Rainwater Management in Urban & Industrial Catchments- Case Studies

By

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Rainwater Harvesting and Artificial Recharge Projects Executed

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BENEFICIARIES

- **IIT Kharagpur**
- **Bharatiya Reserve Bank Note Mudran Ltd., Salboni, W.B**
- **National Aluminum Company Ltd., Damanjodi, Orissa**
- **Arati Steel Ltd., Ghantikal, Cuttack, Orissa**
- **Guali Iron Ore Mines, Keonjhar, Orissa**
- **Nuagaon Iron Ore Mines, Keonjhar, Orissa**
- **Utkal Asbestos Ltd. (UAL) Bengal**
- **Tata Metaliks, Kharagpur**
- **Bokaro Steel Ltd., SAIL, Jharkhand**

IIT Kharagpur Campus

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WATER BALANCE OF IIT KHARAGPUR CAMPUS

- Present rate of consumption of water by the campus = 1.0 Million Gallons per day (MGD) = 4.5×10^3 m^3
- Annual consumption of water = $365 \times 4.5 \times 10^3$ = 1.6×10^6 m^3
- Assuming 20% loss in the supply, the per capita consumption in the campus is ($4.5 \times 0.8 \times 10^3$)/13500 = 267 L/d
- Total campus area = 720 ha = 7.2×10^6 m^2
- Annual average rainfall = 1200 mm = 1.2 m
- Monsoon rainfall = approximately 80% of 1.2 m = 0. 96 m
- Assuming 50% of the rainfall as runoff = 0.48 m
- The total volume of runoff = $7.2 \times 10^6 \times 0.48 = 3.456 \times 10^6$ m^3
- $\cong 3.5 \times 10^6$ m^3 (more than double of the annual water consumption of campus)

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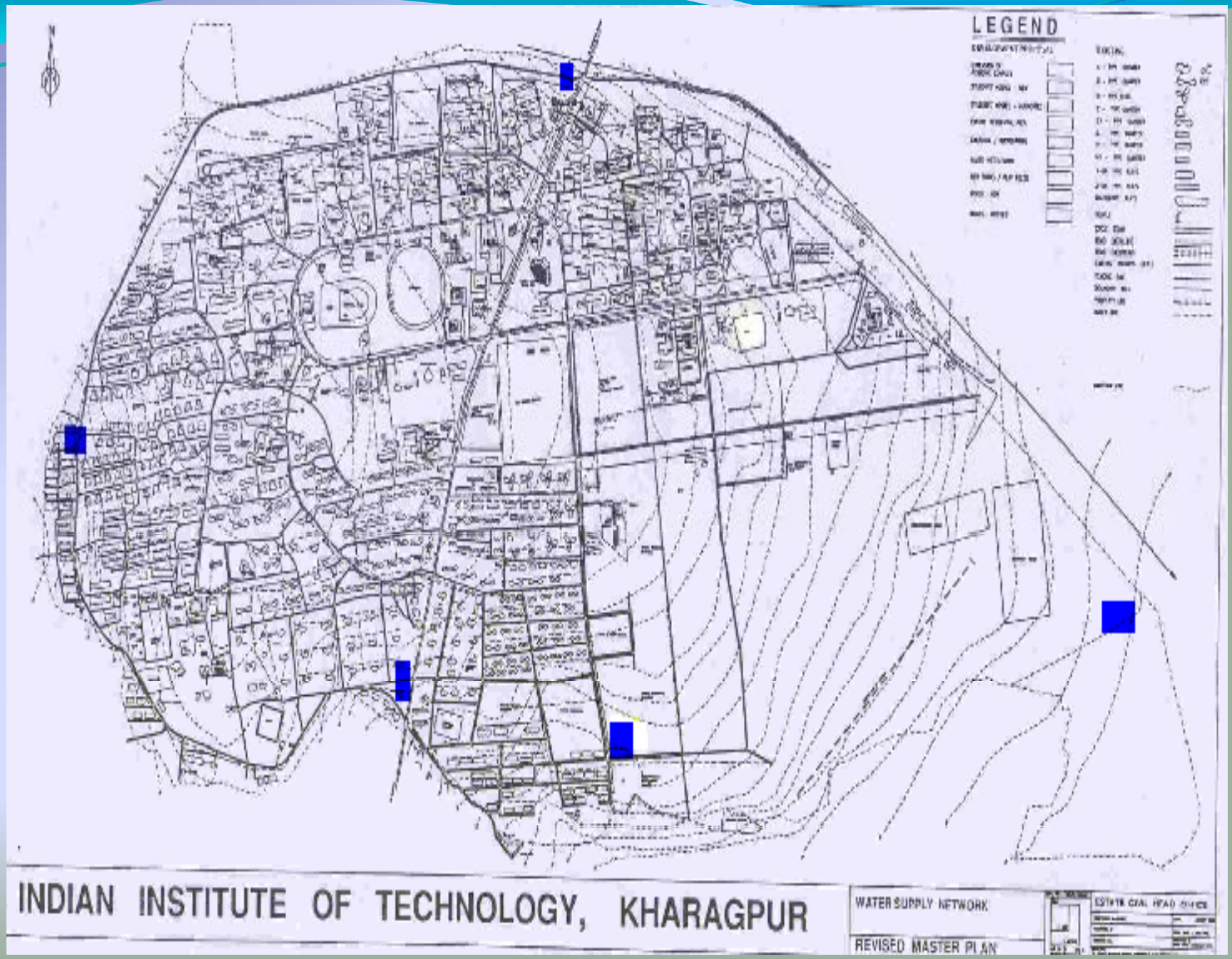

