------+----------------+
6 rows in set (0.00 sec)
```

3)Customer

```
mysql> select *from Customer;
+-------------+---------------------+
| Customer_id | TreatmentFacility_id |
+-------------+---------------------+
|           1 |                   1 |
|          13 |                   1 |
|          15 |                   1 |
|           2 |                   2 |
|           3 |                   2 |
|          16 |                   2 |
|           9 |                   3 |
|          10 |                   3 |
|          11 |                   3 |
|          17 |                   3 |
|          20 |                   3 |
|           8 |                   4 |
|          21 |                   4 |
|          22 |                   4 |
|           4 |                   5 |
|           5 |                   5 |
|          18 |                   5 |
|          14 |                   6 |
|           6 |                   7 |
|           7 |                   7 |
|          12 |                   7 |
|          19 |                   7 |
+-------------+---------------------+
22 rows in set (0.12 sec)
```

4)Domestic

```
mysql> select *from Domestic;
+------------+--------------------+---------------------------------+-------------------+-------------+
| Domesticid | name               | address                         | Customercontact_no | Customer_id |
+------------+--------------------+---------------------------------+-------------------+-------------+
|          1 | Vikram Chauhan     | Akshay society,Koregaon park    |         9187689091 |           5 |
|          2 | Pratyusha Seth     | Gerapark society ,Sangamvadi    |         8878907867 |           7 |
|          3 | Prakrit Taneja     | Rahul society,Lumini park       |         7890564310 |           9 |
|          4 | Vansh Malhotra     | Shivaji Society,Sb road         |         7765473912 |          11 |
|          5 | Viditi Deshmukh    | Shivaji Society,Sb road         |         7765473913 |          13 |
|          6 | Sandhya Mehra      | Mitrangan Society,Baner         |         9853723810 |          14 |
|          7 | Kalpana Agnihotri  | Krishnakamal Society, Sus road  |         9898397927 |          15 |
|          8 | Vaikunth Chatterjee| Elite society,Koregaon park     |         8726335363 |          16 |
|          9 | Faiz Sheikh        | Anjor Housing Society, Baner    |         7352437321 |          17 |
|         10 | Ali Fazal          |  Mitrangan Society,Baner        |         7729946780 |          18 |
|         11 | Vidyut Banerjee    | Shivaji Society,Sb road         |         8836723099 |          19 |
|         12 | Shehzad Khan       | Gera park society,Sangamvadi    |         9173738410 |          20 |
|         13 | Devika Gupta       | Gera park society,Sangamvadi    |         9182736412 |          21 |
|         14 | Vanshika Mukherjee | Mahesh Paradise,Aundh           |         7726351730 |          22 |
+------------+--------------------+---------------------------------+-------------------+-------------+
14 rows in set (0.00 sec)
```

5)Facility Contact Number

```
mysql> select *from facilitycontact_no;
+---------------+---------------------+-------------------+
| fac_contact_id | TreatmentFacility_id | Facilitycontact_no |
+---------------+---------------------+-------------------+
|             1 |                   1 |           2307891 |
|             2 |                   2 |           2678990 |
|             3 |                   3 |           2234560 |
|             4 |                   4 |           2678904 |
```

6)Generates

```
mysql> select *from generates;
+--------------+-------------+-----------+
| Generates_id | Customer_id | Sewage_id |
+--------------+-------------+-----------+
|            1 |           1 |         1 |
|            2 |           4 |         2 |
|            3 |           8 |         2 |
|            4 |          13 |         4 |
|            5 |          15 |         6 |
|            6 |          22 |         6 |
|            7 |          21 |         7 |
|            8 |          20 |         4 |
|            9 |          12 |         3 |
|           10 |          11 |         3 |
|           11 |           6 |         5 |
+--------------+-------------+-----------+
11 rows in set (0.13 sec)
```

7)Industry

```
mysql> select *from industry;
+-------------+-----------+-------------------------+--------------------------------------------------+------------------+-------------+
| industrialid | category | name                    | address                                          | Customer_contactno | Customer_id |
+-------------+-----------+-------------------------+--------------------------------------------------+------------------+-------------+
|           1 | Chemicals | Canpex Chemicals Pvt. Ltd. | 123 Nana Peth Rd near Ashok Chowk             |       9874568291 |           1 |
|           2 | Soap      | Yashshilp Soap Works    | Survey No: 50 Waghjainagar Ambegaon (khurd) Katraj |     8698911221 |           3 |
|           3 | Soap      | Laxmi Soap Factory      | Sirur Koregaon Park                              |         66690789 |           6 |
|           4 | Chemicals | Lupin                   | 46/47 A Village Nande Taluka Mulshi              |       2066749100 |           8 |
+-------------+-----------+-------------------------+--------------------------------------------------+------------------+-------------+
4 rows in set (0.12 sec)
```

8)Meter Reader

```
mysql> select *from meterreader;
+----------------+-----------+---------+
| MeterReader_id | metersize | Bill_no |
+----------------+-----------+---------+
|              1 |         2 |       2 |
|              2 |         3 |       5 |
|              3 |         3 |       6 |
|              4 |         4 |       8 |
|              5 |         6 |      12 |
|              6 |         6 |      11 |
|              7 |         2 |      10 |
|              8 |         8 |      13 |
|              9 |         4 |       4 |
|             10 |         6 |       3 |
|             11 |         4 |       9 |
|             12 |         4 |       7 |
+----------------+-----------+---------+
12 rows in set (0.00 sec)
```

9)Municipality

```
mysql> select *from municipality;
+-----------------+---------------------------+------------------------+
| Municipality_id | Name                      | Address                |
+-----------------+---------------------------+------------------------+
|               1 | Pune Municipal Corporation | PMC Congress house Rd |
+-----------------+---------------------------+------------------------+
1 row in set (0.00 sec)
```

10)Municipality Contact Number

```
mysql> select *from municipalitycontact_no;
+----------------+-----------------+----------------------+
| mun_Contact_id | Municipality_id | Municipalitycontact_no |
+----------------+-----------------+----------------------+
|              1 |               1 |             25501106 |
|              2 |               1 |           9923569398 |
|              3 |               1 |           2025501000 |
+----------------+-----------------+----------------------+
3 rows in set (0.06 sec)
```

11)Reports

