Urban Wildlife Monitoring System

Introduction

The Urban Wildlife Monitoring System is designed to track, monitor, and analyze the movement and behavior of wildlife species in urban environments. This system integrates advanced sensor technologies, citizen reports, and observational tools to collect and store vital data on urban wildlife. The collected data supports researchers, city planners, and conservationists in studying urban wildlife patterns, ensuring species conservation, and managing conflicts between humans and wildlife. By combining various data sources, the system offers valuable insights into urban biodiversity and ecosystem health.

Entities & Relationships

Entities

Species: Represents wildlife species monitored by the system.
Attributes associated would be:
SpeciesID (Primary Key): Unique identifier for each species.
ScientificName: Latin name of the species.
CommonName: Commonly used name of the species.
ConservationStatus: Current conservation status (endangered, threatened).
Description: Brief details about the species.

Habitat_Zones: Represents specific zones in urban areas where wildlife activities are monitored.
Attributes associated would be:
Zone_ID (Primary Key): Unique identifier for each habitat zone.
Zone_Name: Name of the habitat zone.
Location_Coordinates: Geographical location of the zone.
Description: Details about the zone.

Sensors: Devices installed in habitat zones to monitor wildlife activities.
Attributes associated would be:
Sensor_ID (Primary Key): Unique identifier for each sensor.
Sensor_Type: Type of sensor (e.g., camera, motion detector).
ZoneID (Foreign Key): Zone where the sensor is installed.
Installation_Date: Date of sensor installation.

Sightings: Records of wildlife observations collected from sensor/citizen reports.
Attributes associated would be:
Sighting_ID (Primary Key): Unique identifier for each sighting.
Species_ID (Foreign Key): The species identified in the sighting.
Zone_ID (Foreign Key): Habitat zone where the sighting occurred.
Sensor_ID (Foreign Key): Sensor used for the sighting (if applicable).
Sighting_DateTime: Date and time of the sighting.
Reporter_ID (Foreign Key): Reporter who logged the sighting.

Citizen_Reporters: Citizens who report wildlife sightings.
Attributes associated would be:
Reporter_ID (Primary Key): Unique identifier for each citizen reporter.
Name: Full name of the reporter.
Email: Contact email address.
PhoneNumber: Contact phone number.

Weather: Records of weather conditions in habitat zones during sightings.
Attributes associated would be:
Weather_ID (Primary Key): Unique identifier for each weather record.
Zone_ID (Foreign Key): Habitat zone where the weather conditions were recorded.
Recorded_DateTime: Date and time of the weather record.
Temperature: Temperature in the zone.
Humidity: Humidity level in the zone.
Precipitation: Amount of rainfall or snowfall.
WindSpeed: Speed of the wind.

Relationships

Have
Species → Sightings
One species can have multiple sightings, but each sighting is associated with exactly 1 species.

Contains
Habitat_Zones → Sensors
One habitat zone can have multiple sensors, but each sensor is in one zone.

Occurs
Habitat_Zones → Sightings
One habitat zone can have multiple sightings, but each sighting occurs in one zone.

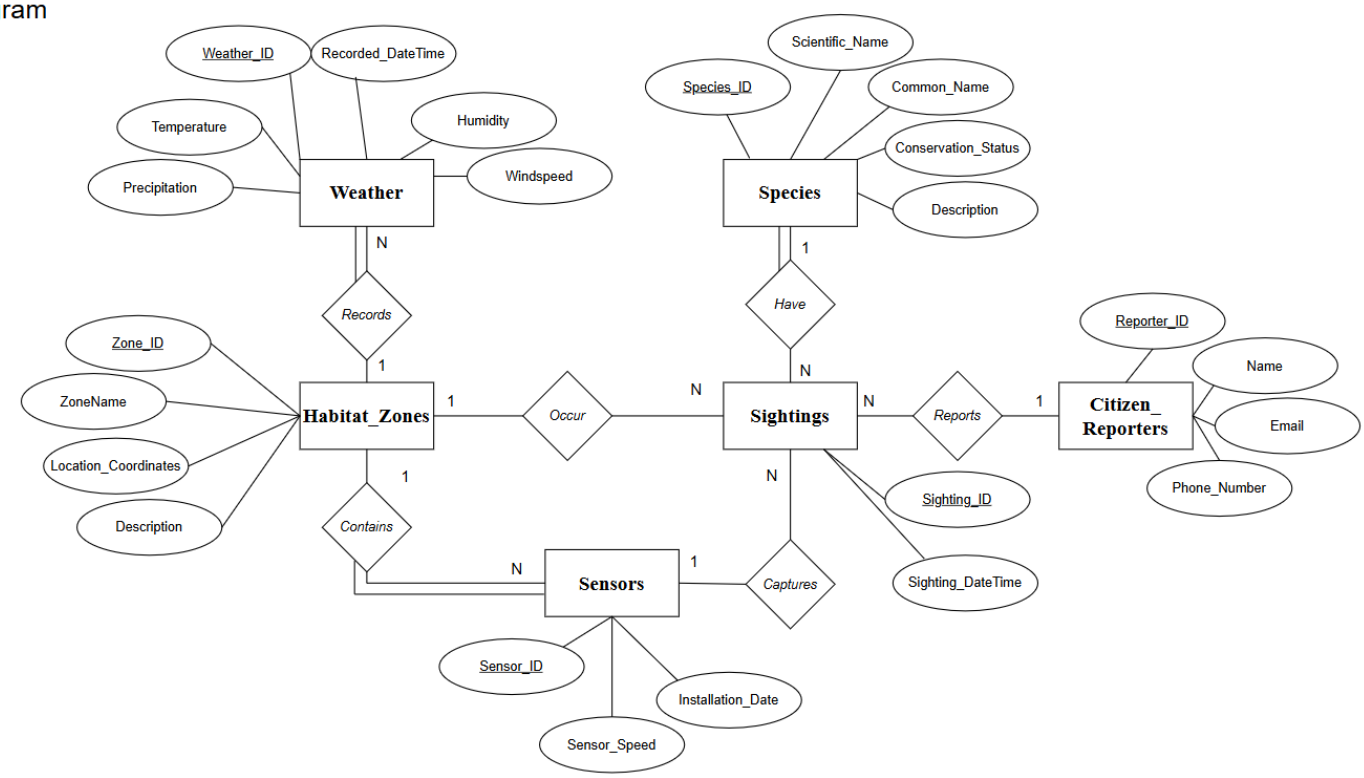
Captures
Sensors → Sightings
One sighting can optionally be captured by one sensor.

Reports
Citizen_Reporters → Sightings
One citizen reporter can report multiple sightings, but each sighting is reported by one reporter.

Records
Habitat_Zones → Weather_Conditions
One habitat zone can have multiple weather condition records, but each record is associated with one zone.