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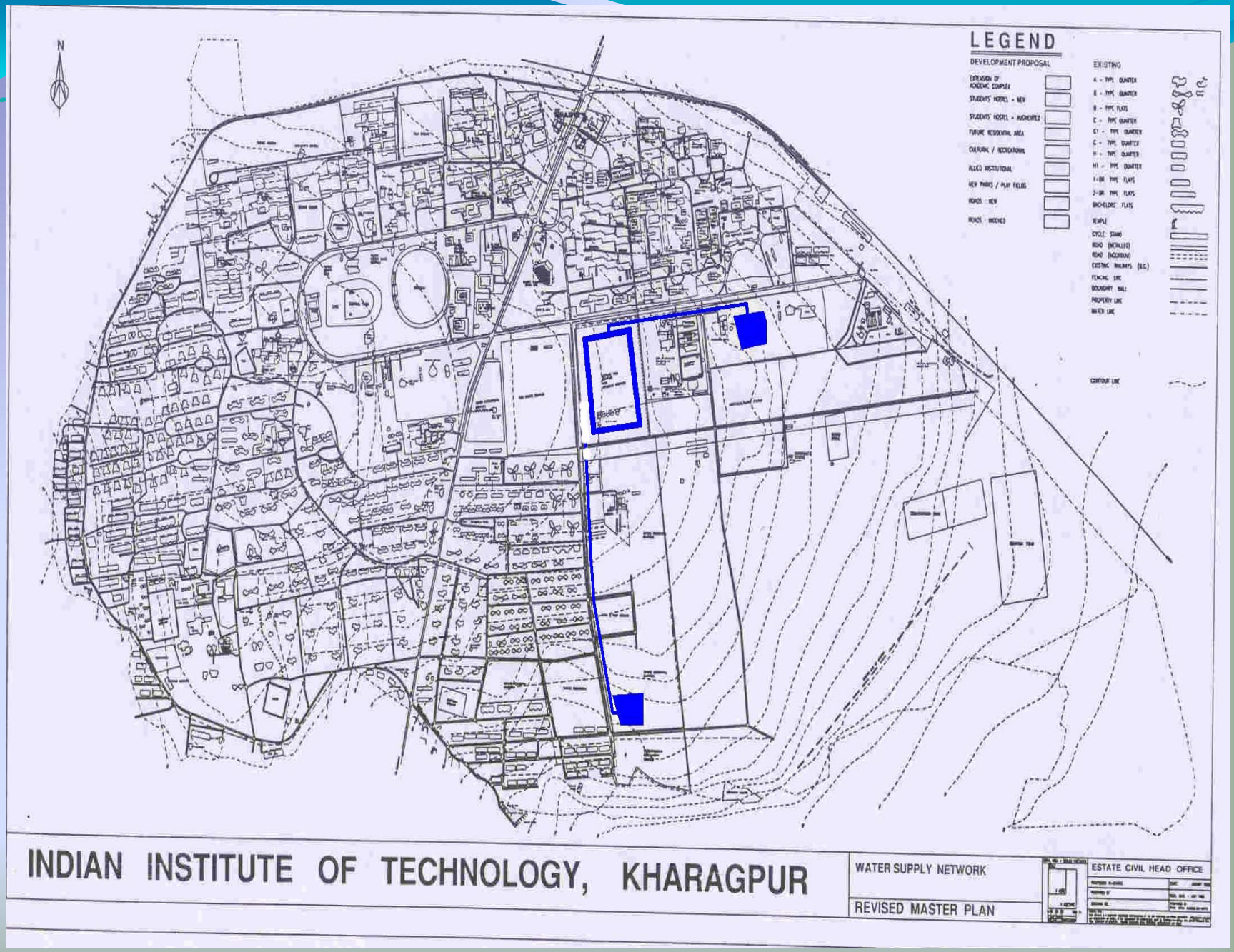

OBJECTIVES

- As a pilot project, collection of rainwater from the rooftops of three big buildings in the new academic complex of the Institute and recharging the the ground water reservoir (aquifer) with the harvested water through recharging well after treatment and filtration

- As a pilot project, harvesting a portion of surface runoff of the campus at an outlet, storing it in a tank and recharging the aquifer through a pit and well after treatment and filtration

- Monitoring the effect of recharge on the aquifer(s) in terms of rise in ground water table, through piezometers and existing tubewells.

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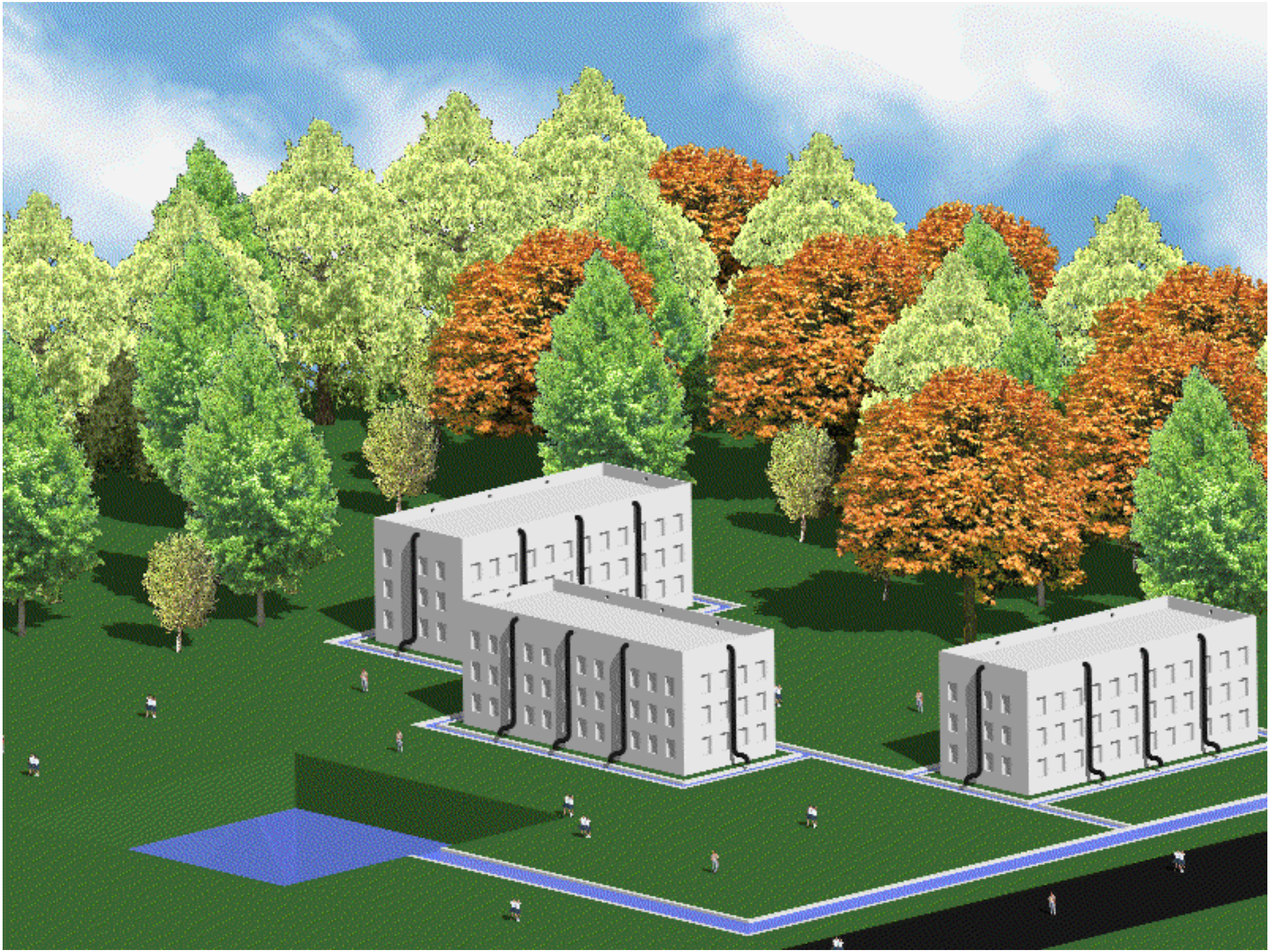

