Rooftop Rainwater Harvesting for Recharging Shallow Groundwater

By

Prof. Rameshwar Rao,

Vice-Chancellor, JNTUH, Telangana State, India.

Dr.M.V.S.S.Giridhar,

Assistant Professor, CWR, JNTUH, Telangana State, India

Outline of the presentation

- **Basics of water resources**
- **Need of Rainwater harvesting**
- **Components of rainwater harvesting**
- **Types of rainwater harvesting**
- **Case study**
- **Objectives of the project**

- Scope of artificial recharge
- Baseline details
- Existing Built-up area
- Proposed Structures
- Maps developed in GIS environment
- Impact of artificial recharge of rainwater

WATER!!!!!!!

THE PRECIOUS GIFT OF NATURE

CONSERVE IT!!

DO NOT WASTE IT!!

Water is the driver of life

-Leonardo da Vinci



Water is indispensable for life and more so for man.

The need for water is felt more and more for better living in modern times.



GLOBAL WATER INVENTORY

- World's water is 1357.5m.cu.Km

- 97% is in oceans as saline water



- Only 3% i.e. 37.5 m.cu.km. is fresh water
- Out of this, about 8.5 m.cu.km is available for use
- The remaining is in the form of ice

The per capita consumption has increased from **few litres** in the stone age to as much as **600litres** in developing countries today



Water Availability

2000 --- 2100 m^3 (comfortable)

2025 --- 1700 m^3 (stress level)

2050 ----1236 m^3 (scarcity level)

Agriculture sector is largest user (80%) of water resources

"More usage Per Drop"



- **Only 12% of rainwater is being used in country**
- **The rest flows into sea**
- **Only 10% of surface water and 90% of groundwater are being used for drinking purposes**

The World Bank estimates that by the year 2025 3.25 billion people in 52 countries will live in conditions of water shortage



What is the solution

RAINWATER HARVESTING

- Harvest it
- Filter it
- Store it
- Use it (if excess)
- Recharge it

RAINWATER HARVESTING cont…

- RWH is the best option.
- RWH system is practically used from prehistoric period.
- This is a simple and economically viable technology.
- The Indian climatic conditions
- Rainfall days less than 50 only
- Rainwater falling over terrace or roof can be collected and stored otherwise goes to the sea through rivers

RAINWATER HARVESTING cont…

- Rainwater is the purest form of water.
- It is the primary source of water and other sources are dependant on rainfall.
- RWH should be viewed with a **positive attitude**

Benefits

- To harness good quality water resource now being wasted
- To augment the expensive piped water supply
- To save expenditure on water
- To prevent soil erosion and urban flooding
- Inexpensive and simple technology
- Aids ecological conservation
- To prevent groundwater depletion

Classification of RWH

- land-based RWH

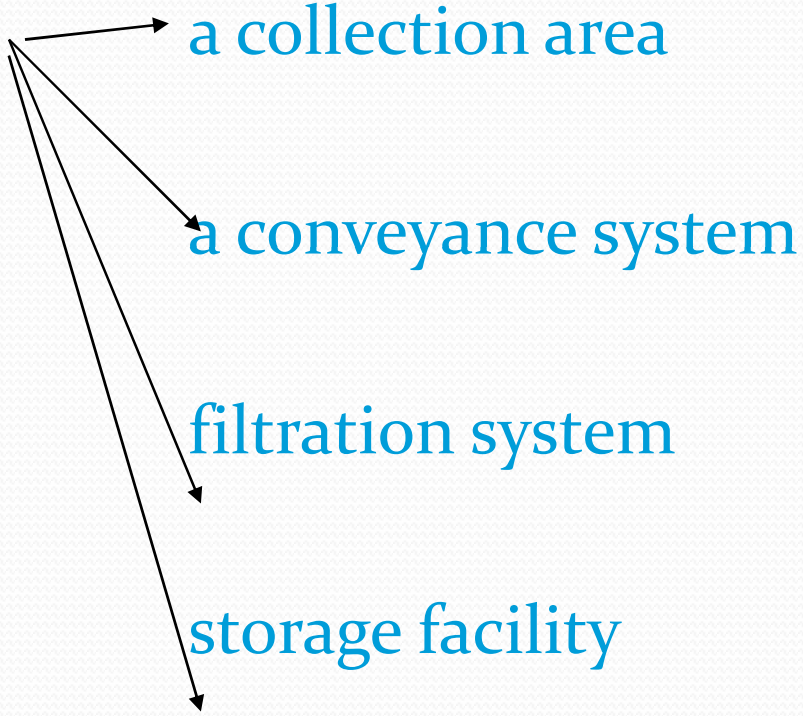
  Land-based rainwater harvesting occurs when rainwater runoff from the land is collected in ponds before it has a chance to reach a river or stream.

Roof-based harvesting

- Roof-based harvesting, on the other hand, involves collecting the rainwater that falls on a roof before the water even reaches the ground.

