

UNIT – IV

Surface and Sub-surface Investigation

1. Introduction

Groundwater exploration methods are used to locate and evaluate groundwater resources.

Objectives

- Locate aquifers
 - Determine groundwater depth
 - Assess groundwater quality and quantity
 - Identify recharge zones
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2. Surface Methods of Exploration

2.1 Electrical Resistivity Method

Based on variation of electrical resistance of subsurface materials.

Principle

- Saturated rocks have lower resistivity
- Dry rocks have higher resistivity

Applications

- Locate groundwater
- Determine depth to bedrock
- Identify fractures

Advantages

- Economical
- Rapid investigation
- Suitable for groundwater surveys

Limitations

- Difficult interpretation
 - Influenced by salinity
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2.2 Seismic Refraction Method

Uses seismic waves to identify subsurface formations.

Principle

Velocity of seismic waves changes with rock type.

Applications

- Determine depth of rock layers
 - Identify fractures and faults
 - Groundwater exploration
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3. Subsurface Methods

3.1 Geophysical Logging

Recording physical properties inside boreholes.

Types of Logs

- Electrical log
- Resistivity log
- Gamma log
- Neutron log

Uses

- Identify aquifers
- Determine lithology
- Estimate water quality

3.2 Resistivity Logging

Measures resistance of formations around boreholes.

Applications

- Determine groundwater zones
- Identify saline water intrusion

4. Artificial Recharge of Groundwater

Artificial recharge is the intentional increase of groundwater storage.

Objectives

- Increase groundwater levels
- Improve water quality
- Prevent seawater intrusion
- Store excess rainwater

5. Methods of Artificial Recharge

Surface Spreading Methods

- Percolation tanks
- Recharge basins
- Flooding methods

Subsurface Methods

- Recharge wells
- Injection wells
- Recharge shafts

6. Advantages of Artificial Recharge

- Reduces water scarcity
 - Prevents decline of water table
 - Improves groundwater quality
 - Reduces flooding
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7. GIS and Remote Sensing in Groundwater

GIS (Geographical Information System)

Used for storing and analyzing spatial data.

Remote Sensing

Collection of information from satellite images.

Applications

- Groundwater potential mapping
 - Watershed management
 - Artificial recharge planning
 - Monitoring groundwater depletion
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8. Case Studies of Artificial Recharge

Example Measures

- Check dams
- Percolation ponds
- Recharge trenches
- Rooftop rainwater harvesting

Benefits

- Rise in groundwater table
- Improved irrigation supply
- Increased well yield