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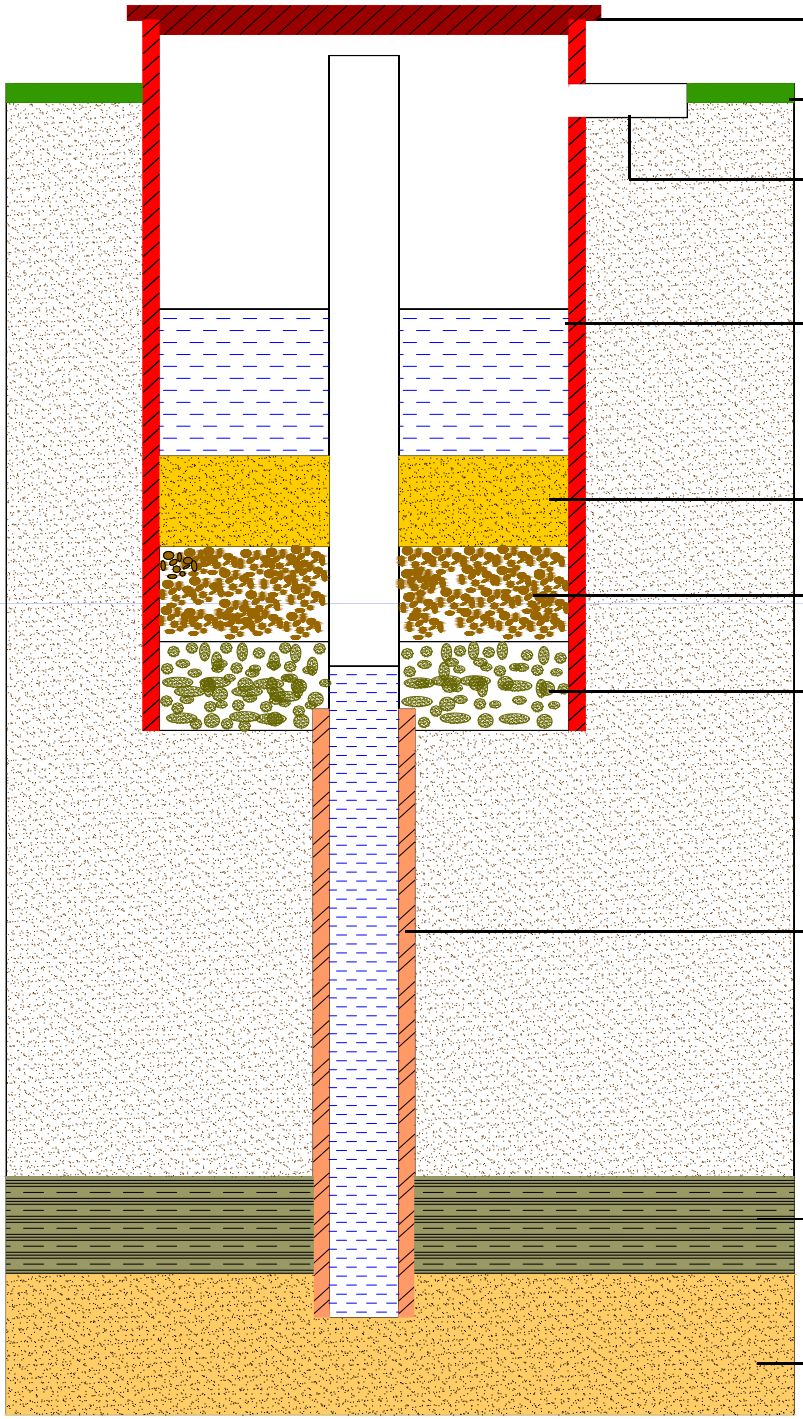

BRBNMPL Campus Salboni

- BRBNML campus is at a distance of 35 km from Kharagpur
- It is surrounded by thick vegetation. The fenced area of the campus is 580 acres (232 ha).
- The campus has a rolling topography. The difference in elevation is about 15m.
- The surface runoff flows quickly out of the campus in south and east directions

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- **The campus population depends solely on the ground water source.**
- **The daily water consumption is 1200 m^3, which is supplied by 6 bore wells located in the campus.**
- **Though well logs revealed very good ground-water potential, the water level is depleting fast**
- **The only way to replenish the aquifer to attain sustainability is by artificial recharge**
- **Therefore a comprehensive rainwater-**

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- **Conservative estimate shows that the amount of rainwater that goes out of the campus as runoff is more than 3 times the annual water consumption of the campus.**

- **Therefore if a portion of this runoff could be harvested and used for recharging the aquifer, a permanent solution to water shortage problem of future could be attained.**

BRBNMPL Contd…

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OBJECTIVES

- Conveyance of runoff water through unlined and lined drains up to the outlets
- Harvesting of surface runoff of the campus at four outlets, through rainwater harvesting tanks and recharging through wells after proper filtration
- To study the effect of recharge in terms of rise in ground water table, monitored through piezometers/ existing tube wells at different locations of the campus.

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ARATI Steel Ltd

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- The company has a campus of about 722 acre at Ghantikal near Cuttack, where manufacturing of alloy steel is carried out
- Rainwater Harvesting is important since water is transported from the Mahanadi River at a distance of about 4 km
- Runoff water is to be stored in surface reservoirs-cum-settling tanks in series and pumped to the raw water reservoir for reuse
- Rooftop rainwater is to be harvested and reused for recharging the aquifer through artificial techniques.