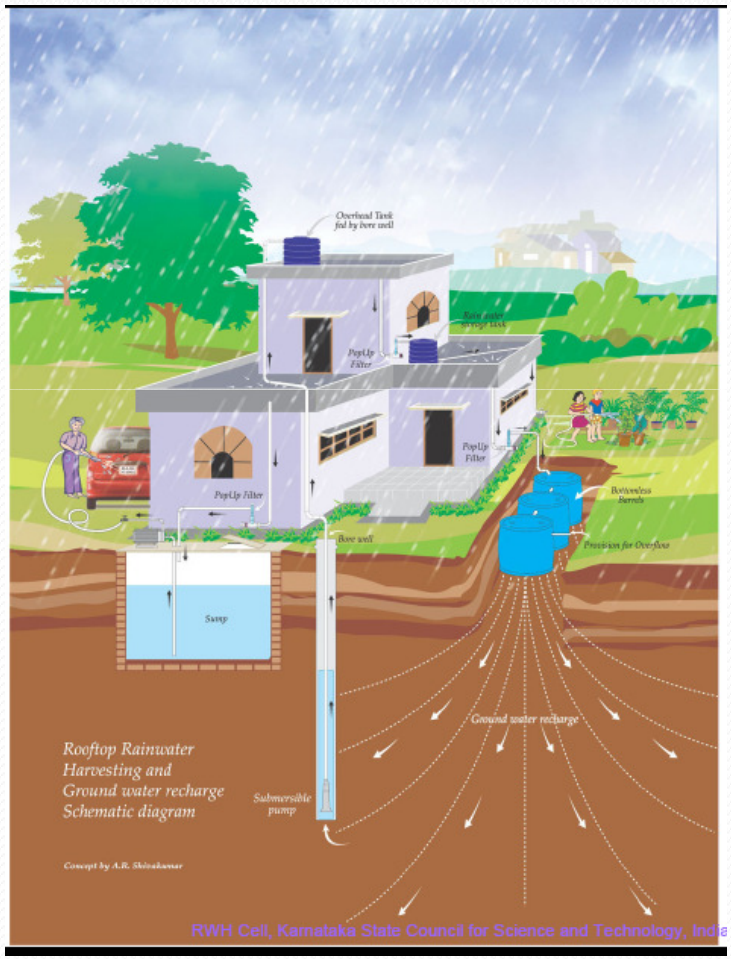
Methods of Rain Water Harvesting

- Storage of rain water and its use
- Recharging the underground aquifer



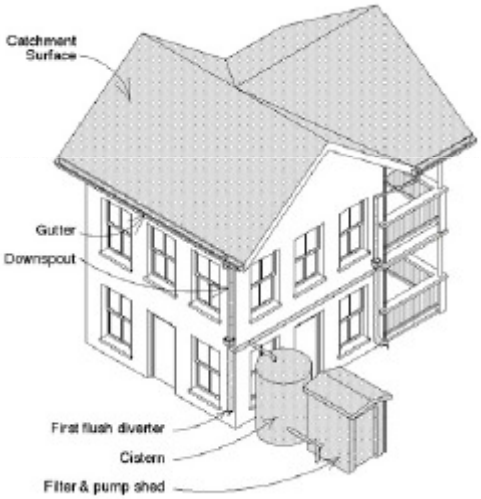
Components of Rainwater Harvesting System

- Catchment area
- Conveyance system
- First rain separator
- Filter unit
- Storage
- Delivery system
- Usage
- Recharge



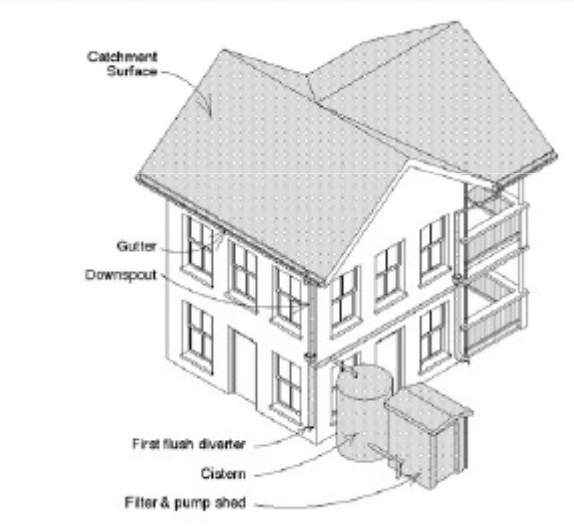
Rainwater Harvesting System Components

- **Catchment surface:** the collection surface from which rainfall runs off
- **Gutters and downspouts:** channel water from the roof to the tank
- **Leaf screens, first-flush diverters, and roof washers:** components which remove debris and dust from the captured rainwater before it goes to the tank



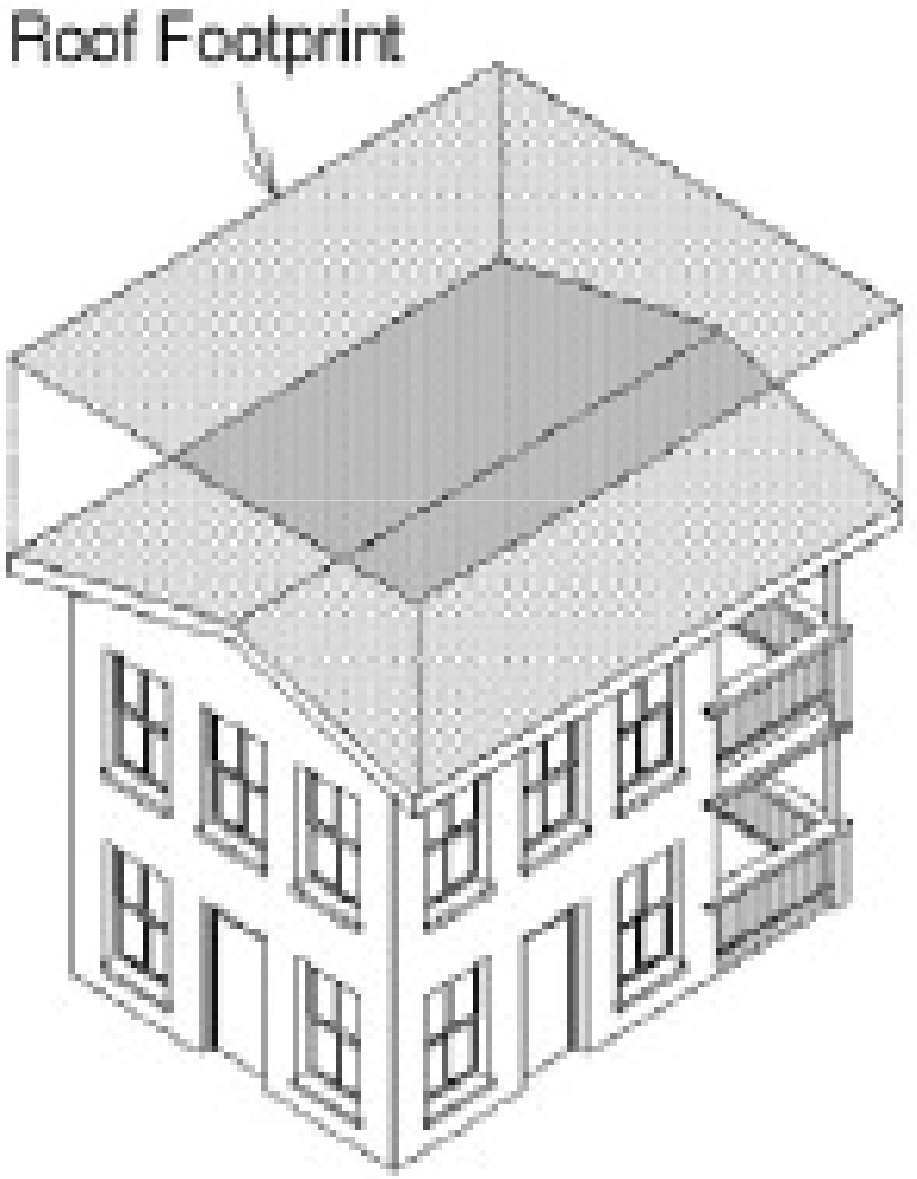
Rainwater Harvesting System Components cont…

- **Cisterns:** One or more storage tanks, also called cisterns
- **Delivery system:** gravity-fed or pumped to the end use
- **Treatment/purification:** for potable systems, filters and other methods to make the water safe to drink