```
mysql> select *from reports;
+----------+-------------+-----------------+------------------------------------------------+----------+
| reportid | Customer_id | municipality_id | description                                    | status   |
+----------+-------------+-----------------+------------------------------------------------+----------+
|        1 |           1 |               1 | Bill paid but connection got disconnected      | Attended |
|        2 |           4 |               1 | Discrepancies in bill                          | Pending  |
|        3 |           7 |               1 | How can I request for name change              | Pending  |
|        4 |          11 |               1 | Bill status not updated                        | Attended |
|        5 |           2 |               1 | Officers behaving unprofessionally             | Pending  |
|        6 |           3 |               1 | I paid bill on time but still shows fine of Rs.100 | Attended |
|        7 |           4 |               1 | Water quality is bad                           | Pending  |
+----------+-------------+-----------------+------------------------------------------------+----------+
7 rows in set (0.02 sec)
```

12)Sewage

```
mysql> select *from sewage;
+----------+-------------------+
| Sewage_id | SewageTreatment_id |
+----------+-------------------+
|        3 |                 1 |
|        1 |                 2 |
|        2 |                 3 |
|        7 |                 4 |
|        4 |                 5 |
|        5 |                 6 |
|        6 |                 6 |
+----------+-------------------+
```

13)Sewage Treatment Plant

```
mysql> select *from sewagetreatmentplant;
+------------------+--------------------------------+-------------------+----------------------------------------------+----------------+
| SewageTreatment_id | name                         | Description       | Address                                      | Municipality_id |
+------------------+--------------------------------+-------------------+----------------------------------------------+----------------+
|                1 | SG watertech Domestic          | industrial        | SG watertech,shivajinagar                    |              1 |
|                2 | PMC Sewage Treatment Plant     | Domestic          | Narveer Tanaji Malusare Rd,Vithalwadi,Hingne Khurd |        1 |
|                3 | Bhairoba Sewage Treatment Plant | Industrial       | N Main Rd,Kavadewadi,Koregaon Park           |              1 |
|                4 | Era Hydro Biotech Energy Pvt. Ltd | Industrial     | Rowhouse 1,Sapling park lane,Baner           |              1 |
|                5 | WasteWater Treatment Plant     | Domestic,Industrial | apodhan Society,Tulshi Colony,Parvati Paytha |            1 |
|                6 | Ideal Systems & Services       | Domestic          | Lohiya Nagar,Laxmi Vihar,Hadapsar            |              1 |
+------------------+--------------------------------+-------------------+----------------------------------------------+----------------+
6 rows in set (0.11 sec)
```

14)Treats

```
mysql> select *from treats;
+----------+--------------------+---------------+----------+------------------------------------------------+
| treat_id | TreatmentFacility_id | WaterSource_id | quantity | description                                    |
+----------+--------------------+---------------+----------+------------------------------------------------+
|        1 |                  1 |             1 |     8000 | Coagulation, Flocculation and Sedimentation    |
|        2 |                  3 |             4 |     7000 | Includes filtration and disinfection           |
|        3 |                  5 |             3 |    10000 | Coagulation, Flocculation and Sedimentation    |
|        4 |                  6 |             2 |     9500 | Includes filtration and disinfection           |
|        5 |                  7 |             2 |     8500 | Coagulation,Flocculation and Sedimentation     |
|        6 |                  4 |             3 |     7500 | Includes filtration and disinfection           |
|        7 |                  4 |             4 |    10000 | Coagulation,Flocculation and Sedimentation     |
|        8 |                  3 |             1 |    15000 | Coagulation,Flocculation and Sedimentation     |
|        9 |                  3 |             2 |    15000 | Coagulation,Flocculation and Sedimentation     |
+----------+--------------------+---------------+----------+------------------------------------------------+
9 rows in set (0.00 sec)
```

15)Water Bill

```
mysql> select *from WaterBill;
+--------+----------------------------------------------------+-------------+-------+------------+------+--------+------------+-----+-------------+
| Bill_No | address                                            | consumption | total | billing_date | fine | status | due_date   | tax | Customer_id |
+--------+----------------------------------------------------+-------------+-------+------------+------+--------+------------+-----+-------------+
|      1 | New akshay society,Koregaon park                   |        2000 |  3000 | 2019-12-15 |    0 | Paid   | 2019-12-30 |   5 |           5 |
|      2 | Mitrangan Society,Baner                            |        2500 |  4500 | 2020-03-12 |  700 | Unpaid | 2020-03-22 |   5 |          14 |
|      3 | Krishnakamal Society, Sus road                     |        1000 |  2000 | 2020-04-14 |  200 | Paid   | 2020-04-28 |   5 |          15 |
|      4 | Kumar elite society,Koregaon park                  |        3000 |  5000 | 2020-07-16 |  120 | Paid   | 2020-07-30 |   5 |          16 |
|      5 | Anjor Co Op Housing Society,Baner                  |        3300 |  5800 | 2020-08-18 |   50 | Paid   | 2020-08-30 |   5 |          17 |
|      6 | Pavillion mall,sb road                             |        5000 |  8000 | 2020-11-30 |    0 | Paid   | 2020-12-10 |   5 |           2 |
|      7 | Mahesh Paradise,Aundh                              |        1500 |  2000 | 2020-12-01 |   55 | Unpaid | 2020-12-15 |   5 |          13 |
|      8 | Gera park housing society,Sangamvadi               |        1000 |  1500 | 2020-01-01 |   60 | Unpaid | 2020-01-15 |   5 |           7 |
|      9 | Chhatrapati Shivaji Housing Society,Sb road        |        4000 |  5500 | 2020-03-05 |    0 | Unpaid | 2020-03-20 |   5 |          11 |
|     10 | Rahul cooperative housing society,Koregaon park    |        3400 |  4800 | 2020-06-23 |    0 | Paid   | 2020-07-08 |   5 |           9 |
|     11 | JW Marriott Hotel,sb road                          |        6000 | 10000 | 2020-06-25 |    0 | Paid   | 2020-07-09 |   6 |           4 |
|     12 | Yash Soap Works-Detergent,Soap Manufacturer, Pune  |       10000 | 10000 | 2020-10-14 |  100 | Paid   | 2020-10-26 |   6 |           3 |
|     13 | Canpex Chemicals Pvt.Ltd.                          |       12000 | 15000 | 2020-11-17 |    0 | Unpaid | 2020-11-30 |   6 |           1 |
+--------+----------------------------------------------------+-------------+-------+------------+------+--------+------------+-----+-------------+
13 rows in set (0.00 sec)
```

16)Water Source