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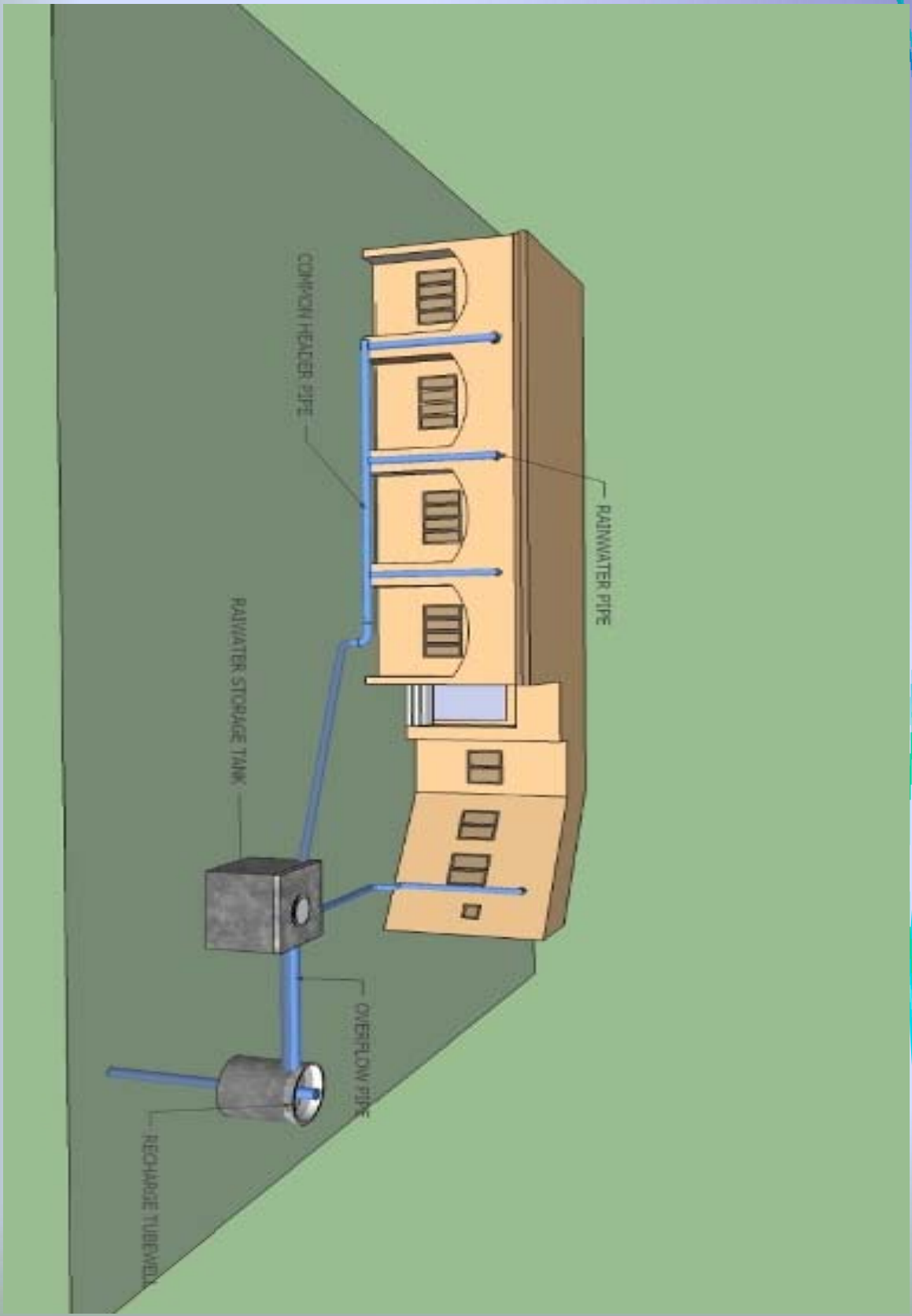

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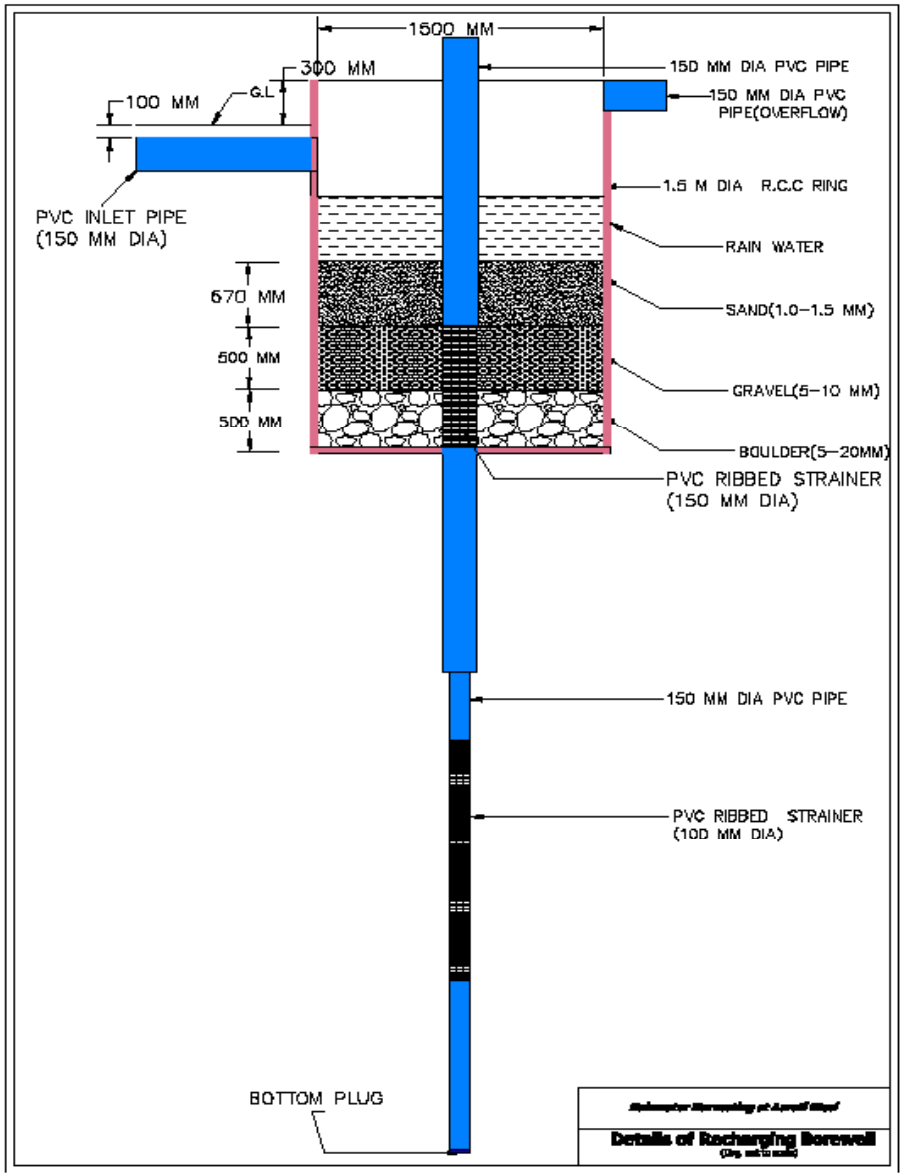

