

Hydrogeology of Indian Coalfields

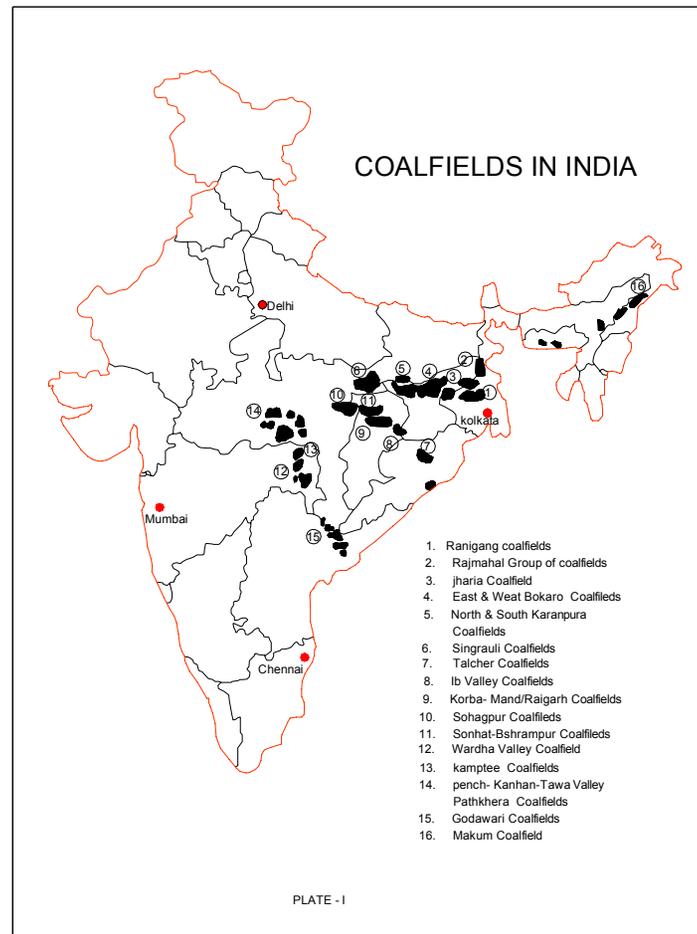
Anand Mohan

Central Mine Planning & Design Institute Ltd.

Hydrogeology of Indian Coalfields

- Coal occurrences in India are mainly confined to present day river Valleys
- Damodar Valley,
- Son Mahanadi Valley,
- Pench- Kanhan Valley,
- Wardha Godavari Valley.
- Bulk of coal reserves are confined to the south-eastern quadrant of the country in west Bengal, Bihar, Jharkhand Orissa, Chhatisgarh and eastern Madhya Pradesh