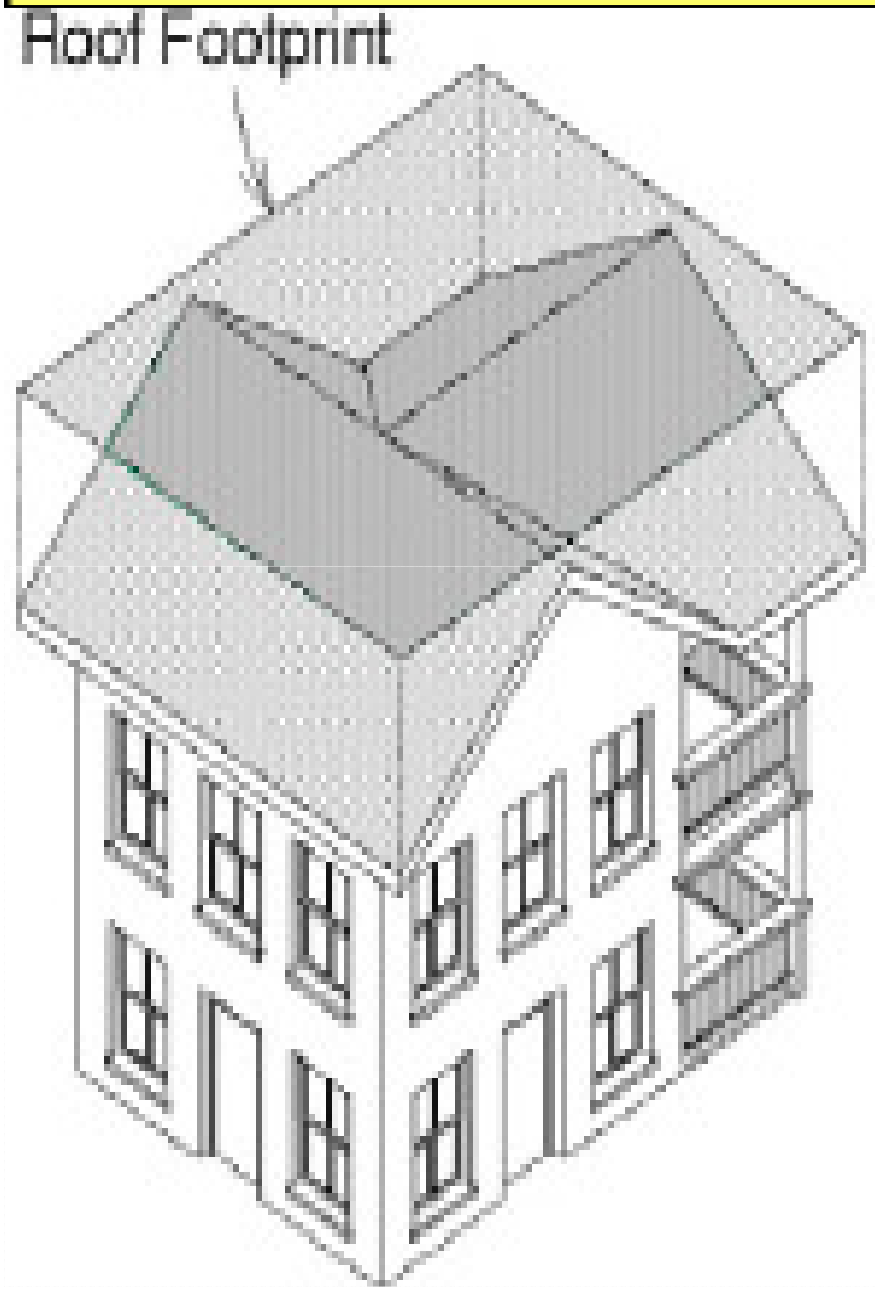


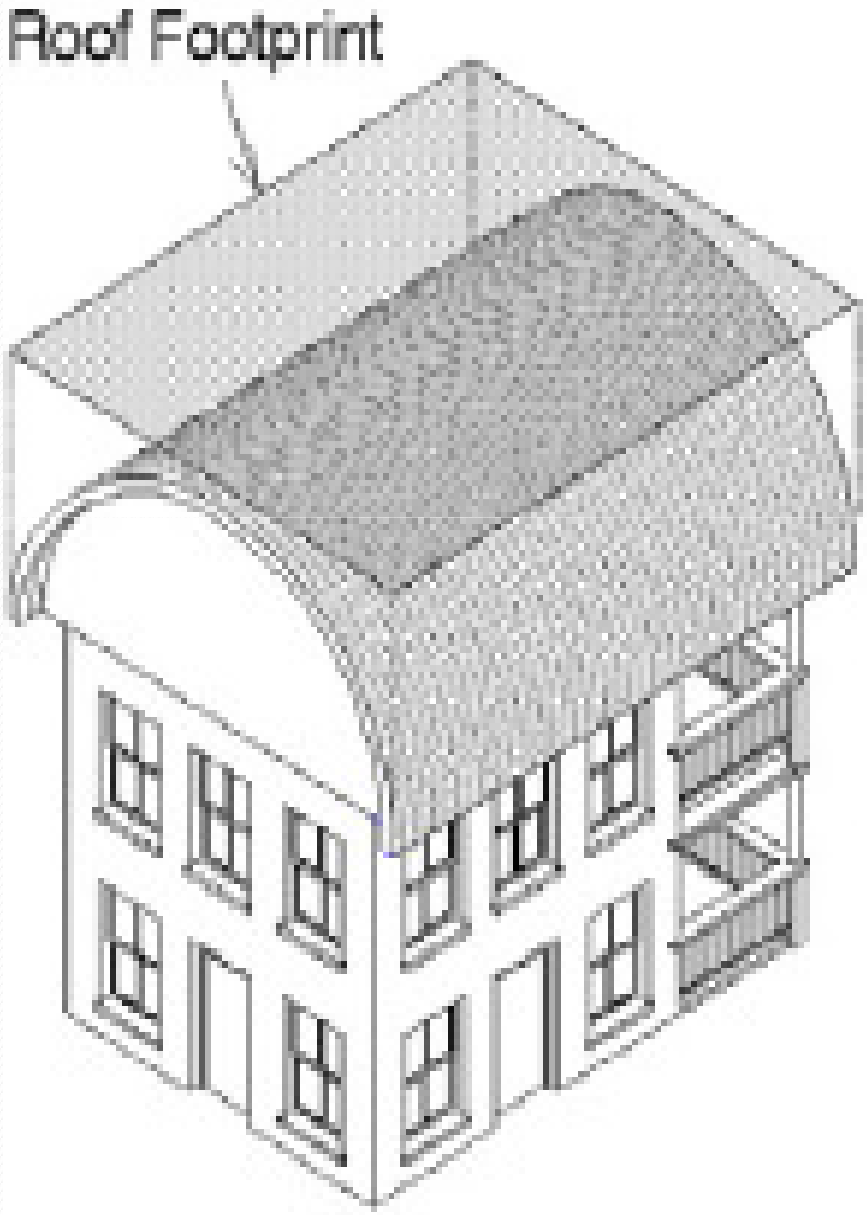
Collection area

- The collection area in most cases is the roof or terrace of the building



Different roofs



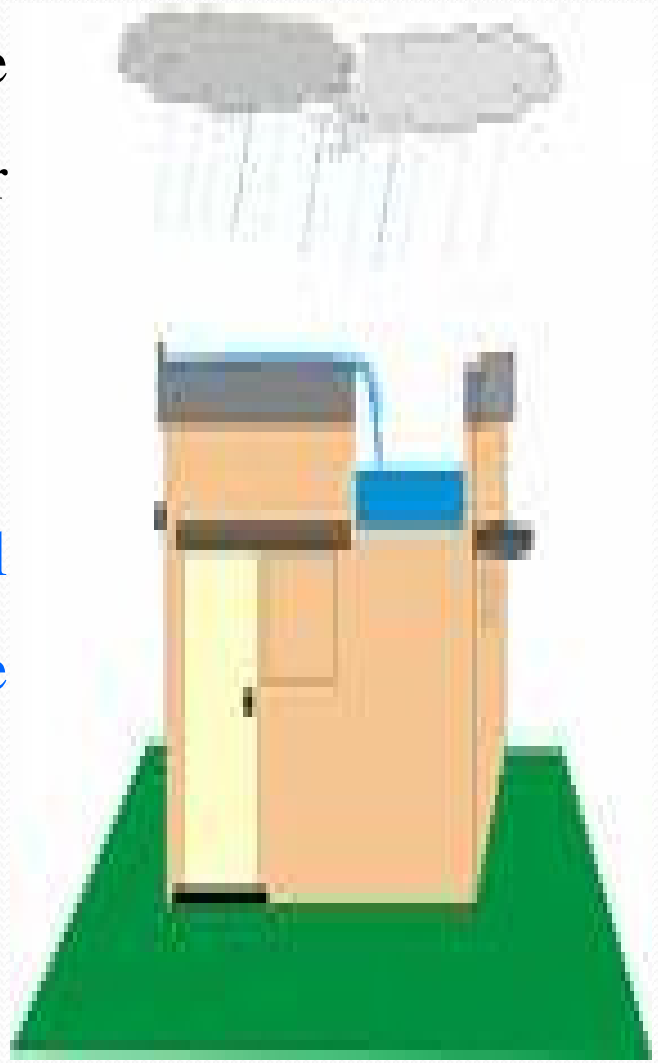


Rainwater harvesting, use and recharge in JNTUH – a Case study

OBJECTIVES OF THE PROJECT

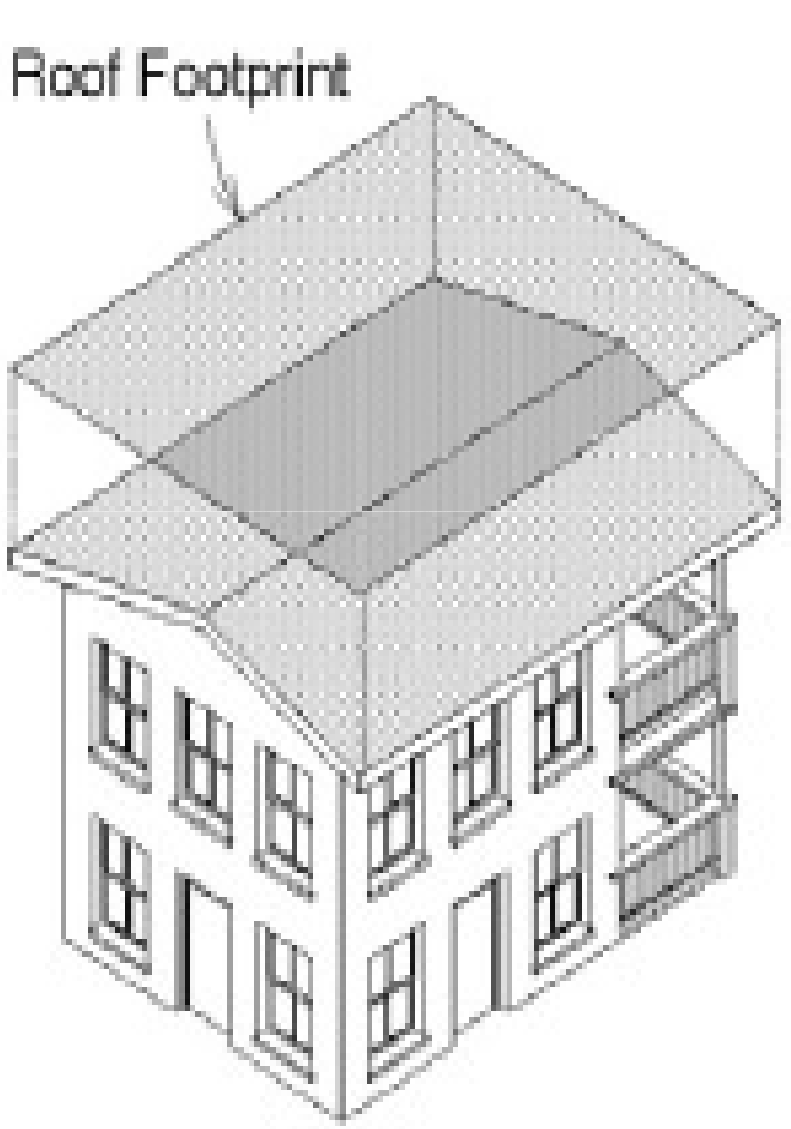
- Large roof area is available in the campus to tap the rain water for augmenting ground water resources.