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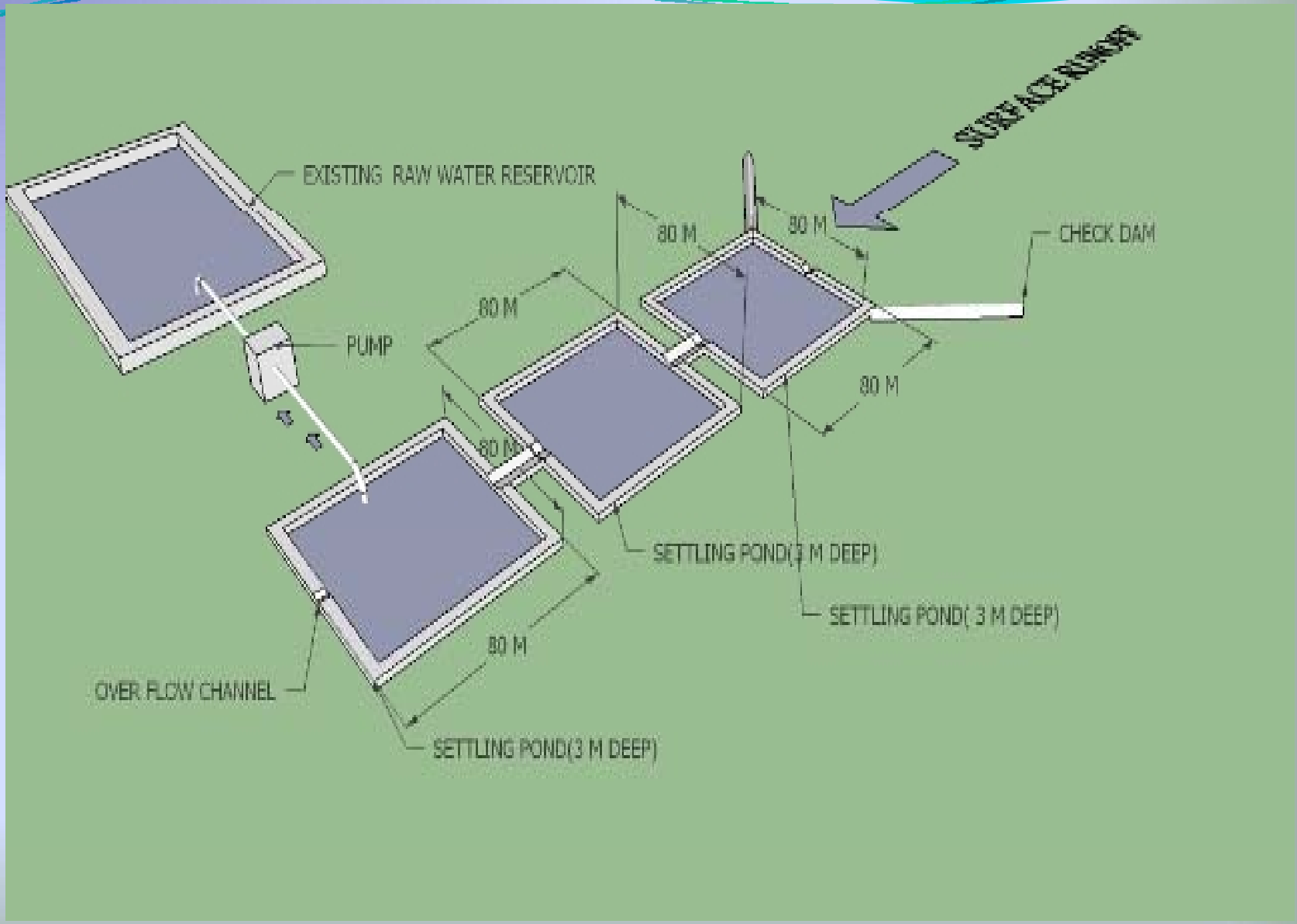

RWH for Nuagaon Iron Ore Mines
(Neelachal High School), Keonjhar, Odisha

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- **Rainwater Harvesting Project for the Nilanchal High School under Nuagaon Iron Ore Mines was important due to the requirement for augmenting the aquifer through artificial recharge**

- **It appears that the ground water table is depleting over the years due to extensive use of ground water for mining, domestic and other uses in the vicinity of Nilanchal High School.**

- **Therefore rainwater was harvested from the roofs of 3 buildings and used for recharging the aquifer artificially after filtration.**


INTEGRATED WATERSHED MANAGEMENT PROGRAM
WATER HARVESTING STRUCTURE

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RWH for the New Camp of Guali Iron Ore Mines, Keonjhar, Odisha

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- RWH for the New Camp under Guali Iron Ore Mines was significant not due to the immediate necessity but due to the long term requirement of augmenting the potential of aquifer by artificial recharge
- Though it appears that ground water table is very near to the surface; it is deceptive. It could be a perched aquifer which is of low potential and will not last long
- Therefore, rainwater from the corrugated roofs of 3 buildings were harvested and used for recharging the aquifer artificially after filtration.

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RWH for NALCO, Damanjudi

- **The National Aluminum Company needs large quantum of water for its present and future use. The existing shallow aquifer is of volatile nature**

- **The potential of the deeper aquifer therefore was to be augmented, so that this would be a sustainable and dependable source**

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RWH NALCO contd..

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MAJOR GOAL

- **Design of RWH Systems for utilization of rainwater from the rooftops of four big buildings of NALCO such as: Administrative building, Training Centre, New Guest House and the Saraswati Vidya Mandir School**

ESTIMATED COST

- **Administrative Building: Rs.6,43,639**
- **Training Centre: Rs.1,85,859**
- **New Guest House: Rs.1,18,684**
- **Sarswati Vidya Mandir School: Rs.3,37,733**