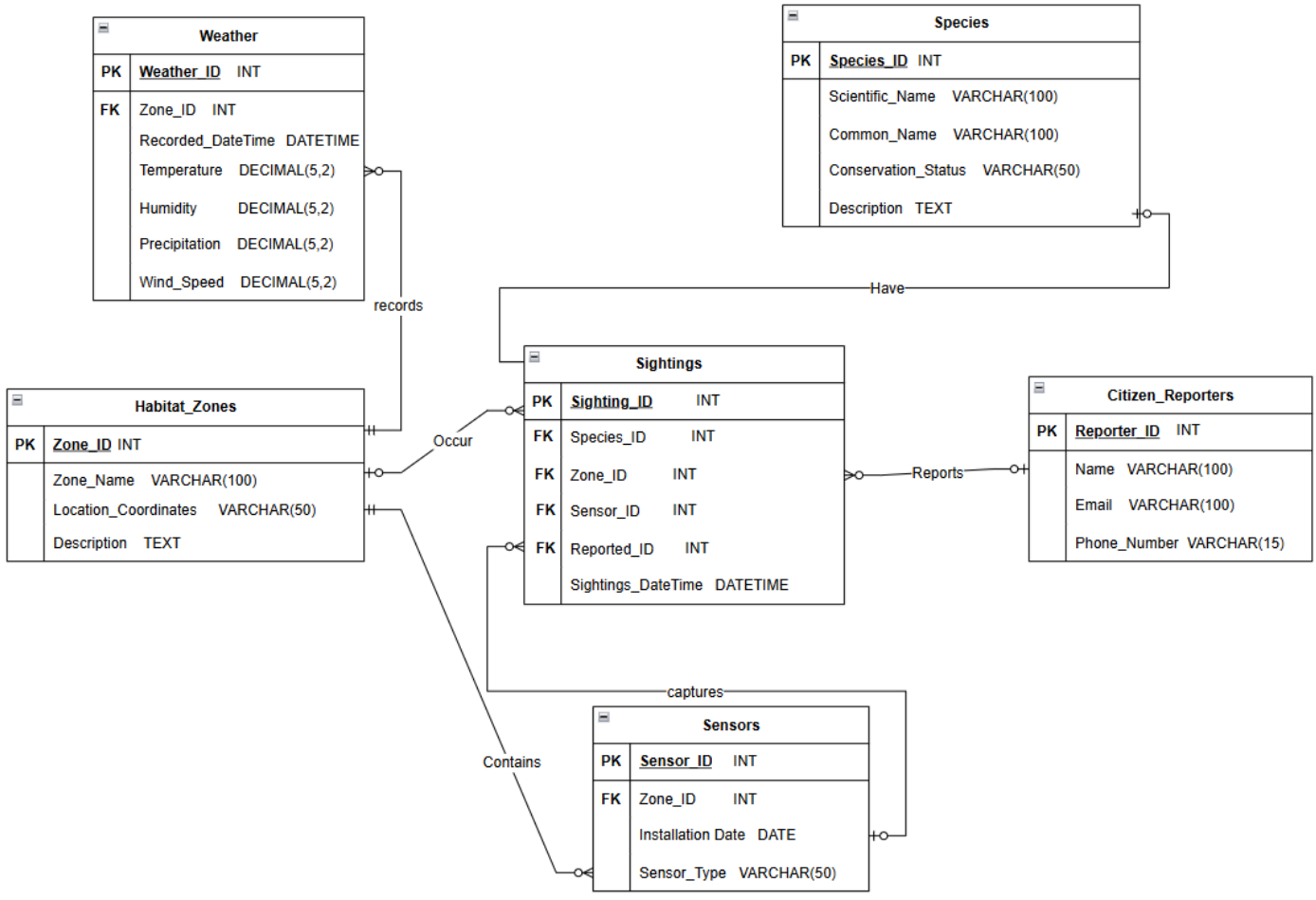
Entity Relationship Diagram:

E-R Diagram

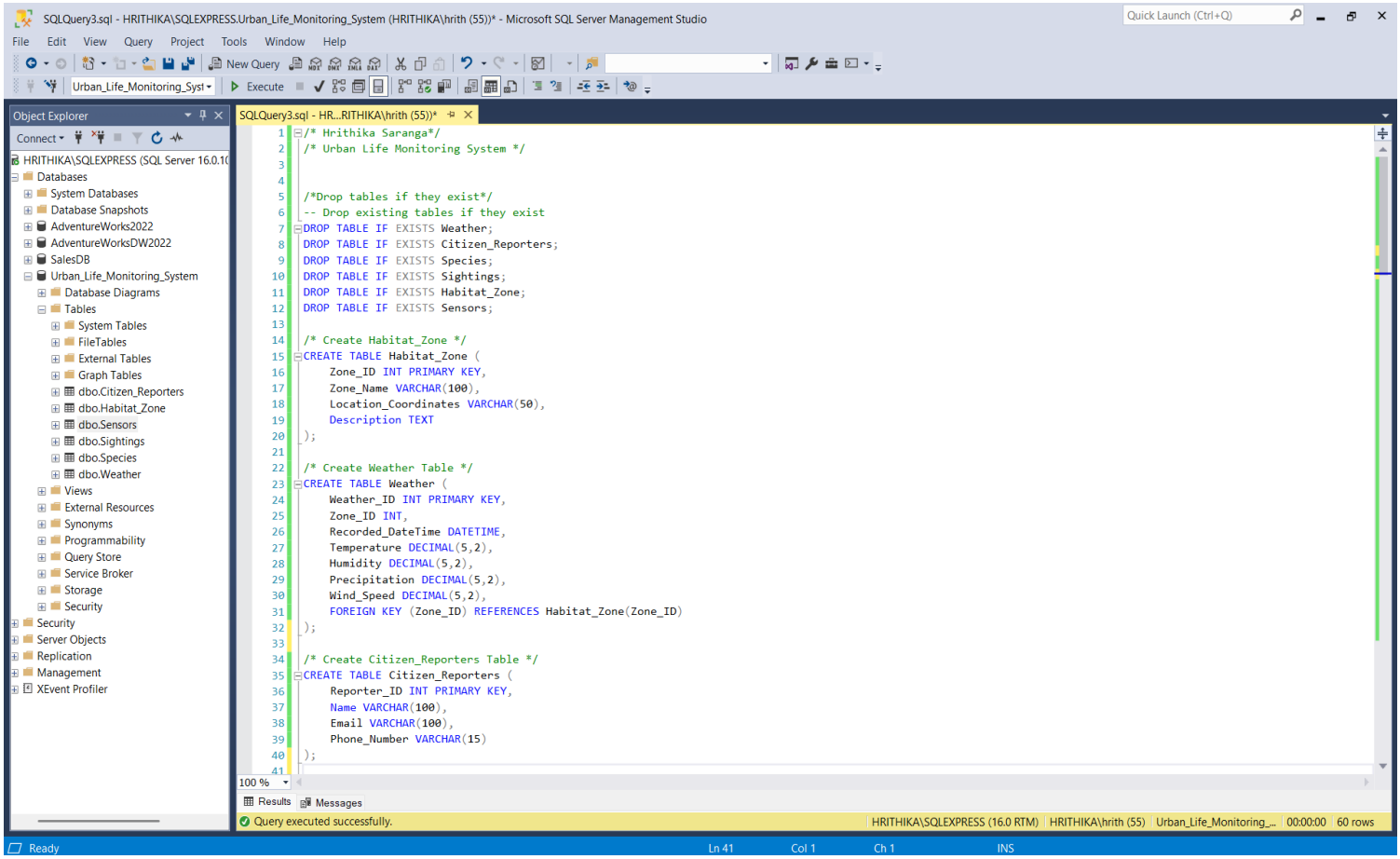


Physical Level Data Model:

