|  |  |  |
| --- | --- | --- |
| **ENTITY** | **PURPOSE** | **RELATIONSHIPS** |
| WaterSource | * Stores different water sources (rivers, lakes, reservoirs) | * *One-to-Many:* A **WaterSource** supplies multiple **TreatmentPlants** |
| TreatmentPlant | * Represents facilities where water is treated before distribution | * *Many-to-One:* Each **TreatmentPlant** gets water from **one WaterSource** * *One-to-Many:* A **TreatmentPlant** feeds multiple **DistributionNetworks** * *One-to-Many:* A **TreatmentPlant** undergoes multiple **WaterQuality tests** * *One-to-Many:* A **TreatmentPlant** has multiple **ComplianceRecords** * *One-to-Many:* A **TreatmentPlant** owns multiple **Assets** |
| DistributionNetwork | * Represents pipelines that distribute water to customers | * *Many-to-One:* Each **DistributionNetwork** is supplied by **one TreatmentPlant** * *One-to-Many:* A **DistributionNetwork** serves multiple **Customers** |
| Customer | * Stores customer details | * *Many-to-One:* Each **Customer** is connected to **one DistributionNetwork** * *One-to-One:* Each **Customer** has **one Meter** * *One-to-Many:* A **Customer** can have multiple **BillPayments** |
| Meter | * Tracks water consumption for customers | * *One-to-One:* Each **Customer** has **one Meter** * *One-to-Many:* A **Meter** is linked to multiple **BillPayments** |
| BillAndPayments | * Manages billing and payments | * *Many-to-One: Each* ***BillPayment*** *is linked to* ***one Customer*** * *Many-to-One: Each* ***BillPayment*** *is linked to* ***one Meter*** |
| WaterQuality | * Stores water quality test results | * *Many-to-One: Each* ***WaterQuality test*** *is conducted at* ***one TreatmentPlant*** * *One-to-Many: A* ***WaterQuality test*** *can be linked to multiple* ***Incidents*** |
| Incident | * Logs contamination, leaks, or failures | * *Many-to-One: Each* ***Incident*** *can be linked to* ***one WaterQuality test*** |
| Asset | * Represents equipment (pumps, valves, meters, generators, etc.) | * *Many-to-One: Each* ***Asset*** *belongs to* ***one TreatmentPlant*** |
| |  | | --- | | MaintenanceRecord |  |  | | --- | |  | | * Logs asset maintenance | * *Many-to-One: Each* ***MaintenanceRecord*** *is related to* ***one Asset*** * *Many-to-One: Each* ***MaintenanceRecord*** *is assigned to* ***one Technician*** |
| Technician | * Stores maintenance personnel details | * *One-to-Many: A* ***Technician*** *performs multiple* ***MaintenanceRecords*** |
| ComplianceRecord | * Stores regulatory compliance data | * *Many-to-One: Each* ***ComplianceRecord*** *is linked to* ***one TreatmentPlant*** |

**LOGICAL SCHEMA**

Meter

MeterId INT

MeterType VARCHAR(50)

InstallationDate DATE

Status VARCHAR(20)

LastReading DECIMAL(10,2) LastReadingDate DATE

CustomerId INT (FK)

DistributionNetwork

NetworkId INT

NetworkType VARCHAR(50)

Length DECIMAL(10,2) PressureLevel DECIMAL(10,2)

FlowRate DECIMAL(10,2)

PlantId INT (FK)

TreatmentPlant

PlantId INT

PlantType VARCHAR(50)

Capacity DECIMAL(10,2)

OperationStatus VARCHAR(20)

Location VARCHAR(100)

LastInspectionDate DATE

WaterSource

SourceId INT

SourceType VARCHAR(50)

Location VARCHAR(100) Capacity DECIMAL(10,2)

Status VA RCHAR(20)

Customer

CustomerId INT

Name VARCHAR(100)

Address VARCHAR(200) BillingInformation VARCHAR(200)

PhoneNumber VARCHAR(20)

Email VARCHAR(100), ConnectionStatus VARCHAR(20)

NetworkId INT (FK)

BillPayment

BillId INT

BillDate DATE

PaymentStatus VARCHAR(20)

AmountDue DECIMAL(10,2) DueDate DATE

PaymentMethod VARCHAR(50)

WaterUsage DECIMAL(10,2), CustomerId INT (FK)

MeterId INT (FK)

Technician

TechnicianId INT

Name VARCHAR(100)

PhoneNumber VARCHAR(20)

Email VARCHAR(100)

MaintenanceRecord

RecordId INT

MaintenanceSchedule VARCHAR(100)

ServiceLocation VARCHAR(100)

LastServiceDate DATE NextServiceDate DATE

AssetId INT (FK)

TechnicianId INT (FK)

Asset

AssetId INT

AssetType VARCHAR(50)

InstallationDate DATE

Condition VARCHAR(50)

PlantId INT (FK)

WaterQuality

TestId INT

TestType VARCHAR(50)

Results VARCHAR(200)

TestDate DATE

pHLevel DECIMAL(4,2)

ContaminantsDetected VARCHAR(200)

Turbidity DECIMAL(5,2)

PlantId INT (FK)TestType VARCHAR(50)

Results VARCHAR(200)

TestDate DATE pHLevel DECIMAL(4,2)

ContaminantsDetected VARCHAR(200)

Turbidity DECIMAL(5,2)

PlantId INT (FK)

ComplianceRecord

DocumentId INT

DocumentType VARCHAR(50)

ExpiryDate DATE

Status VARCHAR(50)

RegulatoryBody VARCHAR(100)

IssuedDate DATE

PlantId INT (FK)

NetworkId INT (FK) (optional)

Incident

IncidentId INT

IncidentType VARCHAR(50)

ResolutionStatus VARCHAR(50)

Description VARCHAR(500)

ReportedDate DATE

AffectedArea VARCHAR(100)

TestId INT (FK)

PlantId INT (FK) (optional