Grand Total: Rs.12, 85,915

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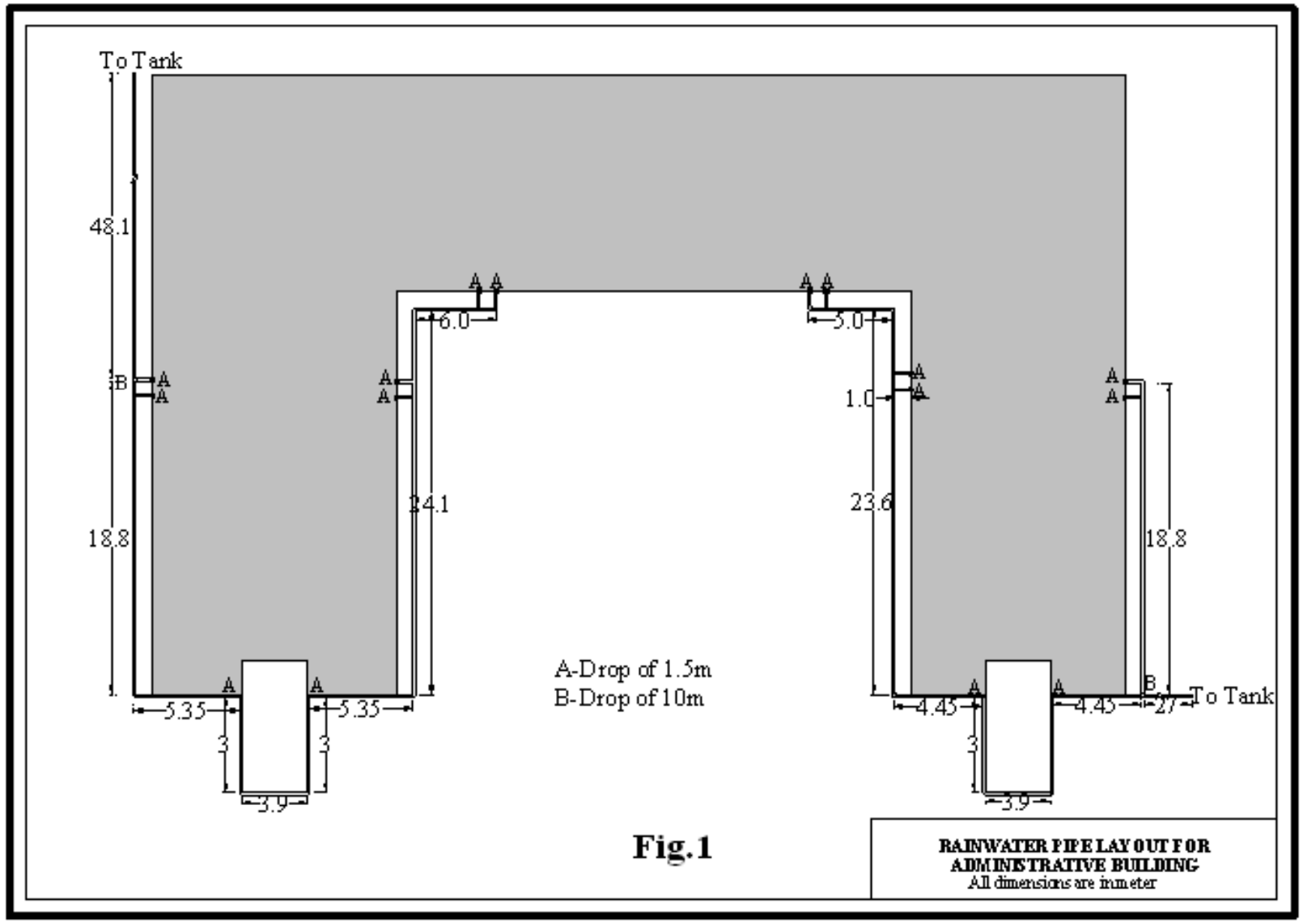

Fig.1

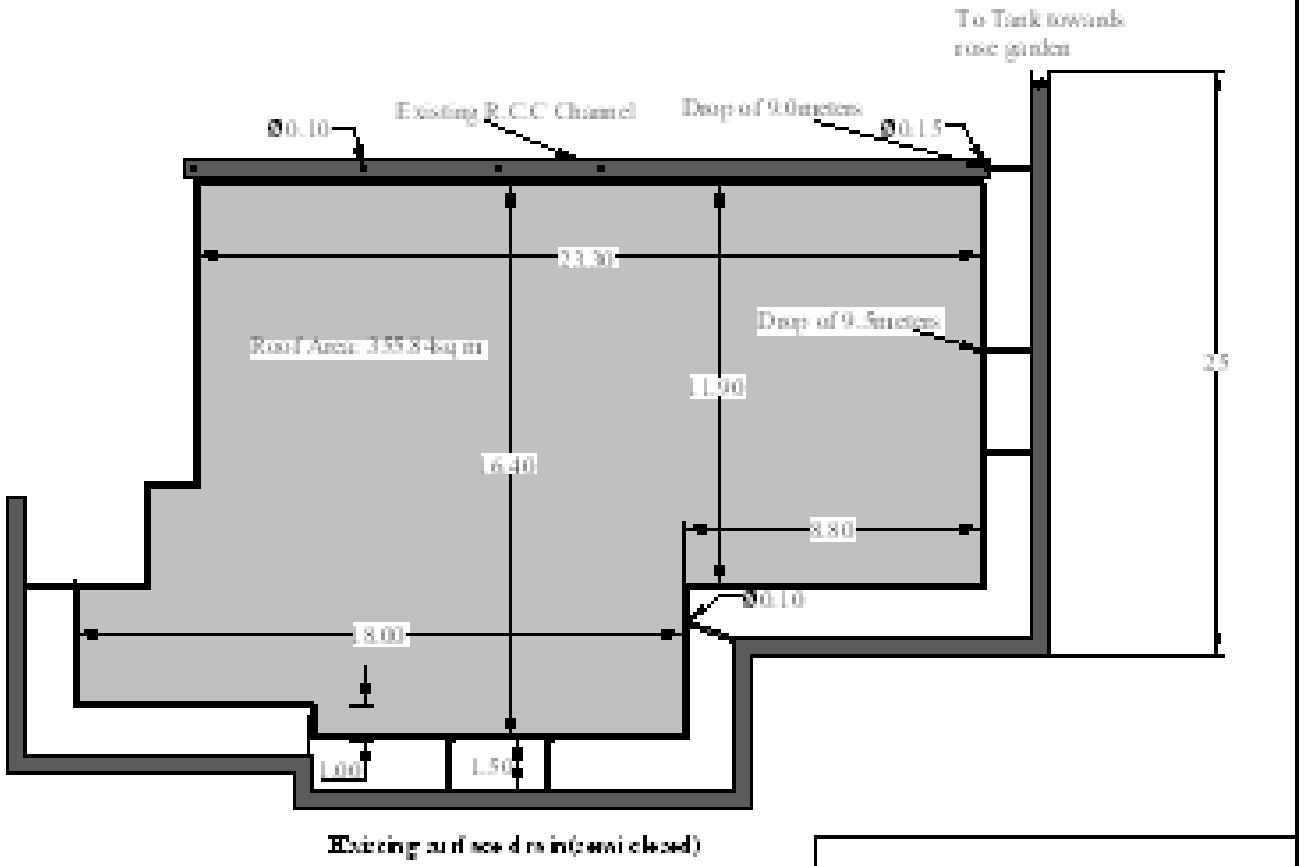
To Tank towards rose garden
Existing R.C.C Channel
Drop of 9.0meters
Ø0.10
Ø0.15
33.30
Drop of 9.5meters
Roof Area: 3558.8sq m
11.00
25
16.40
8.80
Ø0.10
18.00
1.00
1.50
Existing surface drain (semi closed)
RAINWATER HARVESTING LAYOUT FOR BRTW GUEST HOUSE
All dimensions are in meter