Physical Data Model



SQL Code for Urban Life Monitoring System



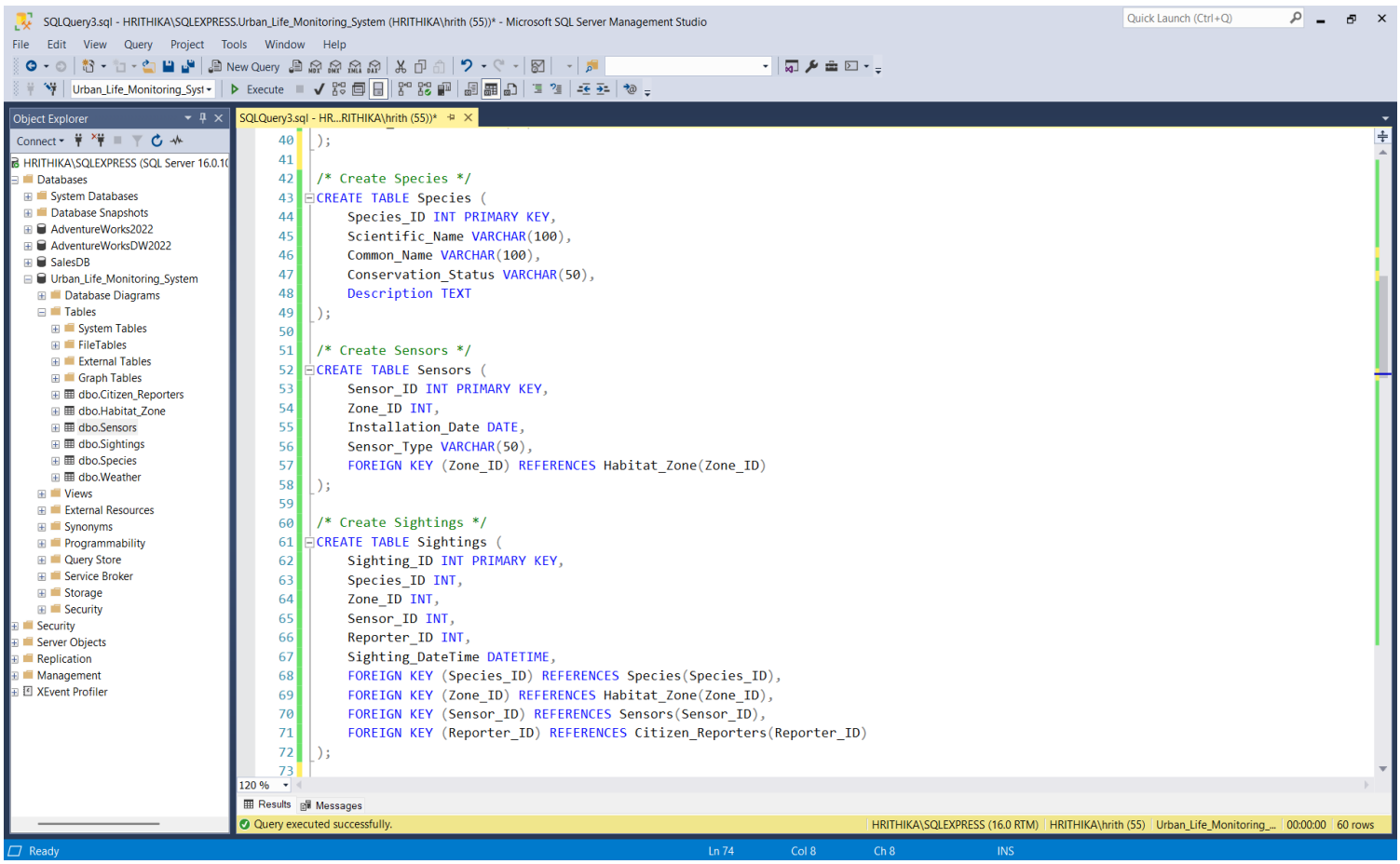
```sql
/* Hrithika Saranga*/
/* Urban Life Monitoring System */


/*Drop tables if they exist*/
-- Drop existing tables if they exist
DROP TABLE IF EXISTS Weather;
DROP TABLE IF EXISTS Citizen_Reporters;
DROP TABLE IF EXISTS Species;
DROP TABLE IF EXISTS Sightings;
DROP TABLE IF EXISTS Habitat_Zone;
DROP TABLE IF EXISTS Sensors;

/* Create Habitat_Zone */
CREATE TABLE Habitat_Zone (
    Zone_ID INT PRIMARY KEY,
    Zone_Name VARCHAR(100),
    Location_Coordinates VARCHAR(50),
    Description TEXT
);

/* Create Weather Table */
CREATE TABLE Weather (
    Weather_ID INT PRIMARY KEY,
    Zone_ID INT,
    Recorded_DateTime DATETIME,
    Temperature DECIMAL(5,2),
    Humidity DECIMAL(5,2),
    Precipitation DECIMAL(5,2),
    Wind_Speed DECIMAL(5,2),
    FOREIGN KEY (Zone_ID) REFERENCES Habitat_Zone(Zone_ID)
);

/* Create Citizen_Reporters Table */
CREATE TABLE Citizen_Reporters (
    Reporter_ID INT PRIMARY KEY,
    Name VARCHAR(100),
    Email VARCHAR(100),
    Phone_Number VARCHAR(15)
);
```