- The campus is located in the capital of Hyderabad and it is more suitable for demonstrative purpose.

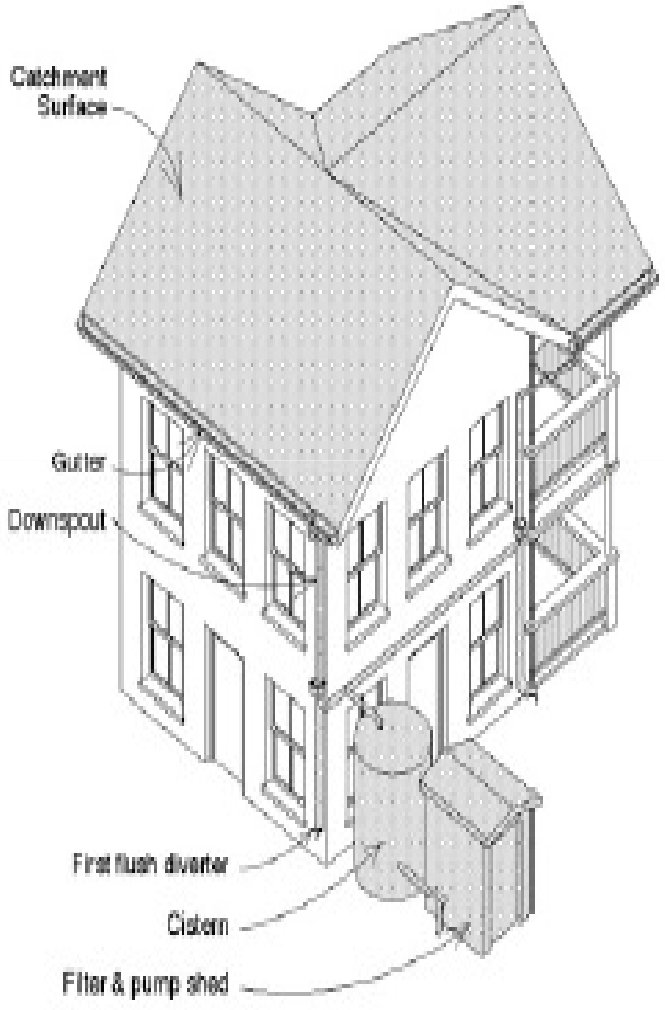


Objectives of the Project cont…

As JNTU Hyderabad is having Centre for Water Resources Department and running M.Tech and M.Sc courses on Water resources, these structures will be useful for permanent field demonstration and experimental research activity for students.