Hydrogeology of Indian Coalfields



COAL AND LIGNITE RESOURCES IN INDIA

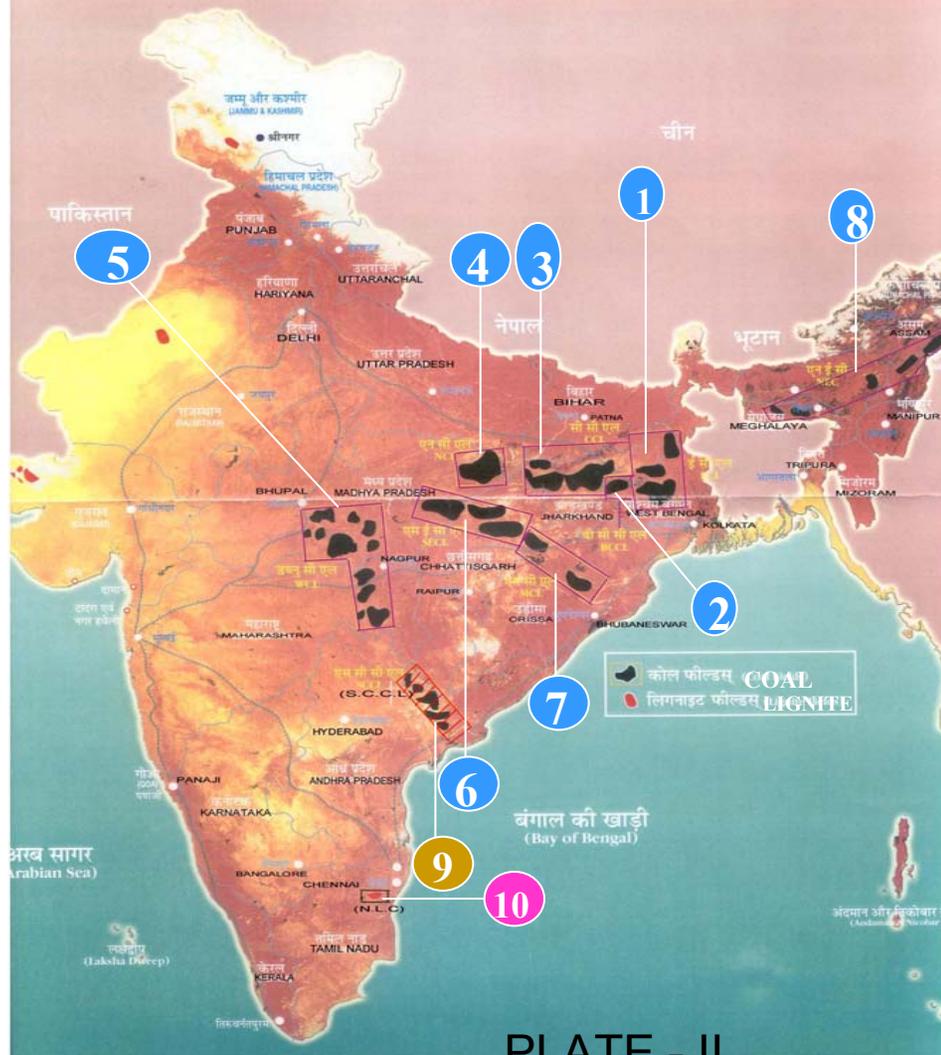


PLATE - II

CIL : COAL PRODUCING SUBSIDIARIES

- EASTERN COALFIELDS LTD. (1)
- BHARAT COKING COAL LTD. (2)
- CENTRAL COALFIELDS LTD. (3)
- NORTHERN COALFIELDS LTD. (4)
- WESTERN COALFIELDS LTD. (5)
- SOUTH EASTERN COALFIELDS LTD. (6)
- MAHANADI COALFIELDS LTD. (7)
- NORTH EASTERN COALFIELDS. (8)
- (A UNIT UNDER CIL(HQ))

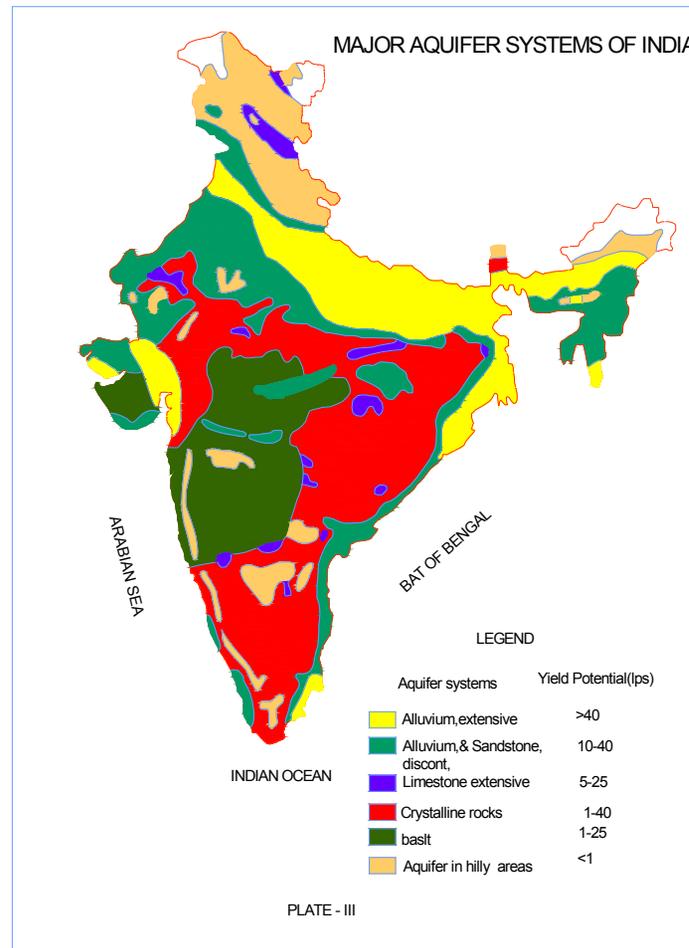
SINGARENI COLLIERIES CO. LTD (9)

NEYVELI LIGNITE CORPORATION (10)