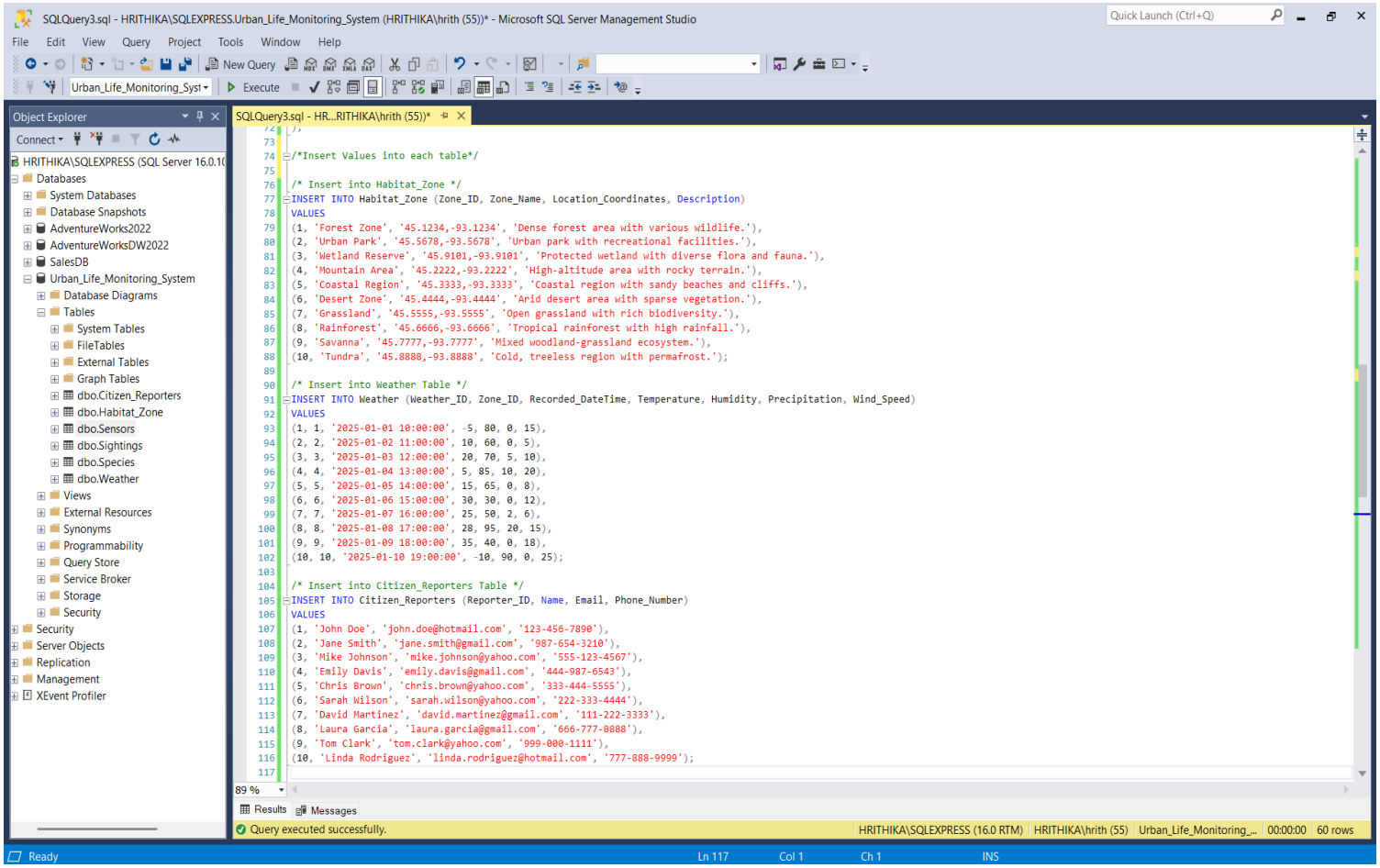


```sql
);

/* Create Species */
CREATE TABLE Species (
    Species_ID INT PRIMARY KEY,
    Scientific_Name VARCHAR(100),
    Common_Name VARCHAR(100),
    Conservation_Status VARCHAR(50),
    Description TEXT
);

/* Create Sensors */
CREATE TABLE Sensors (
    Sensor_ID INT PRIMARY KEY,
    Zone_ID INT,
    Installation_Date DATE,
    Sensor_Type VARCHAR(50),
    FOREIGN KEY (Zone_ID) REFERENCES Habitat_Zone(Zone_ID)
);

/* Create Sightings */
CREATE TABLE Sightings (
    Sighting_ID INT PRIMARY KEY,
    Species_ID INT,
    Zone_ID INT,
    Sensor_ID INT,
    Reporter_ID INT,
    Sighting_DateTime DATETIME,
    FOREIGN KEY (Species_ID) REFERENCES Species(Species_ID),
    FOREIGN KEY (Zone_ID) REFERENCES Habitat_Zone(Zone_ID),
    FOREIGN KEY (Sensor_ID) REFERENCES Sensors(Sensor_ID),
    FOREIGN KEY (Reporter_ID) REFERENCES Citizen_Reporters(Reporter_ID)
);
```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Quick Launch (Ctrl+Q)
File Edit View Query Project Tools Window Help
New Query
Execute
Urban_Life_Monitoring_Syst
Object Explorer
Connect
HRITHIKA\SQLEXPRESS (SQL Server 16.0.1
Databases
System Databases
Database Snapshots
AdventureWorks2022
AdventureWorksDW2022
SalesDB
Urban_Life_Monitoring_System
Database Diagrams
Tables
System Tables
FileTables
External Tables
Graph Tables
dbo.Citizen_Reporters
dbo.Habitat_Zone
dbo.Sensors
dbo.Sightings
dbo.Species
dbo.Weather
Views
External Resources
Synonyms
Programmability
Query Store
Service Broker
Storage
Security
Security
Server Objects
Replication
Management
XEvent Profiler
SQLQuery3.sql - HR...RITHIKA\hrith (55))*
/*Insert Values into each table*/
/* Insert into Habitat_Zone */
INSERT INTO Habitat_Zone (Zone_ID, Zone_Name, Location_Coordinates, Description)
VALUES
(1, 'Forest Zone', '45.1234,-93.1234', 'Dense forest area with various wildlife.'),
(2, 'Urban Park', '45.5678,-93.5678', 'Urban park with recreational facilities.'),
(3, 'Wetland Reserve', '45.9101,-93.9101', 'Protected wetland with diverse flora and fauna.'),
(4, 'Mountain Area', '45.2222,-93.2222', 'High-altitude area with rocky terrain.'),
(5, 'Coastal Region', '45.3333,-93.3333', 'Coastal region with sandy beaches and cliffs.'),
(6, 'Desert Zone', '45.4444,-93.4444', 'Arid desert area with sparse vegetation.'),
(7, 'Grassland', '45.5555,-93.5555', 'Open grassland with rich biodiversity.'),
(8, 'Rainforest', '45.6666,-93.6666', 'Tropical rainforest with high rainfall.'),
(9, 'Savanna', '45.7777,-93.7777', 'Mixed woodland-grassland ecosystem.'),
(10, 'Tundra', '45.8888,-93.8888', 'Cold, treeless region with permafrost.');
/* Insert into Weather Table */
INSERT INTO Weather (Weather_ID, Zone_ID, Recorded_DateTime, Temperature, Humidity, Precipitation, Wind_Speed)
VALUES
(1, 1, '2025-01-01 10:00:00', -5, 80, 0, 15),
(2, 2, '2025-01-02 11:00:00', 10, 60, 0, 5),
(3, 3, '2025-01-03 12:00:00', 20, 70, 5, 10),
(4, 4, '2025-01-04 13:00:00', 5, 85, 10, 20),
(5, 5, '2025-01-05 14:00:00', 15, 65, 0, 8),
(6, 6, '2025-01-06 15:00:00', 30, 30, 0, 12),
(7, 7, '2025-01-07 16:00:00', 25, 50, 2, 6),
(8, 8, '2025-01-08 17:00:00', 28, 95, 20, 15),
(9, 9, '2025-01-09 18:00:00', 35, 40, 0, 18),
(10, 10, '2025-01-10 19:00:00', -10, 90, 0, 25);
/* Insert into Citizen_Reporters Table */
INSERT INTO Citizen_Reporters (Reporter_ID, Name, Email, Phone_Number)
VALUES
(1, 'John Doe', 'john.doe@hotmail.com', '123-456-7890'),
(2, 'Jane Smith', 'jane.smith@gmail.com', '987-654-3210'),
(3, 'Mike Johnson', 'mike.johnson@yahoo.com', '555-123-4567'),
(4, 'Emily Davis', 'emily.davis@gmail.com', '444-987-6543'),
(5, 'Chris Brown', 'chris.brown@yahoo.com', '333-444-5555'),
(6, 'Sarah Wilson', 'sarah.wilson@yahoo.com', '222-333-4444'),