To conduct regular training programmes to public and disseminate the information about the significance of the artificial recharge activities



Objectives of the Project cont…

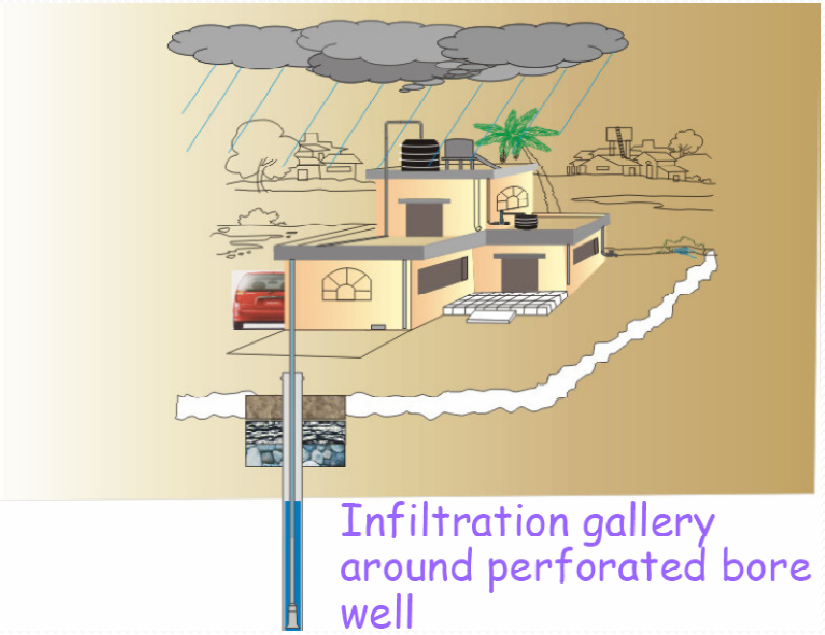
- To harvest, store and reuse for drinking, domestic purposes, gardening etc., in the campus.

- To recharge excess water from storage sumps into the ground through recharge pits and shafts.



Objectives of the Project cont…

- To encourage farm rain water harvesting so as to harvest the rainfall falling other than roof top area within the campus.
- To prepare the reports and disseminate to the public and to various government agencies



Infiltration gallery around perforated bore well

Objectives of the Project cont…

- To monitor and record ground water level fluctuations in the observation wells on daily basis using automatic water level recorders.

- To recharge ground water through recharge pits along with recharge shafts, there by increasing the ground water levels



Scope of artificial recharge

- There are several buildings in the campus with large roof area and there is a lot of scope for roof-top rain water harvesting in the campus.

- Also, there is adequate open area (either paved or covered with grass/vegetation) from which runoff could be harvested and used for recharging the aquifers below the ground



Available built-up area and other particulars related to artificial recharge

Sl. No	Description of Item	Quantity
1	Total existing built-up area within the campus	53,822m^2
2	Normal yearly rainfall	810 mm
3	Maximum water can be harvested in a normal year @80% of the rainfall as runoff	34,877 m^3
4	Max rainfall in a day	70 mm
5	Maximum water can be harvested on a maximum rainfall day	3014 m^3



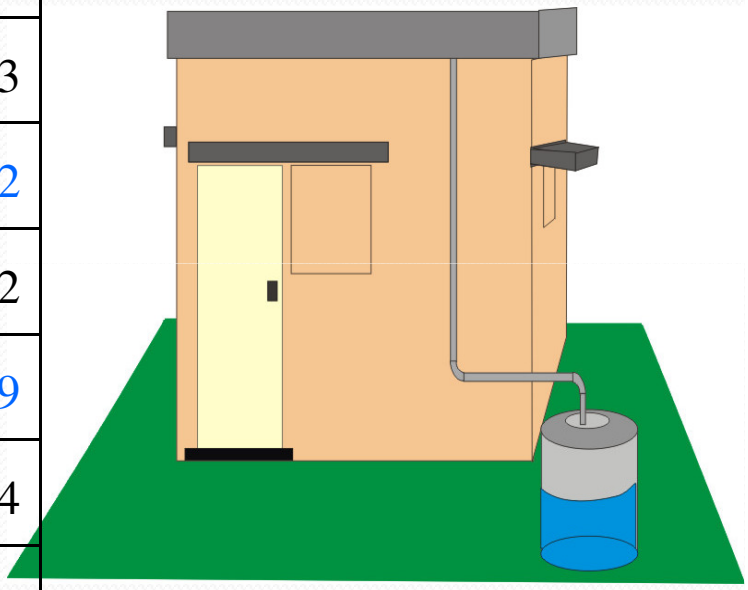
Built-up area and other particulars related to artificial recharge under consideration

Sl. No	Description of Item	Quantity
1	Built-up area	11,339 m^2
2	Normal yearly rainfall	810 mm
3	Maximum water can be harvested in a normal year	7347.67 m^3
4	Max rainfall in a day	70 mm
5	Maximum water can be harvested on a maximum rainfall day	635.0m^3