```
mysql> select *from watersource;
+---------------+----------------+---------------------+--------------------+
| WaterSource_id | location       | currentwaterQuantity | currentwaterQuality |
+---------------+----------------+---------------------+--------------------+
|             1 | KHADAKWASLA DAM |               10000 | Good               |
|             2 | PANSHET DAM    |                8000 | Very good          |
|             3 | WARASGAON DAM  |                8500 | Good               |
|             4 | TEMGHAR DAM    |                9000 | Average            |
+---------------+----------------+---------------------+--------------------+
4 rows in set (0.00 sec)
```

17)Water Treatment Facility

```
mysql> select *from WaterTreatmentFacility;
+--------------------+-------------------------------+-----------------------------+----------------+
| TreatmentFacility_id | Name                        | Address                     | Municipality_id |
+--------------------+-------------------------------+-----------------------------+----------------+
|                  1 | Parvati Water Treatment Plant | Deshpande chowk sinhagad road |              1 |
|                  2 | Warje Water treatment plant   | Hingane home colony,warje   |              1 |
|                  3 | Bopodi Water treatment plant  | Aundh gaon,bopodi           |              1 |
|                  4 | Tukai Nagar Water treatment plant | Ganesh colony           |              1 |
|                  5 | Jog enterprises               | Kamthe estate,shivane       |              1 |
|                  6 | Wagholi Water treatment plant | Wagheshwar nagar,wagholi    |              1 |
|                  7 | Water treatment plant Sangamvadi | Sangamvadi               |              1 |
+--------------------+-------------------------------+-----------------------------+----------------+
7 rows in set (0.00 sec)
```

Queries:

1)Which water source is located in TemGhar Dam

```
mysql> select WaterSource_id from WaterSource where location='TemGhar Dam';
+----------------+
| WaterSource_id |
+----------------+
|              4 |
+----------------+
1 row in set (0.04 sec)
```

2)Find the water bill which is unpaid.

```
mysql> select Bill_No from WaterBill where status='Unpaid';
+---------+
| Bill_No |
+---------+
|       2 |
|       7 |
|       8 |
|       9 |
|      13 |
+---------+
5 rows in set (0.00 sec)
```

3)Find the treatment plant which treats industrial sewage.

```
mysql> select Name from SewageTreatmentPlant where description='Industrial';
+----------------------------------+
| Name                             |
+----------------------------------+
| SG watertech Domestic            |
| Bhairoba Sewage Treatment Plant  |
| Era Hydro Biotech Energy Pvt. Ltd|
+----------------------------------+
3 rows in set (0.03 sec)
```

4)Find all the bills whose fine is between 100 to 200?

```
mysql> select bill_no from WaterBill where fine>=100 and fine<=200;
+---------+
| bill_no |
+---------+
|       3 |
|       4 |
|      12 |
+---------+
3 rows in set (0.01 sec)
```

5)find domestic customers whose bill is greater than 5000

```
mysql> select c.name from Domestic c,WaterBill w where c.Customer_id=w.Customer_Id and total>5000;
+----------------+
| name           |
+----------------+
| Faiz Sheikh    |
| Vansh Malhotra |
+----------------+
2 rows in set (0.05 sec)
```

6) Find the customers whose consumption is greater than 1000 gallons

```
mysql> select Customer_id from WaterBill where consumption >1000;
-------------+
 Customer_id |
-------------+
           5 |
          14 |
          16 |
          17 |
           2 |
          13 |
          11 |
           9 |
           4 |
           3 |
           1 |
-------------+
1 rows in set (0.00 sec)
```

7)Find customer whose bill is greater than some of the customers

```
mysql> select d.name from Domestic d,waterbill w where w.Customer_id=d.Customer_id and w.total>some(select total from WaterBill);
---------------------+
 name                |
---------------------+
 Vikram Chauhan      |
 Sandhya Mehra       |
 Kalpana Agnihotri   |
 Vaikunth Chatterjee |
 Faiz Sheikh         |
 Viditi Deshmukh     |
 Vansh Malhotra      |
 Prakrit Taneja      |
---------------------+
 rows in set (0.00 sec)
```

8)Find out such Sewage treatment plant whose name doesn't starts with "S"

```
mysql> select name from SewageTreatmentPlant where not name like 'S%';
+----------------------------------+
| name                             |
+----------------------------------+
| PMC Sewage Treatment Plant       |
| Bhairoba Sewage Treatment Plant  |
| Era Hydro Biotech Energy Pvt. Ltd |
| WasteWater Treatment Plant       |
| Ideal Systems & Services         |
+----------------------------------+
5 rows in set (0.10 sec)
```

9)find industry which draws water from warje treatment facility

```
mysql> select i.name from industry i,Customer c,WaterTreatmentFacility w where i.Customer_id=c.Customer_id and c.TreatmentFacility_id=W.TreatmentFacility_id and w.name Like 'Warje%';
+---------------------+
| name                |
+---------------------+
| Yashshilp Soap Works |
+---------------------+
1 row in set (0.19 sec)
```

10)Change the water treatment facility name to Parvati Lotus WaterTreatment Plant of "Parvati WaterTreatment Plant" in Deshpande chowk sinhagad road

```
mysql> update WaterTreatmentFacility set name = 'Parvati Lotus WaterTreatment Plant' where address = 'Deshpande chowk sinhagad road';
Query OK, 1 row affected (0.24 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> Select *FROM WaterTreatmentFacility;
+---------------------+-----------------------------------+------------------------------+-----------------+
| TreatmentFacility_id | Name                             | Address                      | Municipality_id |
+---------------------+-----------------------------------+------------------------------+-----------------+
|                   1 | Parvati Lotus WaterTreatment Plant | Deshpande chowk sinhagad road |               1 |
|                   2 | Warje Water treatment plant       | Hingane home colony,warje     |               1 |
|                   3 | Bopodi Water treatment plant      | Aundh gaon,bopodi             |               1 |
|                   4 | Tukai Nagar Water treatment plant | Ganesh colony                |               1 |
|                   5 | Jog enterprises                   | Kamthe estate,shivane         |               1 |
|                   6 | Wagholi Water treatment plant     | Wagheshwar nagar,wagholi      |               1 |
|                   7 | Water treatment plant Sangamvadi  | Sangamvadi                   |               1 |
+---------------------+-----------------------------------+------------------------------+-----------------+
7 rows in set (0.00 sec)
```

11) find customer whose consumption is maximum

```
mysql> Select d.name,max(consumption) from customer c,domestic d,waterbill w where c.customer_id=w.customer_id and c.customer_id=d.domesticid;
+-----------------+-----------------+
| name            | max(consumption) |
+-----------------+-----------------+
| Viditi Deshmukh |           12000 |
+-----------------+-----------------+
1 row in set (0.03 sec)
```

12) Display water sources in descending order of their quantity distributed.