(7, 'David Martinez', 'david.martinez@gmail.com', '111-222-3333'),
(8, 'Laura Garcia', 'laura.garcia@gmail.com', '666-777-8888'),
(9, 'Tom Clark', 'tom.clark@yahoo.com', '999-000-1111'),
(10, 'Linda Rodriguez', 'linda.rodriguez@hotmail.com', '777-888-9999');
89 %
Results
Messages
Query executed successfully.
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Urban_Life_Monitoring_...
00:00:00
60 rows
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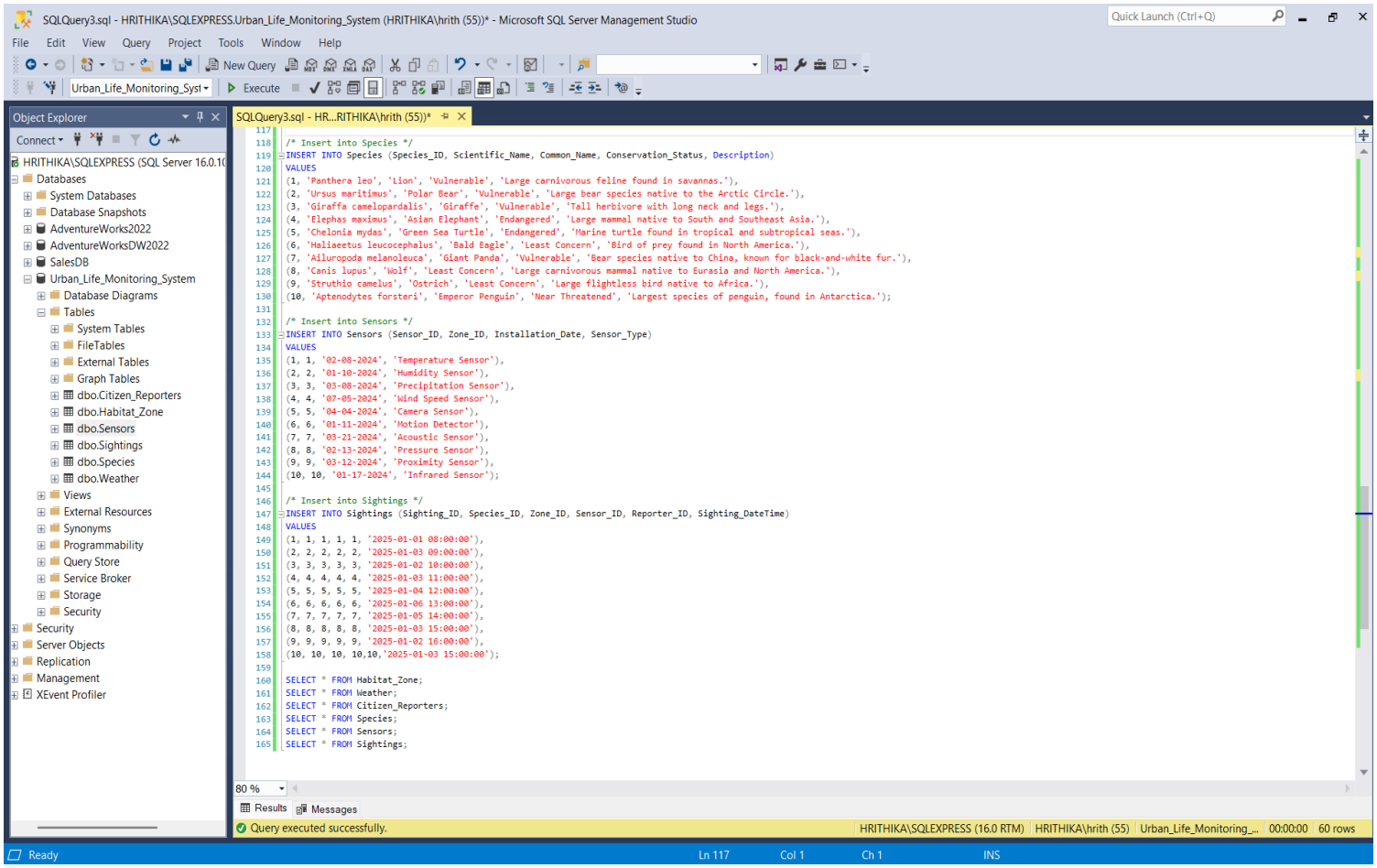
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Query Store
Service Broker
Storage
Security
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Server Objects
Replication
Management
XEvent Profiler
SQLQuery3.sql - HR...RITHIKA\hrith (55))*
/* Insert into Species */
INSERT INTO Species (Species_ID, Scientific_Name, Common_Name, Conservation_Status, Description)
VALUES
(1, 'Panthera leo', 'Lion', 'Vulnerable', 'Large carnivorous feline found in savannas.'),
(2, 'Ursus maritimus', 'Polar Bear', 'Vulnerable', 'Large bear species native to the Arctic Circle.'),
(3, 'Giraffa camelopardalis', 'Giraffe', 'Vulnerable', 'Tall herbivore with long neck and legs.'),
(4, 'Elephas maximus', 'Asian Elephant', 'Endangered', 'Large mammal native to South and Southeast Asia.'),
(5, 'Chelonia mydas', 'Green Sea Turtle', 'Endangered', 'Marine turtle found in tropical and subtropical seas.'),
(6, 'Haliaeetus leucocephalus', 'Bald Eagle', 'Least Concern', 'Bird of prey found in North America.'),
(7, 'Ailuropoda melanoleuca', 'Giant Panda', 'Vulnerable', 'Bear species native to China, known for black-and-white fur.'),
(8, 'Canis lupus', 'Wolf', 'Least Concern', 'Large carnivorous mammal native to Eurasia and North America.'),
(9, 'Struthio camelus', 'Ostrich', 'Least Concern', 'Large flightless bird native to Africa.'),
(10, 'Aptenodytes forsteri', 'Emperor Penguin', 'Near Threatened', 'Largest species of penguin, found in Antarctica.');
/* Insert into Sensors */
INSERT INTO Sensors (Sensor_ID, Zone_ID, Installation_Date, Sensor_Type)
VALUES
(1, 1, '02-08-2024', 'Temperature Sensor'),
(2, 2, '01-10-2024', 'Humidity Sensor'),
(3, 3, '03-08-2024', 'Precipitation Sensor'),
(4, 4, '07-05-2024', 'Wind Speed Sensor'),
(5, 5, '04-04-2024', 'Camera Sensor'),
(6, 6, '01-11-2024', 'Motion Detector'),
(7, 7, '03-21-2024', 'Acoustic Sensor'),
(8, 8, '02-13-2024', 'Pressure Sensor'),
(9, 9, '03-12-2024', 'Proximity Sensor'),
(10, 10, '01-17-2024', 'Infrared Sensor');
/* Insert into Sightings */
INSERT INTO Sightings (Sighting_ID, Species_ID, Zone_ID, Sensor_ID, Reporter_ID, Sighting_DateTime)
VALUES
(1, 1, 1, 1, 1, '2025-01-01 08:00:00'),
(2, 2, 2, 2, 2, '2025-01-03 09:00:00'),
(3, 3, 3, 3, 3, '2025-01-02 10:00:00'),
(4, 4, 4, 4, 4, '2025-01-03 11:00:00'),
(5, 5, 5, 5, 5, '2025-01-04 12:00:00'),
(6, 6, 6, 6, 6, '2025-01-06 13:00:00'),
(7, 7, 7, 7, 7, '2025-01-05 14:00:00'),
(8, 8, 8, 8, 8, '2025-01-03 15:00:00'),
(9, 9, 9, 9, 9, '2025-01-02 16:00:00'),
(10, 10, 10, 10,10,'2025-01-03 15:00:00');
SELECT * FROM Habitat_Zone;
SELECT * FROM Weather;
SELECT * FROM Citizen_Reporters;
SELECT * FROM Species;
SELECT * FROM Sensors;
SELECT * FROM Sightings;
80 %
Results
Messages
Query executed successfully.
HRITHIKA\SQLEXPRESS (16.0 RTM)
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Urban_Life_Monitoring_...
00:00:00
60 rows
Ready
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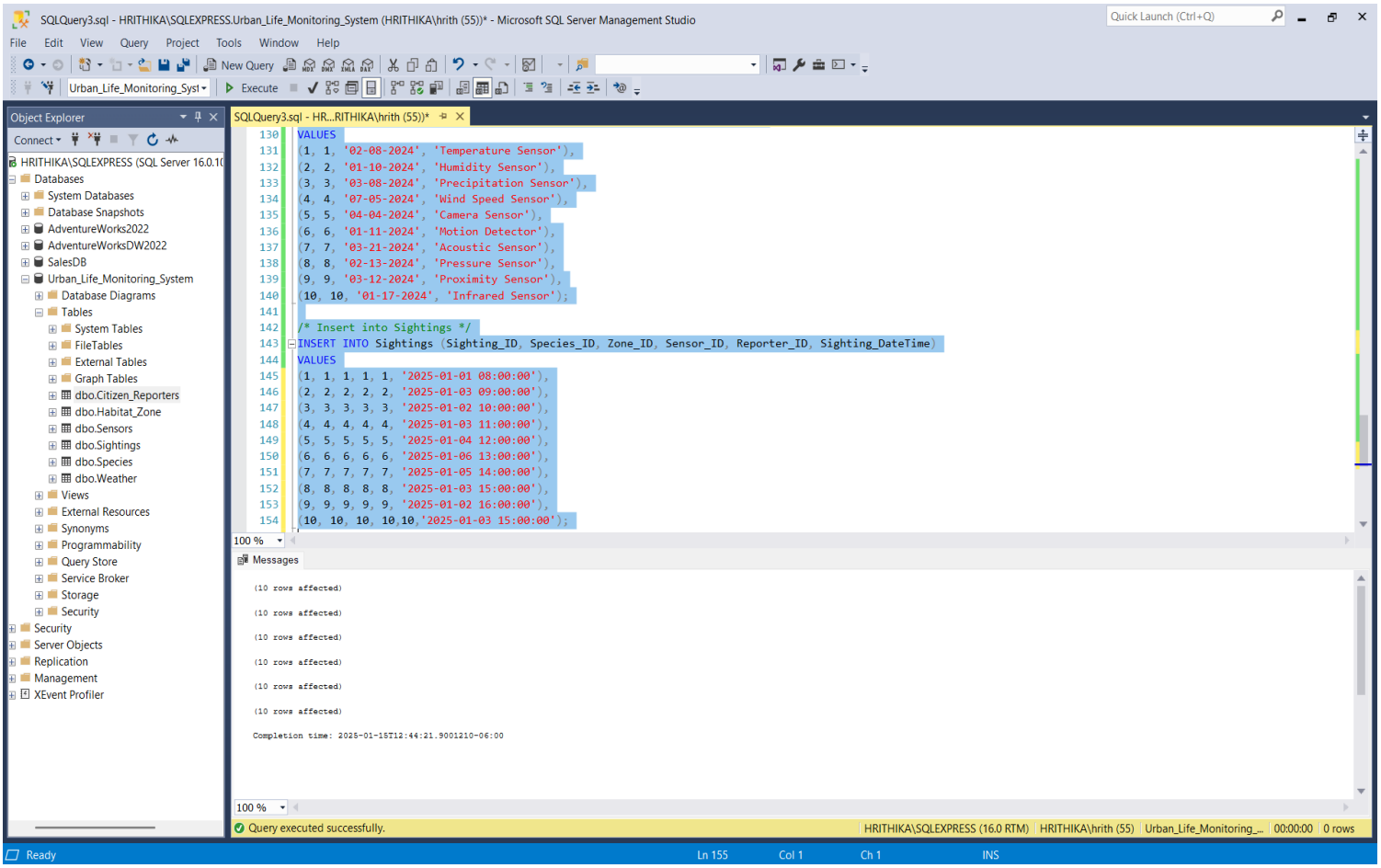
Output: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Object Explorer
SQLQuery3.sql - HR...RITHIKA\hrith (55))*
VALUES
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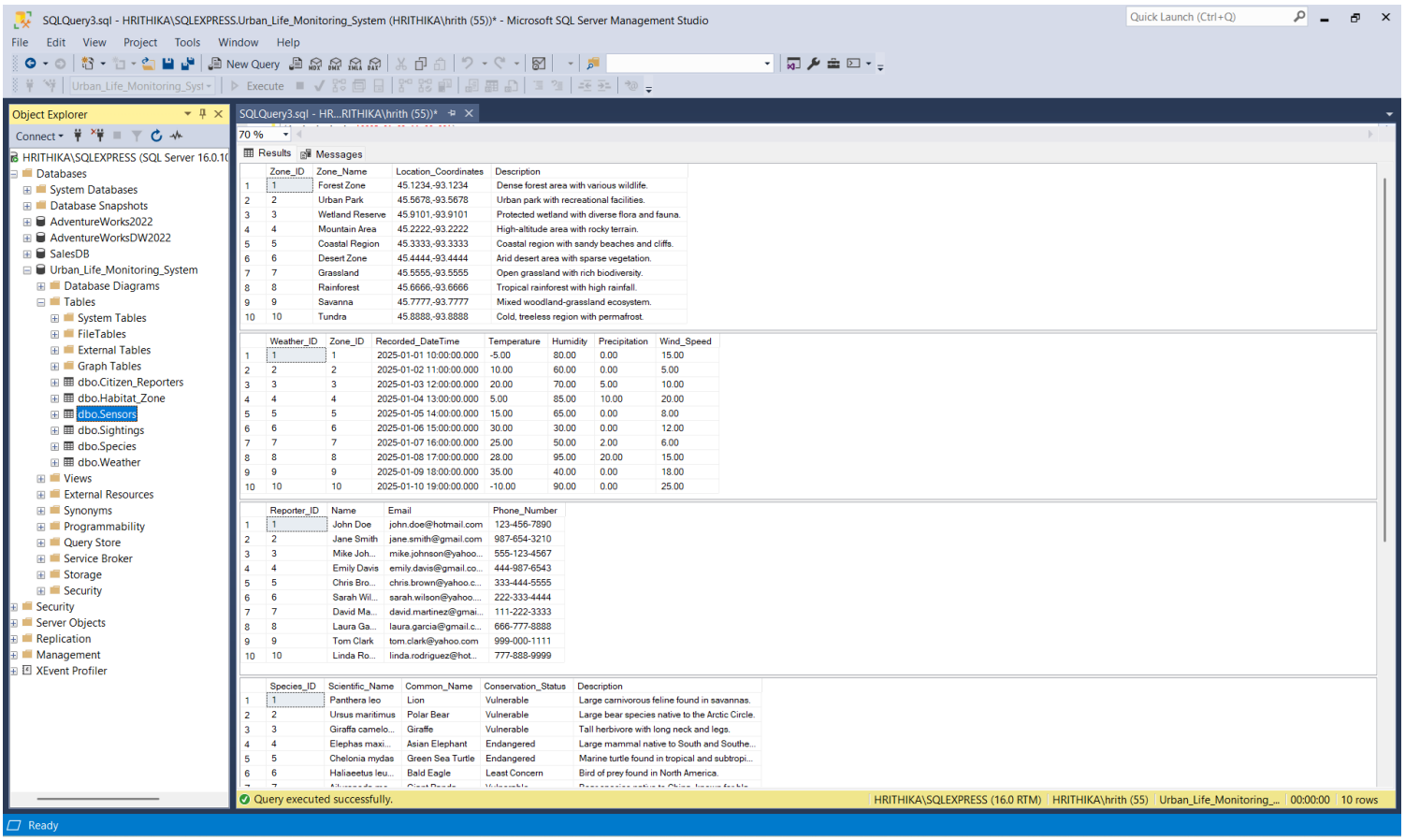
(2, 2, '01-10-2024', 'Humidity Sensor'),
(3, 3, '03-08-2024', 'Precipitation Sensor'),