Land use land cover details in the study area

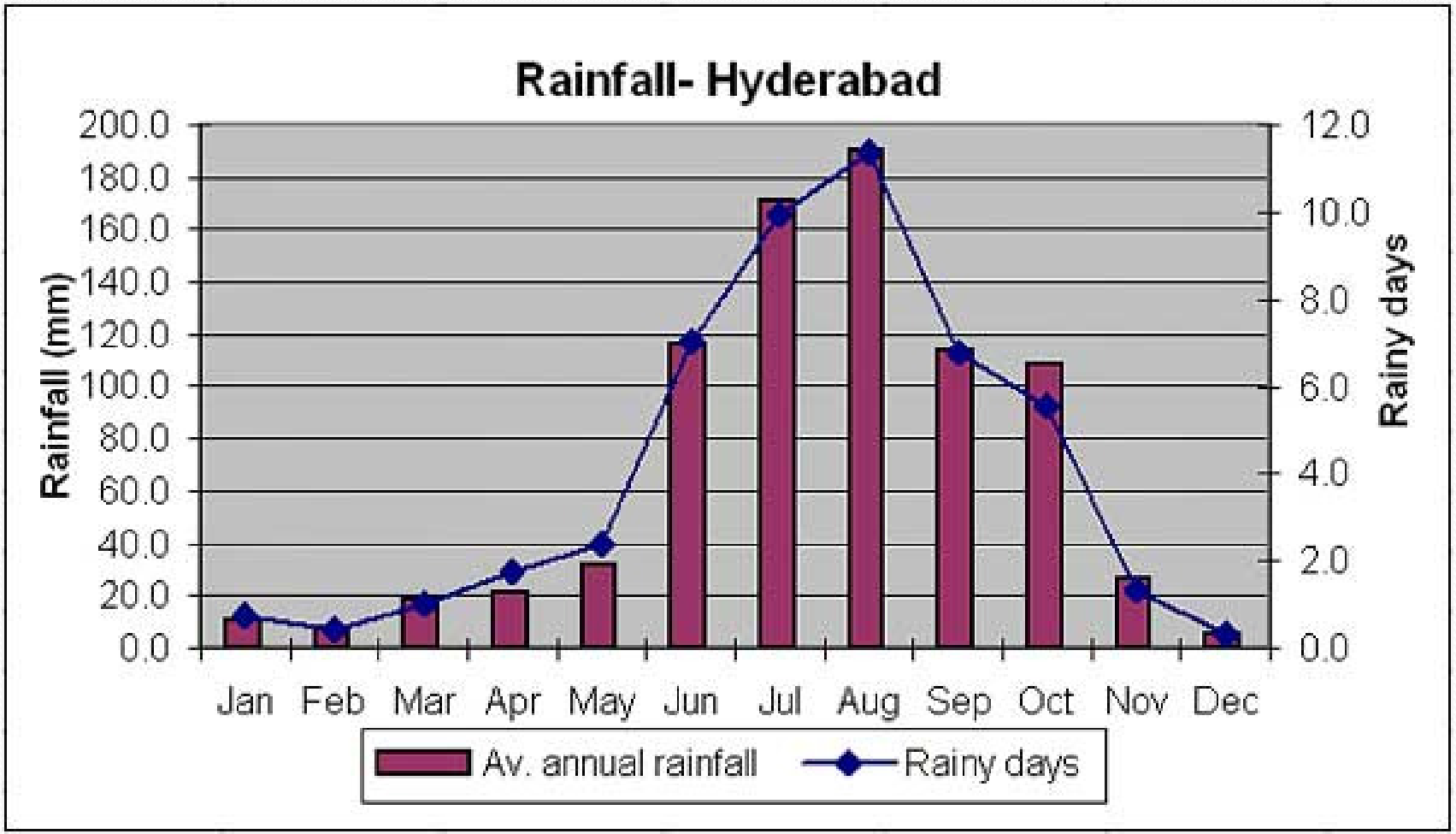
Sl.No	Description of the item	Area in m^2
1	Total built-up area	53822.33
2	Vegetation and parking	30182.92
3	Shed area	8540.22
4	Open area	150604.29
5	Other area	117733.54
6	Total area	89.19acres



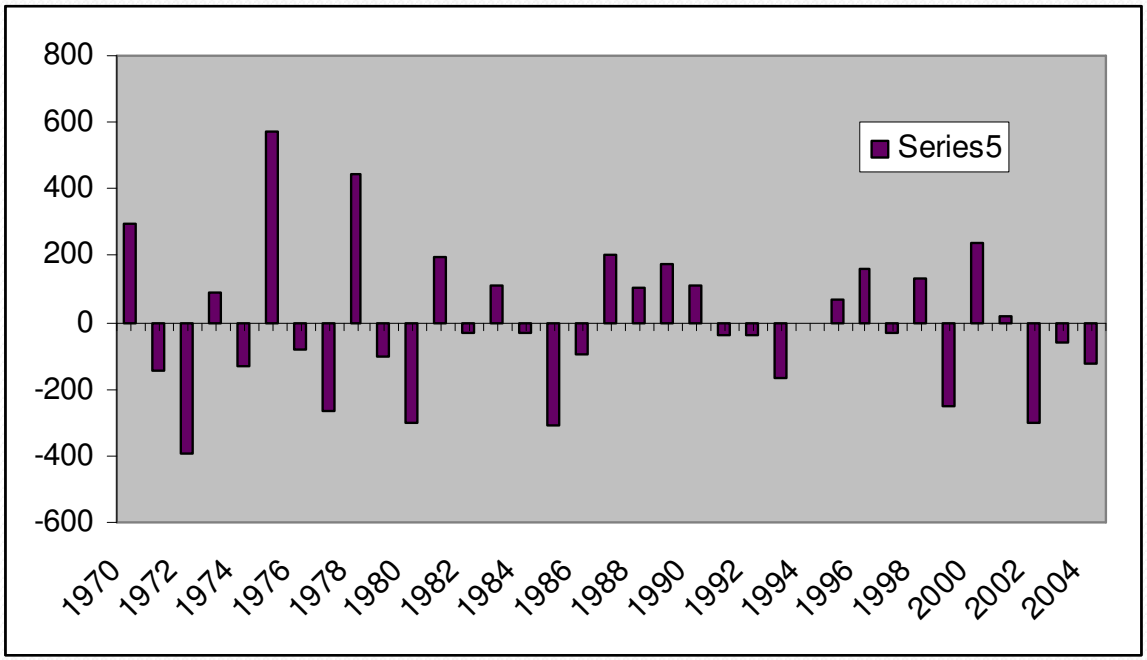
Normal monthly annual rainfall in mm

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Normal Monthly Rainfall (mm)	10.9	8.2	18.9	20.9	31.6	116.3	170.6	190.4	114.1	108.5	26.1	5.3
Rainy Days	0.7	0.4	1	1.7	2.4	7	9.9	11.4	6.8	5.5	1.3	0.3