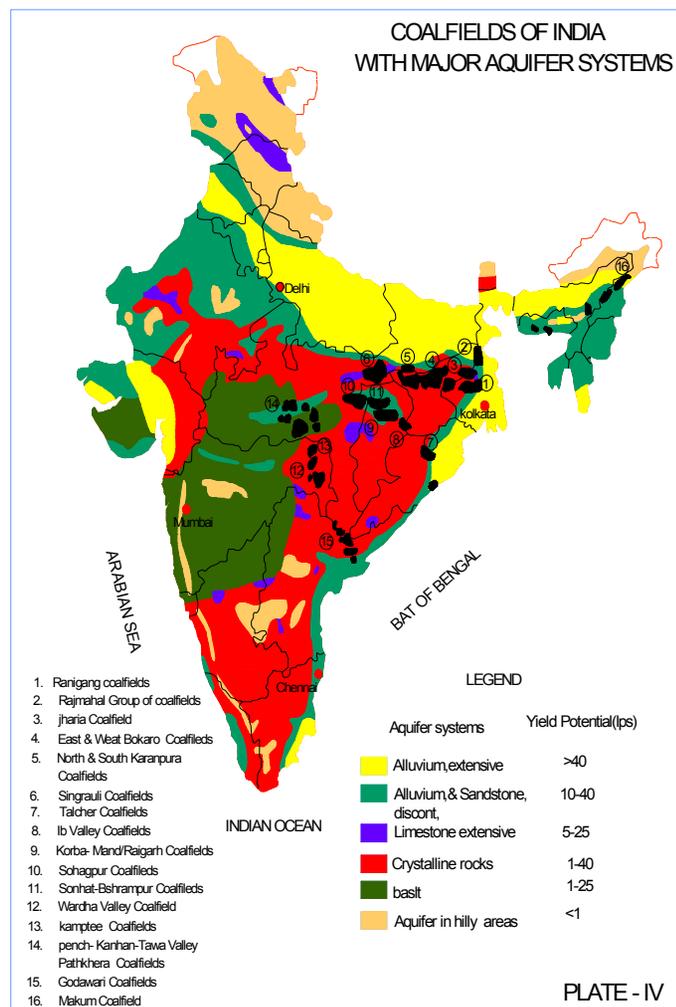
Hydrogeology of Indian Coalfields

- **Ground Water Regime**
 - Based on geology, occurrence of Ground water may be divided into different provinces
 - Extra Peninsula,
 - Peninsula and
 - Indo-gangetic plain
- **Aquifer system**
 - the major Aquifer system of India based on different geological formation

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❖ Occurrence of Ground water

1. Hard rock/consolidated formations

- a) Volcanic rocks
- b) Carbonate rocks
- c) Non-carbonate non-volcanic crystalline rocks or Hard rock

2. Porous rock formations.

- a) Unconsolidated formation and
- b) Semi-consolidated formation.

Hydrogeological units in Indian Coalfields

1. Consolidated formations

Geological Age		Formation	States/hydrogeological character
Jurassic/ Upper cretaceous to Ecocene	Rajmahal Traps, Deccan Traps	Basalts & dolerites	WB, Bihar, Jharkhand, Maharashtra. Well yield up to 5lps. $K = 0.1-15m/d$
Pre-cambrian	Vindhyan	Sst, Sh, lime stone	UP, Bihar, Jharkhand, Chhattisgarh. $K = 0.02-10m/d$