(4, 4, '07-05-2024', 'Wind Speed Sensor'),
(5, 5, '04-04-2024', 'Camera Sensor'),
(6, 6, '01-11-2024', 'Motion Detector'),
(7, 7, '03-21-2024', 'Acoustic Sensor'),
(8, 8, '02-13-2024', 'Pressure Sensor'),
(9, 9, '03-12-2024', 'Proximity Sensor'),
(10, 10, '01-17-2024', 'Infrared Sensor');
/* Insert into Sightings */
INSERT INTO Sightings (Sighting_ID, Species_ID, Zone_ID, Sensor_ID, Reporter_ID, Sighting_DateTime)
VALUES
(1, 1, 1, 1, 1, '2025-01-01 08:00:00'),
(2, 2, 2, 2, 2, '2025-01-03 09:00:00'),
(3, 3, 3, 3, 3, '2025-01-02 10:00:00'),
(4, 4, 4, 4, 4, '2025-01-03 11:00:00'),
(5, 5, 5, 5, 5, '2025-01-04 12:00:00'),
(6, 6, 6, 6, 6, '2025-01-06 13:00:00'),
(7, 7, 7, 7, 7, '2025-01-05 14:00:00'),
(8, 8, 8, 8, 8, '2025-01-03 15:00:00'),
(9, 9, 9, 9, 9, '2025-01-02 16:00:00'),
(10, 10, 10, 10,10, '2025-01-03 15:00:00');
Messages
(10 rows affected)
(10 rows affected)
(10 rows affected)
(10 rows affected)
(10 rows affected)
(10 rows affected)
Completion time: 2025-01-15T12:44:21.9001210-06:00
Query executed successfully.
Ready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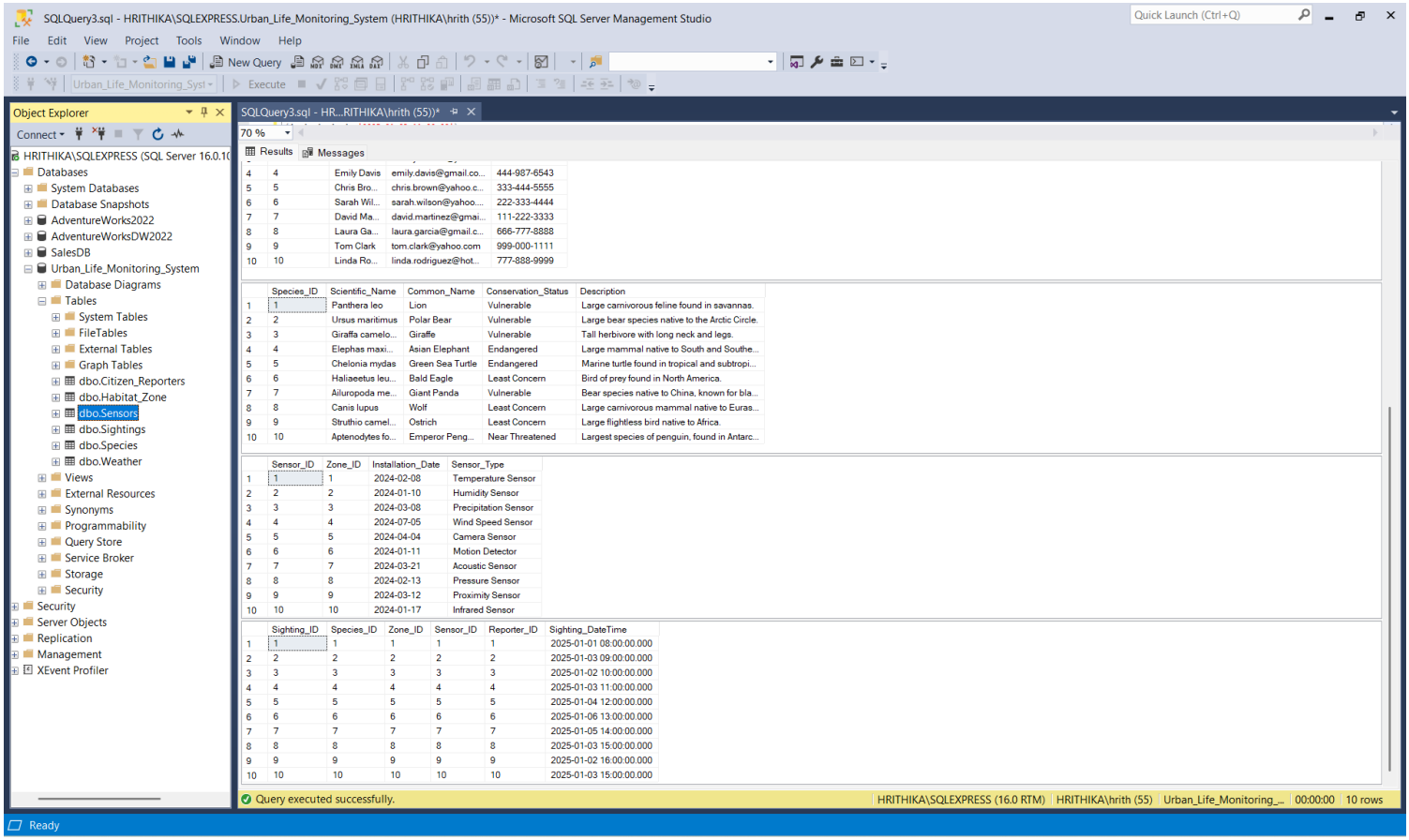
Object Explorer
SQLQuery3.sql - HR...RITHIKA\hrith (55))*
Results
Messages
Zone_ID Zone_Name Location_Coordinates Description
1 Forest Zone 45.1234,-93.1234 Dense forest area with various wildlife.
2 Urban Park 45.5678,-93.5678 Urban park with recreational facilities.
3 Wetland Reserve 45.9101,-93.9101 Protected wetland with diverse flora and fauna.
4 Mountain Area 45.2222,-93.2222 High-altitude area with rocky terrain.
5 Coastal Region 45.3333,-93.3333 Coastal region with sandy beaches and cliffs.
6 Desert Zone 45.4444,-93.4444 Arid desert area with sparse vegetation.
7 Grassland 45.5555,-93.5555 Open grassland with rich biodiversity.
8 Rainforest 45.6666,-93.6666 Tropical rainforest with high rainfall.
9 Savanna 45.7777,-93.7777 Mixed woodland-grassland ecosystem.
10 Tundra 45.8888,-93.8888 Cold, treeless region with permafrost.
Weather_ID Zone_ID Recorded_DateTime Temperature Humidity Precipitation Wind_Speed
1 1 2025-01-01 10:00:00.000 -5.00 80.00 0.00 15.00
2 2 2025-01-02 11:00:00.000 10.00 60.00 0.00 5.00
3 3 2025-01-03 12:00:00.000 20.00 70.00 5.00 10.00
4 4 2025-01-04 13:00:00.000 5.00 85.00 10.00 20.00
5 5 2025-01-05 14:00:00.000 15.00 65.00 0.00 8.00
6 6 2025-01-06 15:00:00.000 30.00 30.00 0.00 12.00
7 7 2025-01-07 16:00:00.000 25.00 50.00 2.00 6.00
8 8 2025-01-08 17:00:00.000 28.00 95.00 20.00 15.00
9 9 2025-01-09 18:00:00.000 35.00 40.00 0.00 18.00
10 10 2025-01-10 19:00:00.000 -10.00 90.00 0.00 25.00
Reporter_ID Name Email Phone_Number
1 John Doe john.doe@hotmail.com 123-456-7890
2 Jane Smith jane.smith@gmail.com 987-654-3210
3 Mike Joh... mike.johnson@yahoo... 555-123-4567
4 Emily Davis emily.davis@gmail.co... 444-987-6543
5 Chris Bro... chris.brown@yahoo.c... 333-444-5555
6 Sarah Wil... sarah.wilson@yahoo.... 222-333-4444
7 David Ma... david.martinez@gmai... 111-222-3333
8 Laura Ga... laura.garcia@gmail.c... 666-777-8888
9 Tom Clark tom.clark@yahoo.com 999-000-1111
10 Linda Ro... linda.rodriguez@hot... 777-888-9999
Species_ID Scientific_Name Common_Name Conservation_Status Description
1 Panthera leo Lion Vulnerable Large carnivorous feline found in savannas.
2 Ursus maritimus Polar Bear Vulnerable Large bear species native to the Arctic Circle.
3 Giraffa camelo... Giraffe Vulnerable Tall herbivore with long neck and legs.
4 Elephas maxi... Asian Elephant Endangered Large mammal native to South and Southe...
5 Chelonia mydas Green Sea Turtle Endangered Marine turtle found in tropical and subtropi...
6 Haliaeetus leu... Bald Eagle Least Concern Bird of prey found in North America.
Query executed successfully.
Ready