```
mysql> Select * from WaterSource order by currentwaterQuantity desc;
+---------------+---------------+----------------------+---------------------+
| WaterSource_id | location      | currentwaterQuantity | currentwaterQuality |
+---------------+---------------+----------------------+---------------------+
|             1 | KHADAKWASLA DAM |                10000 | Good                |
|             4 | TEMGHAR DAM     |                 9000 | Average             |
|             3 | WARASGAON DAM   |                 8500 | Good                |
|             2 | PANSHET DAM     |                 8000 | Very good           |
+---------------+---------------+----------------------+---------------------+
4 rows in set (0.04 sec)
```

13) Give treatment of water details based on water source

```
mysql> Select w.Watersource_id, count(t.Treat_id) from Treats t, WaterSource w where w.Watersource_id=t.Watersource_id group by(t.Treat_id);
+---------------+-------------------+
| Watersource_id | count(t.Treat_id) |
+---------------+-------------------+
|             1 |                 1 |
|             4 |                 1 |
|             3 |                 1 |
|             2 |                 1 |
|             2 |                 1 |
|             3 |                 1 |
|             4 |                 1 |
|             1 |                 1 |
|             2 |                 1 |
+---------------+-------------------+
9 rows in set (0.13 sec)
```

14) count number of customer in koregaon park

```
mysql> Select count(domesticid)from domestic where address like '%koregaon park';
+-------------------+
| count(domesticid) |
+-------------------+
|                 2 |
+-------------------+
1 row in set (0.00 sec)
```

15) Sewage areas from industry(using joins)

```
mysql> Select s.Sewage_id from Sewage s inner join SewageTreatmentPlant st on s.Sewagetreatment_id = st.Sewagetreatment_id where st.description = 'Industrial';
+-----------+
| Sewage_id |
+-----------+
|         3 |
|         2 |
|         7 |
+-----------+
3 rows in set (0.11 sec)
```

16)join water treatment facility and facility contact number using left outer join

```
mysql> Select * from FacilityContact_no f left outer join WaterTreatmentFacility w on f.TreatmentFacility_id = w.TreatmentFacility_id;
+---------------+---------------------+------------------+---------------------+----------------------------------+---------------------------------+----------------+
| fac_contact_id | TreatmentFacility_id | Facilitycontact_no | TreatmentFacility_id | Name                             | Address                         | Municipality_id |
+---------------+---------------------+------------------+---------------------+----------------------------------+---------------------------------+----------------+
|             1 |                   1 |          2307891 |                   1 | Parvati Lotus WaterTreatment Plant | Deshpande chowk sinhagad road |              1 |
|             2 |                   2 |          2678990 |                   2 | Warje Water treatment plant      | Hingane home colony,warje       |              1 |
|             3 |                   3 |          2234560 |                   3 | Bopodi Water treatment plant     | Aundh gaon,bopodi               |              1 |
|             4 |                   4 |          2678904 |                   4 | Tukai Nagar Water treatment plant | Ganesh colony                   |              1 |
|             5 |                   5 |          2003456 |                   5 | Jog enterprises                  | Kamthe estate,shivane           |              1 |
|             6 |                   6 |          2560897 |                   6 | Wagholi Water treatment plant    | Wagheshwar nagar,wagholi        |              1 |
|             7 |                   7 |          2334098 |                   7 | Water treatment plant Sangamvadi | Sangamvadi                      |              1 |
+---------------+---------------------+------------------+---------------------+----------------------------------+---------------------------------+----------------+
7 rows in set (1.18 sec)
```

17)join tables water bill and meter reader using right outer join

```
mysql> select * from WaterBill w right outer join MeterReader m on m.Bill_no = w.Bill_no;
+---------+-------------------------------------------------------+-------------+-------+-------------+------+--------+------------+-----+-------------+---------------+----------+---------+
| Bill_No | address                                               | consumption | total | billing_date | fine | status | due_date   | tax | Customer_id | MeterReader_id | metersize | Bill_no |
+---------+-------------------------------------------------------+-------------+-------+-------------+------+--------+------------+-----+-------------+---------------+----------+---------+
|       2 | Mitrangan Society,Baner                               |        2500 |  4500 | 2020-03-12  |  700 | Unpaid | 2020-03-22 |   6 |          14 |             1 |        2 |       2 |
|       5 | Anjor Co Op Housing Society,Baner                     |        3300 |  5800 | 2020-08-18  |   50 | Paid   | 2020-08-30 |   6 |          17 |             2 |        3 |       5 |
|       6 | Pavillion mall,sb road                                |        5000 |  8000 | 2020-11-30  |    0 | Paid   | 2020-12-10 |   6 |           2 |             3 |        3 |       6 |
|       8 | Gera park housing society,Sangamvadi                  |        1000 |  1500 | 2020-01-01  |   60 | Unpaid | 2020-01-15 |   6 |           7 |             4 |        4 |       8 |
|      12 | Yash Soap Works-Detergent,Soap Manufacturer, Pune     |       10000 | 10000 | 2020-10-14  |  100 | Paid   | 2020-10-26 |   8 |           3 |             5 |        6 |      12 |
|      11 | JW Marriott Hotel,sb road                             |        6000 | 10000 | 2020-06-25  |    0 | Paid   | 2020-07-09 |   7 |           4 |             6 |        6 |      11 |
|      10 | Rahul cooperative housing society,Koregaon park       |        3400 |  4800 | 2020-06-23  |    0 | Paid   | 2020-07-08 |   6 |           9 |             7 |        2 |      10 |
|      13 | Canpex Chemicals Pvt.Ltd.                             |       12000 | 15000 | 2020-11-17  |    0 | Unpaid | 2020-11-30 |   8 |           1 |             8 |        8 |      13 |
|       4 | Kumar elite society,Koregaon park                     |        3000 |  5000 | 2020-07-16  |  120 | Paid   | 2020-07-30 |   6 |          16 |             9 |        4 |       4 |
|       3 | Krishnakamal Society, Sus road                        |        1000 |  2000 | 2020-04-14  |  200 | Paid   | 2020-04-28 |   6 |          15 |            10 |        6 |       3 |
|       9 | Chhatrapati Shivaji Housing Society,Sb road           |        4000 |  5500 | 2020-03-05  |    0 | Unpaid | 2020-03-20 |   6 |          11 |            11 |        4 |       9 |
|       7 | Mahesh Paradise,Aundh                                 |        1500 |  2000 | 2020-12-01  |   55 | Unpaid | 2020-12-15 |   6 |          13 |            12 |        4 |       7 |
+---------+-------------------------------------------------------+-------------+-------+-------------+------+--------+------------+-----+-------------+---------------+----------+---------+
12 rows in set (0.11 sec)
```

18)Customers whose report status is pending.