Hydrogeological units in Indian Coalfields

2.Semi-consolidated formations

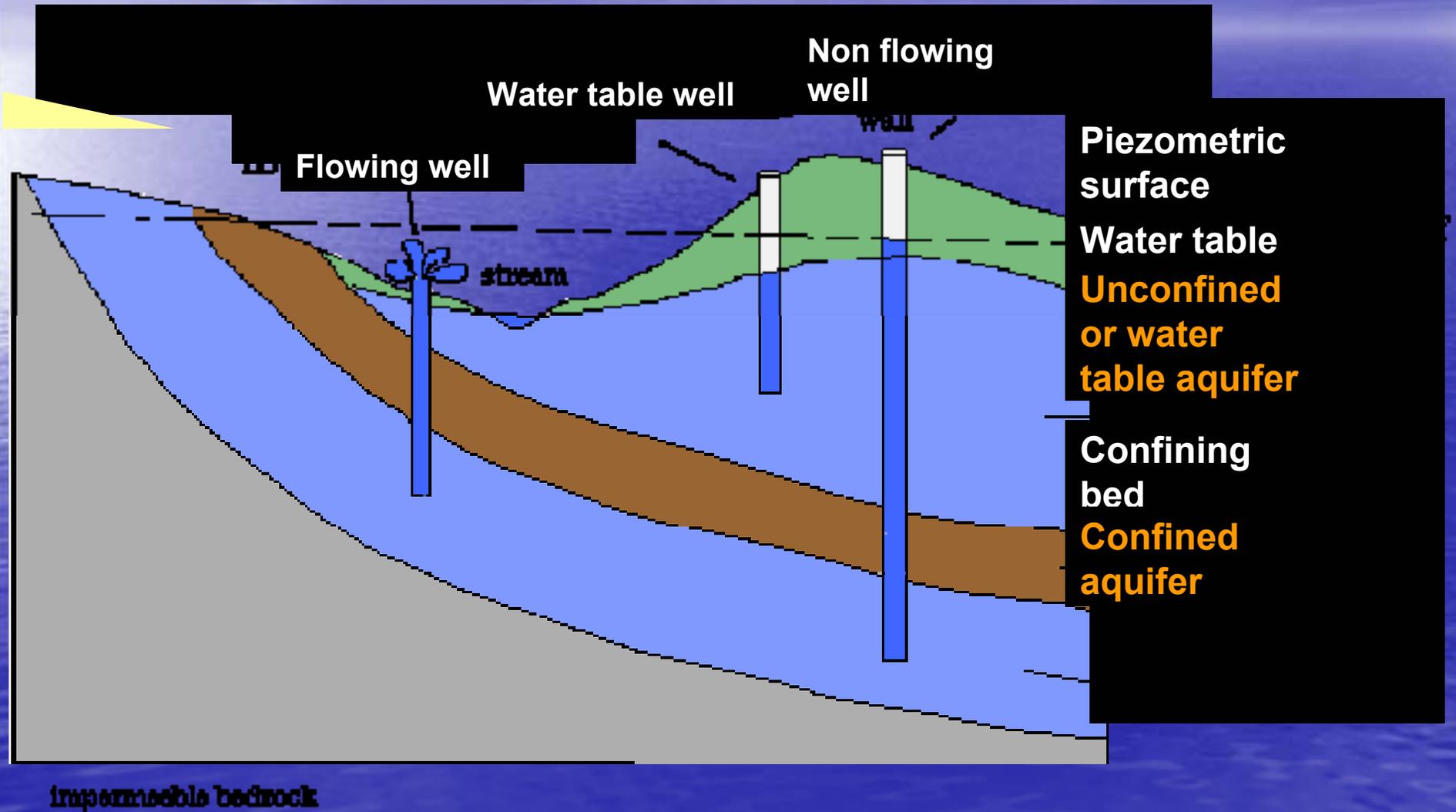
Geological Age		Formation	States/hydrogeological character
Tertiary		Shale,carb.sh , coal, sst, pebble & boulder bed	Assam, UP, J&K,Sikkim, Rajasthan, Gujarat, TN,WB.Well yield up to 28lps.
Upper Carboniferous to Jurrasic	Gondwana	Sst,Shale, coal seams	UP,Bihar,Jharkhand, Chhattisgarh, Maharashtra,Orissa, Gujarat, Rajasthan & TN. K =0.5-50m/d, well yield up to 14lps

Hydrogeological units in Indian Coalfields

3.Un-consolidated formations

Geological Age		Formation	States/hydrogeological character
Recent	Alluvial Plains	Clay,silt, ,gravel,sand, peat, coal & organic matter	Indo-Gangetic , Brahmaputra & Godavari Alluvial Plains. K=10-100, well yield=5to 67 lps

Confined and Unconfined aquifers



Hydrogeology of Indian Coalfields

❖ A Case Study

▪ Underground Coal Gasification Project Merta Road Rajasthan

- analysis of the hydrogeological data of the experimental site, the following conclusions were drawn -
- the hydrogeological conditions of the experimental site has changed considerably due to extensive water pumping resulting in drawdown in aquifer 'A' (saturated thickness 4 m).
- No need of dewatering operation in Aquifer 'A'
- Aquifer 'B' below Lignite seam is multilayered thick system
- Advanced dewatering required for Aquifer 'B',

Hydrogeology of Indian Coalfields

❖ A Case Study contd.....