4	4	Emily Davis	emily.davis@gmail.co...	444-987-6543
5	5	Chris Bro...	chris.brown@yahoo.c...	333-444-5555
6	6	Sarah Wil...	sarah.wilson@yahoo....	222-333-4444
7	7	David Ma...	david.martinez@gmai...	111-222-3333
8	8	Laura Ga...	laura.garcia@gmail.c...	666-777-8888
9	9	Tom Clark	tom.clark@yahoo.com	999-000-1111
10	10	Linda Ro...	linda.rodriguez@hot...	777-888-9999

	Species_ID	Scientific_Name	Common_Name	Conservation_Status	Description
1	1	Panthera leo	Lion	Vulnerable	Large carnivorous feline found in savannas.
2	2	Ursus maritimus	Polar Bear	Vulnerable	Large bear species native to the Arctic Circle.
3	3	Giraffa camelo...	Giraffe	Vulnerable	Tall herbivore with long neck and legs.
4	4	Elephas maxi...	Asian Elephant	Endangered	Large mammal native to South and Southe...
5	5	Chelonia mydas	Green Sea Turtle	Endangered	Marine turtle found in tropical and subtropi...
6	6	Haliaeetus leu...	Bald Eagle	Least Concern	Bird of prey found in North America.
7	7	Ailuropoda me...	Giant Panda	Vulnerable	Bear species native to China, known for bla...
8	8	Canis lupus	Wolf	Least Concern	Large carnivorous mammal native to Euras...
9	9	Struthio camel...	Ostrich	Least Concern	Large flightless bird native to Africa.
10	10	Aptenodytes fo...	Emperor Peng...	Near Threatened	Largest species of penguin, found in Antarc...