```
mysql> select r.reportid, r.status from Reports r left join Customer c on c.Customer_id = r.Customer_id where r.status = 'Pending';
+----------+---------+
| reportid | status  |
+----------+---------+
|        2 | Pending |
|        3 | Pending |
|        5 | Pending |
|        7 | Pending |
+----------+---------+
4 rows in set (0.09 sec)
```

19)Average consumption of domestic people

```
mysql> Select avg(consumption) from WaterBill where Customer_id in (Select Customer_id from domestic);
+------------------+
| avg(consumption) |
+------------------+
|        2411.1111 |
+------------------+
1 row in set (0.16 sec)
```

20)Delete attended complaints of industries

```
mysql> delete from complaint where customer_id in(select customer_id from industry) and status='Attended';
Query OK, 1 row affected (0.23 sec)

mysql> Select *from COmplaint;
+--------------+----------+-------------+-----------------+
| Complaint_id | status   | Customer_id | Municipality_id |
+--------------+----------+-------------+-----------------+
|            2 | Pending  |           4 |               1 |
|            3 | Pending  |           7 |               1 |
|            4 | Attended |          11 |               1 |
|            5 | Attended |           2 |               1 |
|            6 | Pending  |           4 |               1 |
+--------------+----------+-------------+-----------------+
5 rows in set (0.00 sec)
```

21)Tukai nagar water treatment plant treats how many water source.

```
mysql> Select count(WaterSource_id) from waterSource where WaterSource_id in (Select waterSource_id from treats where TreatmentFacility_id i
(Select TreatmentFacility_id from WaterTreatmentFacility where name like '%Tukai Nagar Water treatment plant'));
+----------------------+
| count(WaterSource_id) |
+----------------------+
|                    2 |
+----------------------+
1 row in set (0.02 sec)
```

22)List domestic customer name metersize wise.

```
mysql> select d.name,count(MeterReader_id) from Domestic d inner join MeterReader m inner join WaterBill  w on m.Bill_No=w.Bill_No and w.customer_id=d.customer_id group by
metersize;
+-------------------+----------------------+
| name              | count(MeterReader_id) |
+-------------------+----------------------+
| Sandhya Mehra     |                    2 |
| Faiz Sheikh       |                    1 |
| Pratyusha Seth    |                    4 |
| Kalpana Agnihotri |                    1 |
+-------------------+----------------------+
```

23)Increase tax of industries by 2%

```
mysql> Update WaterBill set tax=1.02*tax where Customer_id in(select customer_id from Customer where customer_id in(select customer_id from industry));
Query OK, 0 rows affected (0.13 sec)
Rows matched: 2  Changed: 0  Warnings: 0

mysql> Select *FROM WaterBill;
+---------+--------------------------------------------------------+-------------+-------+-------------+------+--------+------------+------+-------------+
| Bill_No | address                                                | consumption | total | billing_date | fine | status | due_date   | tax  | Customer_id |
+---------+--------------------------------------------------------+-------------+-------+-------------+------+--------+------------+------+-------------+
|       1 | New akshay society,Koregaon park                       |        2000 |  3000 | 2019-12-15  |    0 | Paid   | 2019-12-30 |    6 |           5 |
|       2 | Mitrangan Society,Baner                                |        2500 |  4500 | 2020-03-12  |  700 | Unpaid | 2020-03-22 |    6 |          14 |
|       3 | Krishnakamal Society, Sus road                         |        1000 |  2000 | 2020-04-14  |  200 | Paid   | 2020-04-28 |    6 |          15 |
|       4 | Kumar elite society,Koregaon park                      |        3000 |  5000 | 2020-07-16  |  120 | Paid   | 2020-07-30 |    6 |          16 |
|       5 | Anjor Co Op Housing Society,Baner                      |        3300 |  5800 | 2020-08-18  |   50 | Paid   | 2020-08-30 |    6 |          17 |
|       6 | Pavillion mall,sb road                                 |        5000 |  8000 | 2020-11-30  |    0 | Paid   | 2020-12-10 |    6 |           2 |
|       7 | Mahesh Paradise,Aundh                                  |        1500 |  2000 | 2020-12-01  |   55 | Unpaid | 2020-12-15 |    6 |          13 |
|       8 | Gera park housing society,Sangamvadi                   |        1000 |  1500 | 2020-01-01  |   60 | Unpaid | 2020-01-15 |    6 |           7 |
|       9 | Chhatrapati Shivaji Housing Society,Sb road            |        4000 |  5500 | 2020-03-05  |    0 | Unpaid | 2020-03-20 |    6 |          11 |
|      10 | Rahul cooperative housing society,Koregaon park        |        3400 |  4800 | 2020-06-23  |    0 | Paid   | 2020-07-08 |    6 |           9 |
|      11 | JW Marriott Hotel,sb road                              |        6000 | 10000 | 2020-06-25  |    0 | Paid   | 2020-07-09 |    7 |           4 |
|      12 | Yash Soap Works-Detergent,Soap Manufacturer, Pune      |       10000 | 10000 | 2020-10-14  |  100 | Paid   | 2020-10-26 |    8 |           3 |
|      13 | Canpex Chemicals Pvt.Ltd.                              |       12000 | 15000 | 2020-11-17  |    0 | Unpaid | 2020-11-30 |    8 |           1 |
+---------+--------------------------------------------------------+-------------+-------+-------------+------+--------+------------+------+-------------+
13 rows in set (0.00 sec)
```

24)Display treatment plant in descending order of the quantity treated.