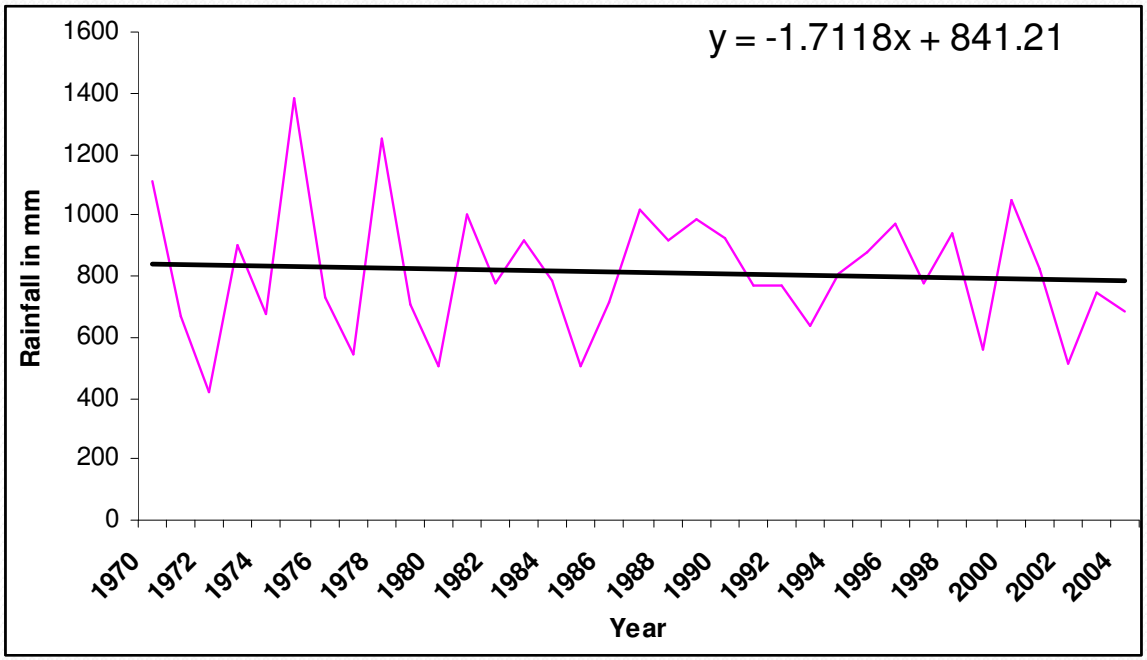
Normal rainfall over the study area



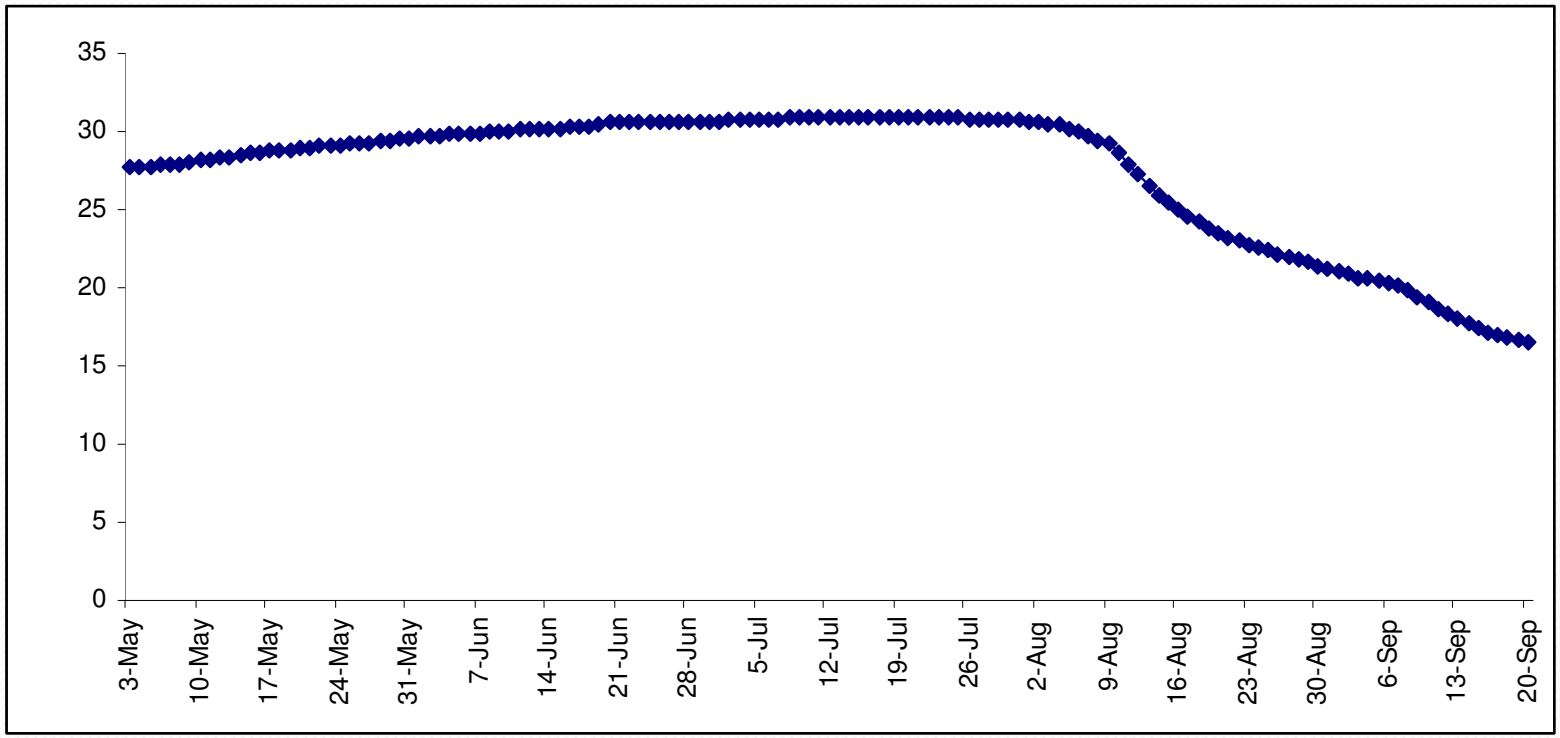
Percentage of deviation over normal rainfall



Trend line of rainfall over Hyderabad



Water level fluctuations for a period of May to September at 30 min interval



Details about the name of the building, existing built-up area, maximum amount of water can be harvested on a normal year and on a maximum rain day

S. NO	NAME OF THE BUILDING	AREA in m^2	Max. water can be harvested in a normal year in m^3	Max. Water can be harvested on a max rainy day in m^3
1	CSE Building (Old)	584.25	378.594	32.718
2	ANDHRA BANK(G.F)	312.8	202.6944	17.5168
3	RECTOR/REGISTRAR QAR	315.84	204.6643	17.68704
4	VC'S LODGE	280.01	181.4465	15.68056
5	C DAC BUILDING	494.44	320.3971	27.68864
6	**GUEST HOUSE ***	**900.87***	**583.7638**	**50.44872**
7	**MECHANICAL BUILDING ***	**890***	**576.72**	**49.84**
8	METALLURGICAL BUILDING	1352	876.096	75.712
9	ESTATE OFFICE	202.46	131.1941	11.33776
10	CANTEEN	382.69	247.9831	21.43064
11	PRINCIPAL'S OFFICE	2179.57	1412.361	122.0559
12	EEE BUILDING	2921.31	1893.009	163.5934
13	**UGC-ASC BUILDING ***	**1760.47***	**1140.785**	**98.58632**
14	A2 TYPE QUARTERS	732.55	474.6924	41.0228
15	B2,B3&B4 TYPE QUARTERS	2047.89	1327.033	114.6818
16	ECE Builiding	1144.02	741.325	64.06512
17	ADMINISTRATIVE BUILDING(G.F,F.F,&S.F)	1394.34	903.5323	78.08304
18	**CIVIL ENGG. BUILDING ***	**1774.4***	**1149.811**	**99.3664**
19	SIT Builiding	2225.58	1442.176	124.6325
20	UNIVERSITY HEALTH CENTRE(G.F.)	502.32	325.5034	28.12992