Fig. 7

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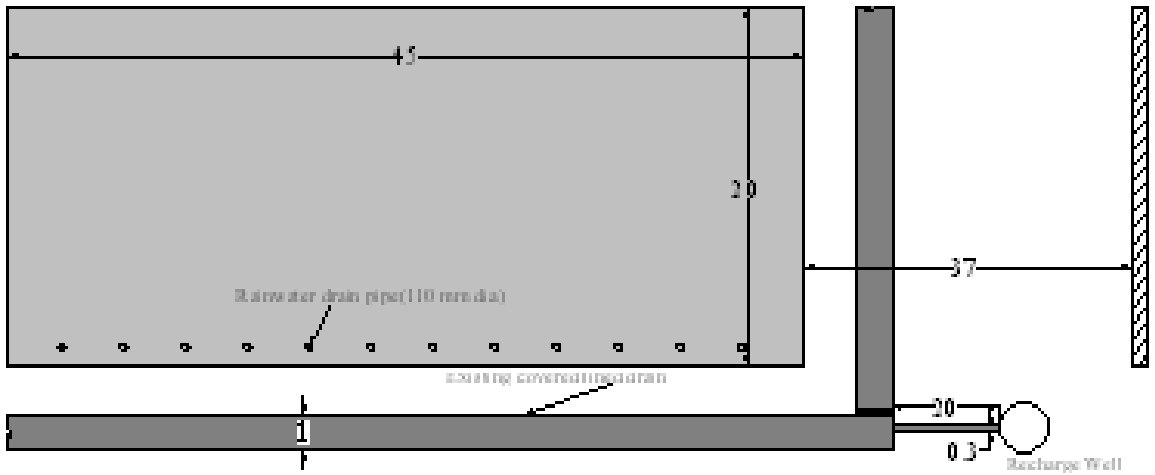

Fig.8

RAINWATER PIPE LAYOUT FOR SVM SCHOOL
All dimensions are in meter

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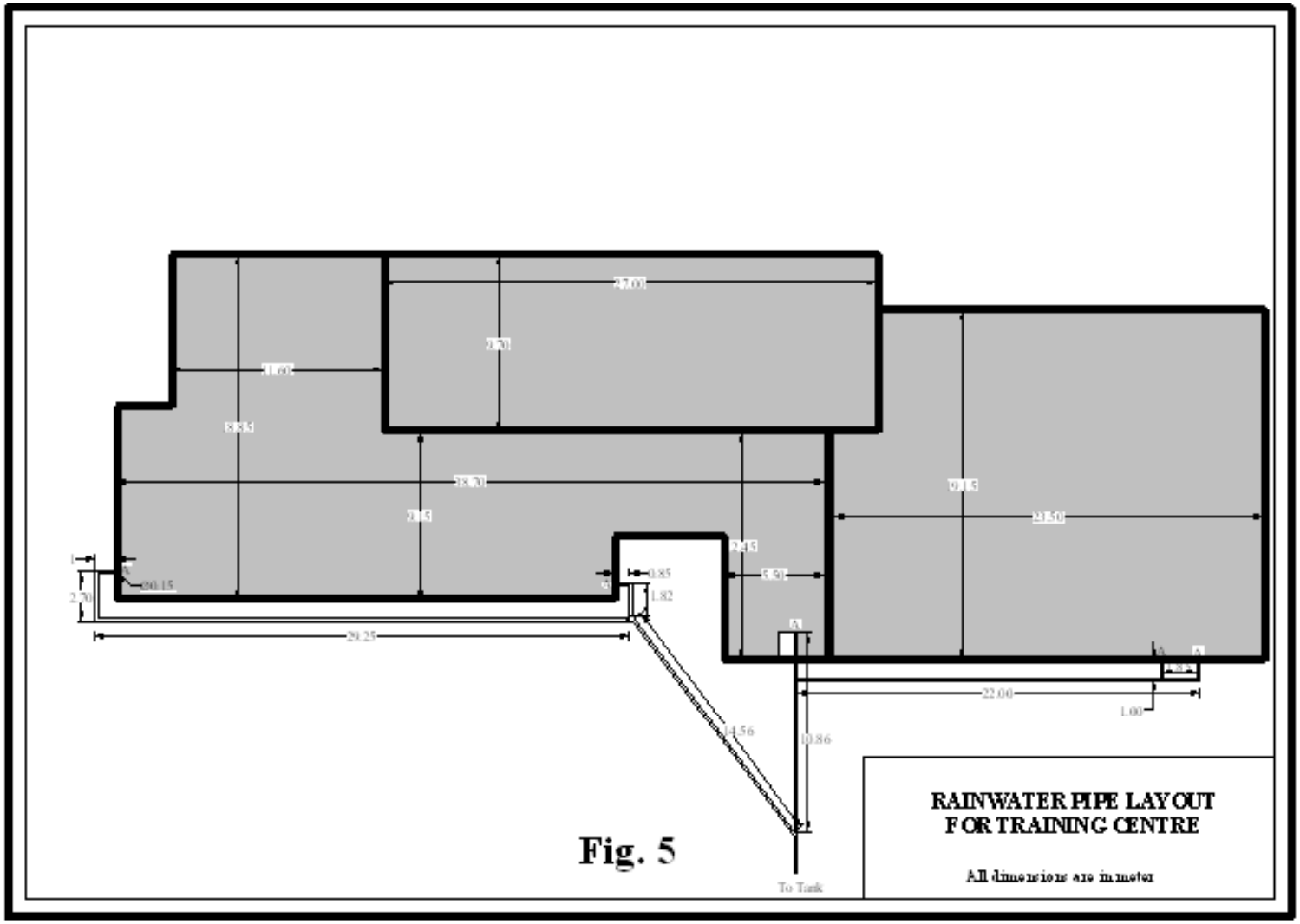

Fig. 5

RWH for Bokaro Steel Plant

- **Rainwater is collected from the rooftop of the Cold Rolling Mill shed of BSL having huge dimension of 540 m x 165 m**

- **It has collector pipes of 250 mm each spaced at 12 m apart for collecting rooftop water and terminating in vertical drop pipes of 350 mm each**

- **The vertical drop pipes conveying the rainwater to the lined surface drain will be tapped to bring the rainwater to 4 points where storage-cum-recharge structures will be constructed for recharge after filtration through sand beds for augmenting the ground water potential (aquifer)**

- **The artificial recharge structures has been designed as per the soil strata in the vadose zone and as per the aquifer characteristics.**