```
mysql> select t.name,tr.quantity from Treats tr,WaterTreatmentFacility t where t.TreatmentFacility_id=tr.TreatmentFacility_id order by quantity Desc;
+-----------------------------------+----------+
| name                              | quantity |
+-----------------------------------+----------+
| Bopodi Water treatment plant      |    15000 |
| Bopodi Water treatment plant      |    15000 |
| Jog enterprises                   |    10000 |
| Tukai Nagar Water treatment plant |    10000 |
| Wagholi Water treatment plant     |     9500 |
| Water treatment plant Sangamvadi  |     8500 |
| Parvati Lotus WaterTreatment Plant|     8000 |
| Tukai Nagar Water treatment plant |     7500 |
| Bopodi Water treatment plant      |     7000 |
+-----------------------------------+----------+
9 rows in set (0.07 sec)
```

25) Finding bill number of customers having consumption greater than 5000

```
mysql> select Bill_no,count(consumption) from WaterBill group by consumption having consumption>5000;
+---------+--------------------+
| Bill_no | count(consumption) |
+---------+--------------------+
|      11 |                  1 |
|      12 |                  1 |
|      13 |                  1 |
+---------+--------------------+
3 rows in set (0.00 sec)
```

Functions:

1) write a function to find out the number of complaints that are attended.

```
mysql> Delimiter &&
mysql> Create function ftotalattended()
    -> Returns int
    -> Deterministic
    -> Begin
    -> Declare total int;
    -> Select count(c.status) into total from Complaint c right join Municipality  m on m.Municipality_id = c.Municipality_id where c.status = 'Attended';
    -> Return total;
    -> End &&
Query OK, 0 rows affected (0.13 sec)

mysql> Select ftotalattended() \g;
+-----------------+
| ftotalattended() |
+-----------------+
|               2 |
+-----------------+
1 row in set (0.00 sec)
```

2) Find out the total number of reports

```
mysql> Delimiter &&
mysql> Create function findtotalreports()
    -> Returns int
    -> Deterministic
    -> Begin
    -> Declare result int;
    -> Select count(Reportid) into result from Reports;
    -> Return result;
    -> End &&
Query OK, 0 rows affected (0.13 sec)

mysql> Select findtotalreports() \g;
+--------------------+
| findtotalreports() |
+--------------------+
|                  7 |
+--------------------+
1 row in set (0.15 sec)
```

3)Total amount received by municipality

```
mysql> Delimiter &&
mysql> Create function totalamountmunicipality()
    ->
    -> Returns int
    -> Deterministic
    -> Begin
    -> Declare totalamount int;
    -> Select sum(total)  into totalamount from WaterBill;
    -> Return totalamount;
    -> End &&
Query OK, 0 rows affected (0.34 sec)

mysql> Select totalamountmunicipality() \g;
+---------------------------+
| totalamountmunicipality() |
+---------------------------+
|                     77100 |
+---------------------------+
1 row in set (0.04 sec)
```

4)Finding water quantity from water source

```
mysql> Delimiter &&
mysql> Create function minimumquantity()
    -> Returns int
    -> Deterministic
    -> Begin
    -> Declare quantitymin int;
    -> Select MIN(currentwaterQuantity) into quantitymin from  WaterSource;
    -> Return quantitymin;
    -> End &&
Query OK, 0 rows affected (0.21 sec)

mysql> Select minimumquantity() \g;
+-------------------+
| minimumquantity() |
+-------------------+
|              8000 |
+-------------------+
1 row in set (0.02 sec)
```

5) Find number of customers whose metersize is equal to 8

```
mysql> Delimiter &&
mysql> Create function findcustomer()
    -> Returns int
    -> Deterministic
    -> Begin
    -> Declare id int;
    -> SELECT w.Customer_id into id from WaterBill w INNER JOIN MeterReader m ON w.Bill_no= m.Bill_no where m.metersize=8;
    -> Return id;
    -> End &&
Query OK, 0 rows affected (0.22 sec)

mysql> select findcustomer() \g;
+----------------+
| findcustomer() |
+----------------+
|              1 |
+----------------+
1 row in set (0.12 sec)
```

Procedures:

1) Write a procedure to count the total number of reports that are attended.

```
mysql> Delimiter &&
mysql> Create procedure numreports(IN c VARCHAR(25))
    -> Begin
    -> Select count(Reportid) from Reports where status = c;
    -> End &&
Query OK, 0 rows affected (0.19 sec)
```

```
mysql> call numreports('Attended') \g;
+-----------------+
| count(Reportid) |
+-----------------+
|               3 |
+-----------------+
1 row in set (0.00 sec)

Query OK, 0 rows affected (0.00 sec)
```

2) Write a procedure to get the total number of consumption of a particular domestic customer.

```
mysql> Delimiter &&
mysql> Create procedure numconsumed(IN c VARCHAR(25))
    -> Begin
    -> Select d.name, w.consumption from Domestic d inner join WaterBill w on d.Customer_id = w.Customer_id where d.name = c;
    -> End &&
Query OK, 0 rows affected (0.20 sec)
```

```
mysql> call numconsumed('Vansh Malhotra') \g;
+----------------+-------------+
| name           | consumption |
+----------------+-------------+
| Vansh Malhotra |        4000 |
+----------------+-------------+
1 row in set (0.04 sec)
```

3)Write a procedure to update the address of a particular commercial customer.