- The hydraulic conductivity and storativity of Aquifer 'B' is 0.0008m/day & 0.002 respectively
- Environmental protection measures needed against water contamination

LITHOLOGICAL CROSS SECTION OF MERTA ROAD AREA RAJASTHAN

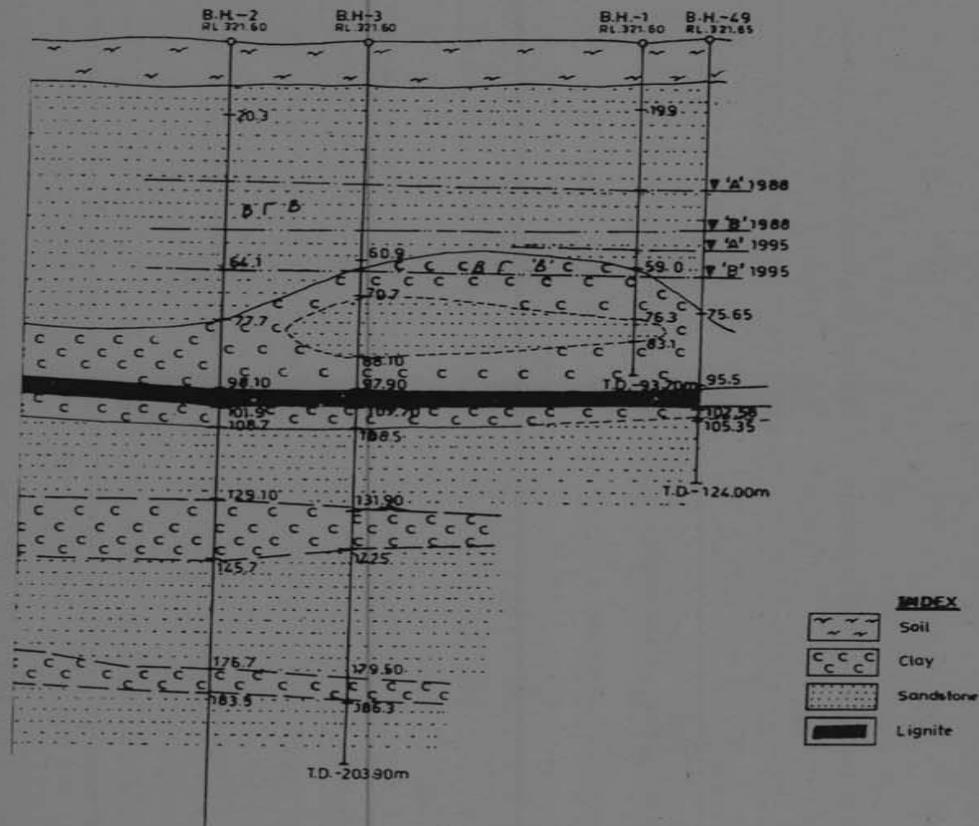


FIG- I'

Hydrogeology of Indian Coalfields

- Ground water Modelling
 - " Modelling and control of water systems in coal Mining Environment " done for Wardha Valley Coalfield.
 - Hydraulic demarcation between Kamthis & Barakars intermingled
 - Depletion of groundwater effect is confined to 500-1000m down dip
 - In UG mine depletion is insignificant.

Hydrogeology of Indian Coalfields

CONCLUSIONS

- Coal India is the pioneer organization to establish ground water regime of Indian Coalfields.
- Indian Coalfields are normally bounded by crystalline rocks. The hydraulic conductivity of crystalline rocks varies from 0.1 to 1.5 m/day and yield ranges from 42 to 250 m³/day.
- The aquifer in Indian Coal bearing formation is mostly constitutes Gondwana sandstone. The hydraulic conductivity ranges from 0.5 to 50m/day and yield ranges from 84 to 1176m³/day

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CONCLUSIONS

- The Indian coal mostly acts as aquitard having hydraulic conductivity ranging from 0.005 to 0.03 m/day.
- In underground mining the estimation of mine water inflow under caving condition in Wardha valley, Sohagpur and Ib Valley Coalfields had been done in selected mines. The mine water inflow ranges from 550m³/day to 5000m³/day.

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CONCLUSIONS

- In open pit mining the advance dewatering operation in selected mines of Indian Coalfields viz. Rajmahal (ECL), Wardha Valley (WCL) Singrauli (NCL) have been done. The advance pumping from the respective mines ranges from 5000 to 60000 m³/day.
- The problem related to environmental impact likely to be caused by ground water pumping during active mining is being addressed.

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CONCLUSIONS

- To identify the problem of depletion of ground water due to mining , hydrographic monitoring stations has been established in Indian Coalfields and monitoring of water levels , four times in a year viz January, May, August and November is being done as per guidelines of Ministry of Environment and Forest (MoEF) Govt. of India
- Problem of ground water depletion, once identified the remedial measure is undertaken to augment water level by implementing artificial recharge system such as Rain water harvesting, Creation of water lagoon in mined out region and recharge through abandoned tube wells.

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CONCLUSIONS

- All efforts are being made to restore original water table by land reclamation and sand stowing after the closure of open pit and underground mine respectively to accelerate recharge of ground water system of the area.

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Thank You