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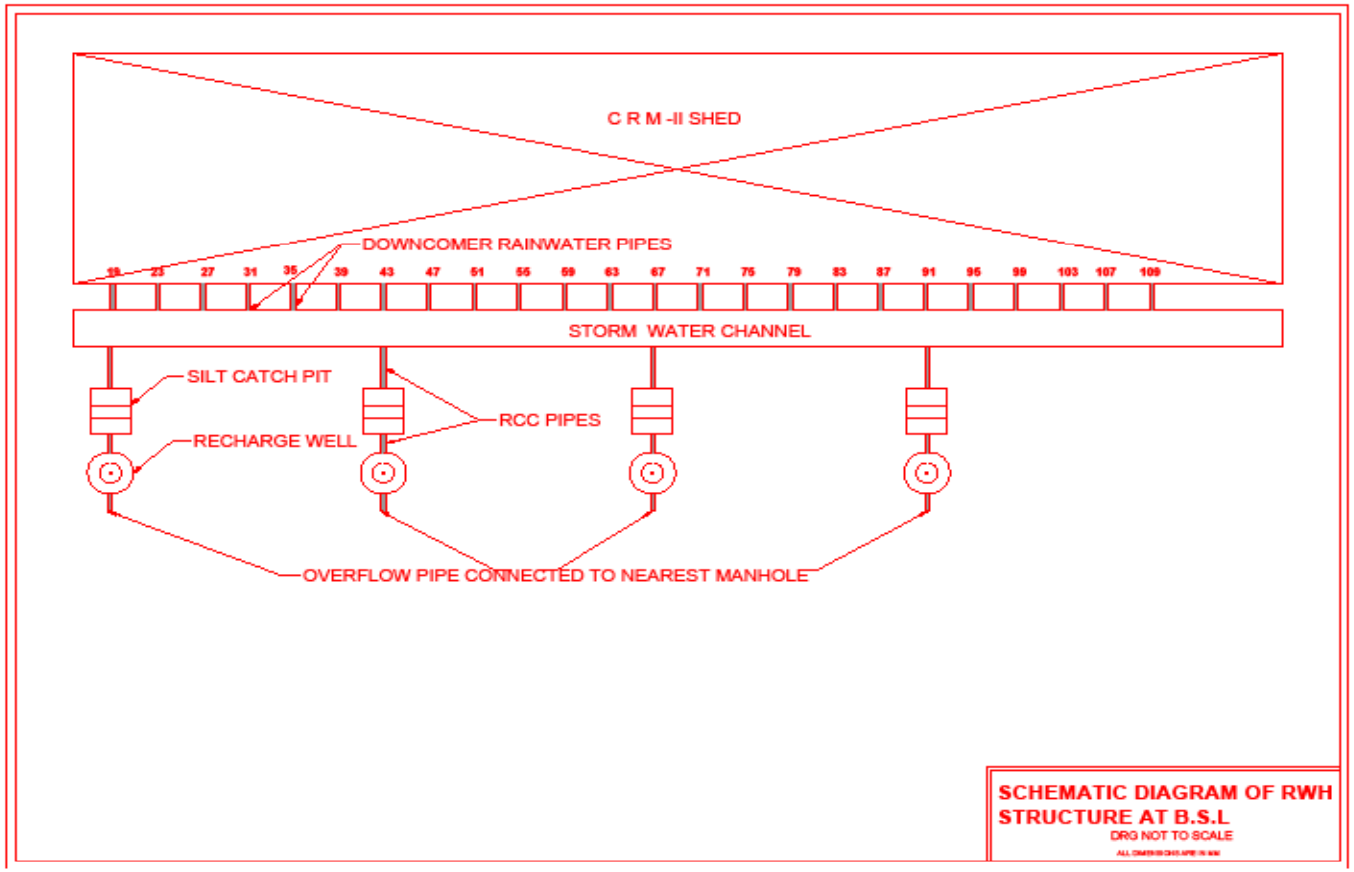
RWH for Bokaro Steel Plant contd…



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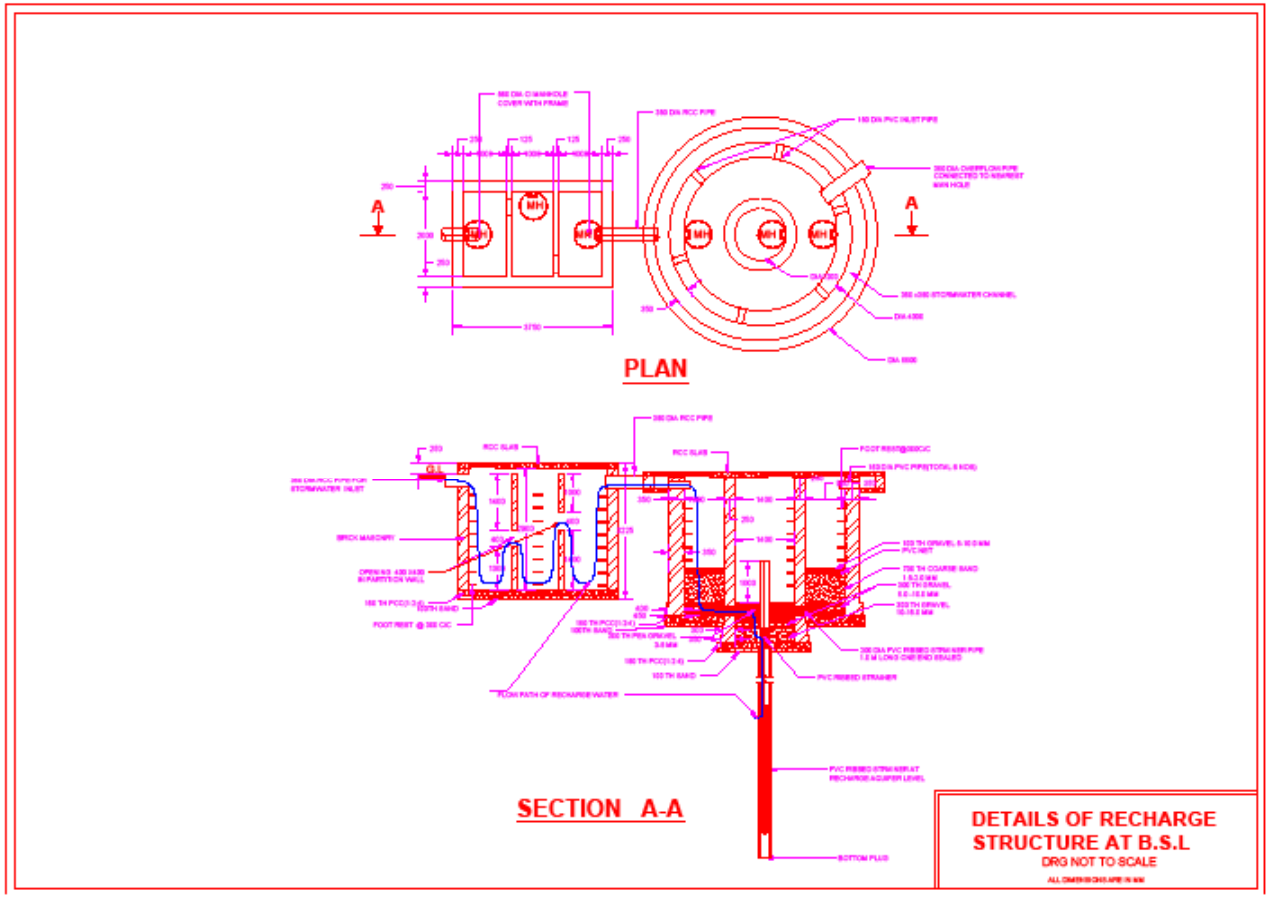
RWH for Bokaro Steel Plant contd…



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Thank you for Attention