```
mysql> Delimiter &&
mysql> Create procedure updateaddresscustomer(IN c VARCHAR(25), IN b INT)
    -> Begin
    ->
    -> Update Domestic set Address = c where Customer_id = b;
    -> End &&
Query OK, 0 rows affected (0.13 sec)
```

```
mysql> call updateaddresscustomer('Royal Castle Society',11) \g;
Query OK, 1 row affected (0.12 sec)

    -> \g
```

```
mysql> Select *from Domestic \g;
+------------+----------------------+---------------------------------+------------------+-------------+
| Domesticid | name                 | address                         | Customercontact_no | Customer_id |
+------------+----------------------+---------------------------------+------------------+-------------+
|          1 | Vikram Chauhan       | Akshay society,Koregaon park    |       9187689091 |           5 |
|          2 | Pratyusha Seth       | Gerapark society ,Sangamvadi    |       8878907867 |           7 |
|          3 | Prakrit Taneja       | Rahul society,Lumini park       |       7890564310 |           9 |
|          4 | Vansh Malhotra       | Royal Castle Society            |       7765473912 |          11 |
|          5 | Viditi Deshmukh      | Shivaji Society,Sb road         |       7765473913 |          13 |
|          6 | Sandhya Mehra        | Mitrangan Society,Baner         |       9853723810 |          14 |
|          7 | Kalpana Agnihotri    | Krishnakamal Society, Sus road  |       9898397927 |          15 |
|          8 | Vaikunth Chatterjee  | Elite society,Koregaon park     |       8726335363 |          16 |
|          9 | Faiz Sheikh          | Anjor Housing Society, Baner    |       7352437321 |          17 |
|         10 | Ali Fazal            |  Mitrangan Society,Baner        |       7729946780 |          18 |
|         11 | Vidyut Banerjee      | Shivaji Society,Sb road         |       8836723099 |          19 |
|         12 | Shehzad Khan         | Gera park society,Sangamvadi    |       9173738410 |          20 |
|         13 | Devika Gupta         | Gera park society,Sangamvadi    |       9182736412 |          21 |
|         14 | Vanshika Mukherjee   | Mahesh Paradise,Aundh           |       7726351730 |          22 |
+------------+----------------------+---------------------------------+------------------+-------------+
14 rows in set (0.00 sec)
```

4)Write a procedure to find details of the water treatment plant of a given municipality.

```
mysql> Delimiter &&
mysql> Create procedure Treatmunicipal(IN c INT)
    -> Begin
    -> Select w.TreatmentFacility_id, w.name, w.address from WaterTreatmentFacility w inner join Municipality m on m.Municipality_id = w.Municip
ality_id where m.Municipality_id = c;
    -> End &&
Query OK, 0 rows affected (0.19 sec)

mysql> call Treatmunicipal(1) \g;
+---------------------+------------------------------------+----------------------------------+
| TreatmentFacility_id | name                              | address                          |
+---------------------+------------------------------------+----------------------------------+
|                   1 | Parvati Lotus WaterTreatment Plant | Deshpande chowk sinhagad road    |
|                   2 | Warje Water treatment plant        | Hingane home colony,warje        |
|                   3 | Bopodi Water treatment plant       | Aundh gaon,bopodi                |
|                   4 | Tukai Nagar Water treatment plant  | Ganesh colony                    |
|                   5 | Jog enterprises                    | Kamthe estate,shivane            |
|                   6 | Wagholi Water treatment plant      | Wagheshwar nagar,wagholi         |
|                   7 | Water treatment plant Sangamvadi   | Sangamvadi                       |
+---------------------+------------------------------------+----------------------------------+
7 rows in set (0.12 sec)

Query OK, 0 rows affected (0.28 sec)
```

5)Write a procedure to find the quantity treated and its description of treatment by a water treatment facility.

```
mysql> Delimiter &&
mysql> Create procedure countquantitybyTreatment(IN c VARCHAR(25))
    -> Begin
    -> Select t.quantity, t.description from Treats t  inner join WaterTreatmentFacility w on t.Treatme
ntFacility_id = w.TreatmentFacility_id where w.name = c;
    -> End &&
Query OK, 0 rows affected (0.16 sec)
```

```
mysql> call countquantitybyTreatment('Jog enterprises') \g;
+----------+-----------------------------------------------+
| quantity | description                                   |
+----------+-----------------------------------------------+
|    10000 | Coagulation, Flocculation and Sedimentation   |
+----------+-----------------------------------------------+
1 row in set (0.02 sec)

Query OK, 0 rows affected (0.03 sec)
```

TRIGGERS:

1) Implement before insert trigger on meter reader table

```
mysql> delimiter &&
mysql> create trigger trigg
    -> before insert on MeterReader
    -> for each row
    -> begin
    -> if new.metersize is NULL then
    ->     set new.metersize=2;
    -> end if;
    -> end &&
Query OK, 0 rows affected (0.30 sec)
```

```
mysql> insert into MeterReader values(13,NULL,1);
    -> insert into MeterReader values(13,NULL,1) \g;
Query OK, 1 row affected (0.26 sec)
```

OUTPUT:

```
mysql> select *from MeterReader \g;
+----------------+-----------+---------+
| MeterReader_id | metersize | Bill_no |
+----------------+-----------+---------+
|              1 |         2 |       2 |
|              2 |         3 |       5 |
|              3 |         3 |       6 |
|              4 |         4 |       8 |
|              5 |         6 |      12 |
|              6 |         6 |      11 |
|              7 |         2 |      10 |
|              8 |         8 |      13 |
|              9 |         4 |       4 |
|             10 |         6 |       3 |
|             11 |         4 |       9 |
|             12 |         4 |       7 |
|             13 |         2 |       1 |
+----------------+-----------+---------+
13 rows in set (0.00 sec)
```

2) Implement after update trigger on water bill

```
mysql> delimiter &&
mysql> create trigger logupd
    -> after update on waterBill
    -> for each row
    -> begin
    -> insert into log set action='update',Bill_no=old.Bill_no,total=old.total,changedone=now();
    -> end &&
Query OK, 0 rows affected (0.44 sec)
```

```
mysql> update WaterBill set fine=20 where Bill_no=2 \g;
Query OK, 1 row affected (0.20 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

Output:

```
mysql> select *from log \g;
+------+---------+-------+--------+---------------------+
| upid | Bill_no | total | action | changedone          |
+------+---------+-------+--------+---------------------+
|    1 |       2 |  4500 | update | 2020-12-14 12:45:32 |
+------+---------+-------+--------+---------------------+
1 row in set (0.00 sec)
```

```
mysql> select *from WaterBill \g;
```