	Sensor_ID	Zone_ID	Installation_Date	Sensor_Type
1	1	1	2024-02-08	Temperature Sensor
2	2	2	2024-01-10	Humidity Sensor
3	3	3	2024-03-08	Precipitation Sensor
4	4	4	2024-07-05	Wind Speed Sensor
5	5	5	2024-04-04	Camera Sensor
6	6	6	2024-01-11	Motion Detector
7	7	7	2024-03-21	Acoustic Sensor
8	8	8	2024-02-13	Pressure Sensor
9	9	9	2024-03-12	Proximity Sensor
10	10	10	2024-01-17	Infrared Sensor

	Sighting_ID	Species_ID	Zone_ID	Sensor_ID	Reporter_ID	Sighting_DateTime
1	1	1	1	1	1	2025-01-01 08:00:00.000
2	2	2	2	2	2	2025-01-03 09:00:00.000
3	3	3	3	3	3	2025-01-02 10:00:00.000
4	4	4	4	4	4	2025-01-03 11:00:00.000
5	5	5	5	5	5	2025-01-04 12:00:00.000
6	6	6	6	6	6	2025-01-06 13:00:00.000
7	7	7	7	7	7	2025-01-05 14:00:00.000
8	8	8	8	8	8	2025-01-03 15:00:00.000
9	9	9	9	9	9	2025-01-02 16:00:00.000
10	10	10	10	10	10	2025-01-03 15:00:00.000