Bill_No	address	consumption	total	billing_date	fine	status	due_date	tax	Customer_id
1	New akshay society,Koregaon park	2000	3000	2019-12-15	0	Paid	2019-12-30	5	5
2	Mitrangan Society,Baner	2500	4500	2020-03-12	20	Unpaid	2020-03-22	5	14
3	Krishnakamal Society, Sus road	1000	2000	2020-04-14	200	Paid	2020-04-28	5	15
4	Kumar elite society,Koregaon park	3000	5000	2020-07-16	120	Paid	2020-07-30	5	16
5	Anjor Co Op Housing Society,Baner	3300	5800	2020-08-18	50	Paid	2020-08-30	5	17
6	Pavillion mall,sb road	5000	8000	2020-11-30	0	Paid	2020-12-10	5	2
7	Mahesh Paradise,Aundh	1500	2000	2020-12-01	55	Unpaid	2020-12-15	5	13
8	Gera park housing society,Sangamvadi	1000	1500	2020-01-01	60	Unpaid	2020-01-15	5	7
9	Chhatrapati Shivaji Housing Society,Sb road	4000	5500	2020-03-05	0	Unpaid	2020-03-20	5	11
10	Rahul cooperative housing society,Koregaon park	3400	4800	2020-06-23	0	Paid	2020-07-08	5	9
11	JW Marriott Hotel,sb road	6000	10000	2020-06-25	0	Paid	2020-07-09	6	4
12	Yash Soap Works-Detergent,Soap Manufacturer, Pune	10000	10000	2020-10-14	100	Paid	2020-10-26	6	3
13	Canpex Chemicals Pvt.Ltd.	12000	15000	2020-11-17	0	Unpaid	2020-11-30	6	1

```
13 rows in set (0.00 sec)
```

3) Implement before insert trigger on municipality contact number

```
mysql> delimiter &&
mysql> create trigger trig
    -> before insert  on Municipalitycontact_no
    -> for each row
    -> begin
    -> declare mssg varchar(30);
    -> if new.Municipalitycontact_no =25501106 then
    ->   set mssg='Number already exists';
    ->   signal sqlstate '45000' set message_text=mssg;
    -> end if;
    -> end &&
Query OK, 0 rows affected (0.63 sec)
```

Output:

```
mysql> insert into Municipalitycontact_no values(6,1,25501106);
    -> insert into Municipalitycontact_no values(6,1,25501106) \g;
ERROR 1644 (45000): Number already exists
   ` end &&
```

4)Update customer phone number using before update

```
mysql> delimiter &&
mysql> create trigger before_contactno_update
    -> before update on Industry
    -> for each row
    -> begin
    -> declare message varchar(255);
    -> set message=('updated');
    -> end &&
Query OK, 0 rows affected (0.37 sec)
```

```
mysql> update Industry set Customer_contactno=8888680430 where Customer_id=6 \g;
Query OK, 1 row affected (0.18 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

Output:

```
mysql> select *from Industry \g;
+-------------+-----------+----------------------------+------------------------------------------------+-------------------+-------------+
| industrialid | category  | name                       | address                                        | Customer_contactno | Customer_id |
+-------------+-----------+----------------------------+------------------------------------------------+-------------------+-------------+
|           1 | Chemicals | Canpex Chemicals Pvt. Ltd. | 123 Nana Peth Rd near Ashok Chowk              |         9874568291 |           1 |
|           2 | Soap      | Yashshilp Soap Works       | Survey No: 50 Waghjainagar Ambegaon (khurd) Katraj | 8698911221 |  3 |
|           3 | Soap      | Laxmi Soap Factory         | Sirur Koregaon Park                            |         8888680430 |           6 |
|           4 | Chemicals | Lupin                      | 46/47 A Village Nande Taluka Mulshi            |         2066749100 |           8 |
+-------------+-----------+----------------------------+------------------------------------------------+-------------------+-------------+
4 rows in set (0.00 sec)
```

5) Delete a report and save it in archives

```
mysql> Delimiter &&
mysql> Create trigger beforereportdeletetrig
    -> before delete on Reports
    -> for each row
    -> begin
    -> insert into ReportArchives(Customer_Id, Municipality_id, description, status)
    ->
    -> values(old.Customer_Id, old.Municipality_id, old.description, old.status);
    -> end &&
Query OK, 0 rows affected (0.28 sec)
```

```
mysql> Delete from Reports where Reportid = 7 \g;
Query OK, 1 row affected (0.22 sec)
```

```
mysql> Delete from Reports where Reportid=1 \g;
Query OK, 1 row affected (0.15 sec)
```

Output:

```
mysql> select *from ReportArchives \g;
+-----------+-------------+-----------------+-------------------------------------------+----------+
| Report_id | Customer_id | Municipality_id | description                                | status   |
+-----------+-------------+-----------------+-------------------------------------------+----------+
|         1 |           4 |               1 | Water quality is bad                      | Pending  |
|         2 |           1 |               1 | Bill paid but connection got disconnected | Attended |
+-----------+-------------+-----------------+-------------------------------------------+----------+
2 rows in set (0.01 sec)
```

```
mysql> select *from Reports \g;
+----------+-------------+-----------------+------------------------------------------------+----------+
| reportid | Customer_id | municipality_id | description                                    | status   |
+----------+-------------+-----------------+------------------------------------------------+----------+
|        2 |           4 |               1 | Discrepancies in bill                          | Pending  |
|        3 |           7 |               1 | How can I request for name change              | Pending  |
|        4 |          11 |               1 | Bill status not updated                        | Attended |
|        5 |           2 |               1 | Officers behaving unprofessionally             | Pending  |
|        6 |           3 |               1 | I paid bill on time but still shows fine of Rs.100 | Attended |
+----------+-------------+-----------------+------------------------------------------------+----------+
5 rows in set (0.00 sec)
```

CONCLUSION:

In this project, the water supply database is created and SQL commands are executed on this database. Initially, the database was formed from the ER diagram that we constructed at the beginning and converted it into relational schemas. Then we implemented the relational schemas and entered the data values into MySQL. Using data definition language we were able to create

and delete tables. Using data manipulation language we were able to insert, update and delete data values in MySQL. Then we were able to execute queries on the database such as, inner joins, right joins, left joins, and using keywords such as, some, min, max, and exists. We also executed functions, procedures and triggers on this database.