Details about the name of the building, existing built-up area, maximum amount of water can be harvested on a normal year and on a maximum rain day

21	LIBRARY BUILDING	1677	1086.696	93.912
22	DIRECTOR'S QUARTERS(G.F&F.F)	207.6	134.5248	11.6256
23	A-TYPE QUARTERS(OLD)	534.38	346.2782	29.92528
24	B-TYPE QUARTERS(OLD)	441.44	286.0531	24.72064
25	C-TYPE QUARTERS(OLD)	313.66	203.2517	17.56496
26	BOYS HOSTEL(OLD)	1518.76	984.1565	85.05056
27	GIRLS HOSTEL(OLD)	1328.17	860.6542	74.37752
28	SPORTS COMPLEX(G.F)	437.12	283.2538	24.47872
29	KRISHNA HOSTEL SHED	3743.75	2425.95	209.65
30	MECHANICAL SHEDS	4198.17	2720.414	235.0975
31	GENERATOR	82.07	53.18136	4.59592
32	GEO TECH	252.28	163.4774	14.12768
33	SHEDS NEAR REG/REC.QTRS	263.95	171.0396	14.7812
34	**PG BOYS HOSTEL ***	**3596.21***	**2330.344**	**201.3878**
35	A3TYPE QUARTERS	801.5	519.372	44.884

Details about the name of the building, existing built-up area, maximum amount of water can be harvested on a normal year and on a maximum rain day

36	B5 TYPE QUARTERS	615.98	399.155	34.49488
37	**GIRLS HOSTEL(OLD) ***	**1802.26***	**1167.864**	**100.9266**
38	IIC BUILDING	950	615.6	53.2
39	TBI BUILDING	765.6	496.1088	42.8736
40	ADMINISTRATIVE BUILDING(T.F)	1394.34	903.5323	78.08304
41	IST BUILDING	1354	877.392	75.824
42	CENTRALIZED	1446.38	937.2542	80.99728
43	EXAMINATION BUILDING	1453.74	942.0235	81.40944
44	ANDHRA BANK(F.F)	331.91	215.0777	18.58696
45	GUEST HOUSE (DINING -F.F&S.F)	330	213.84	18.48
46	UNIVERSITY HEALTH CENTRE(F.F.)	502.32	325.5034	28.12992
47	SPORTS COMPLEX(F.F,S.F)	874.24	566.5075	48.95744
48	DIRECTOR'S QUARTERS(S.F)	207.6	134.5248	11.6256
	TOTAL Plinth area	**53822.24**	**34876.81**	3014.045

*** Structure considered for rainwater harvesting**

PROPOSED STRUCTURES

- Farm rainwater harvesting structures
- Three Observation wells in the campus
- Roof-top rainwater harvesting with a capacity of 50,000 litres and re-use (at two places)

  Roof top rainwater harvesting with a capacity of two lakh liters and re-use
-

Farm rainwater harvesting structures

- There are three distinct watersheds covering JNTUH campus from which surface runoff could be harvested for recharging the ground water aquifers.
- Recharge pond with suitable silt trap, inlet and outlet are proposed to be constructed.
- The detailed estimate has been prepared for this proposal with SSR rates approved by the Andhra Pradesh state government for the year 2008-09.
- Two recharge shafts are also planned with in the recharge pit with coir.
- The diameter of well is proposed to be 6”.

- These wells would be helpful in recharging aquifers at various depths below the ground surface.
- It is also planned to irrigate near by avenue plants with the water stored in the sump.
- The rates include transportation and installation charges for irrigating the avenue plants in the surrounding of the proposed rain water harvesting sump for reuse purpose.

Three Observation wells in the campus

- Presently, one observation well is located near the hydro-meteorological station near the field farm to monitor fluctuations in the ground water levels for every 30 minutes using automatic water level recorder.

- These water levels are monitored since 2008 and found to be 25m to 30 m deep in pre-monsoon period and 16m to 19 m in post-monsoon.

- It is proposed to dig and install Three more observation wells with proper protection work.

Three Observation wells in the campus cont….

- It is proposed to monitor daily water level fluctuations throughout the year, and to notify the fluctuations for pre and post monsoon.

- It is also proposed to compare and identify the impact of rain water harvesting structures before and after execution.

Roof-top rainwater harvesting with a capacity of 50,000 litres and re-use

- Keeping in view the availability of roof area of various buildings in JNTU campus, roof top rain water harvesting for collecting and storing rain water from roof tops of buildings and its re-use is proposed.
- From the roof top, the water is diverted to disc filter unit of higher capacity.
- From the filter unit, the pure water is led to leak proof storage tank.

- Provision for pumping and pipe line system for taking the water from the storage tank to overhead tank is also proposed.

- The budget requirement is for installing the pipe line for collecting the roof top rain water, installation of filter unit, construction of 50,000 litres leak proof storage tank and pumping system

- Initially, this water will be reused for gardening, flushing and other regular uses.
- However, this water will be tested as for BIS norms and it may also be used for drinking purpose if it matches standard norms as per water quality.
- This water will be assessed for quality for complying with BIS norms and its safe for re-use.
- This will be useful at the level of individual buildings.
- These structures shall be useful to demonstrate to public as well as students in the campus.

Roof top rainwater harvesting with a capacity of two lakh liters and re-use

- Keeping the large roof area of different buildings in the JNTU campus, roof top rain water harvesting for collecting and storing rain water from roof tops of buildings is proposed.
- From the roof top the water is diverted to filter unit (perforated lid on top, layers of pebbles, coarse sand and gravel).
- From the filter unit the pure water is led to leak proof (water and air) storage tank.
- Provision for pumping and pipe line system for taking the water from the storage tank to overhead tank is also proposed.

- Thus the total budget is required for installing the pipe line for collecting the roof top rain water, installation of filter unit, construction of 2.0 lakh liters leak proof storage tank and pumping system etc.
- Initially, this water will be reused for gardening, flushing and other regular uses.
- However, this water will be tested as for BIS norms and it may also be used for drinking purpose if it matches standard norms as per water quality.

- This water will be assessed for quality for complying to BIS norms and its safe use.
- This will be useful at the level of colonies, colleges, group of houses, gated communities etc.,.
- These structures shall be useful to demonstrate to public under this category.

Roof top rainwater collection with a capacity of 1,00,000 liters along with recharge shafts and supported with side brick walls

- Two bore holes with accessories and water collection system at three different places for injection of rain water from surface to underground formation are proposed.

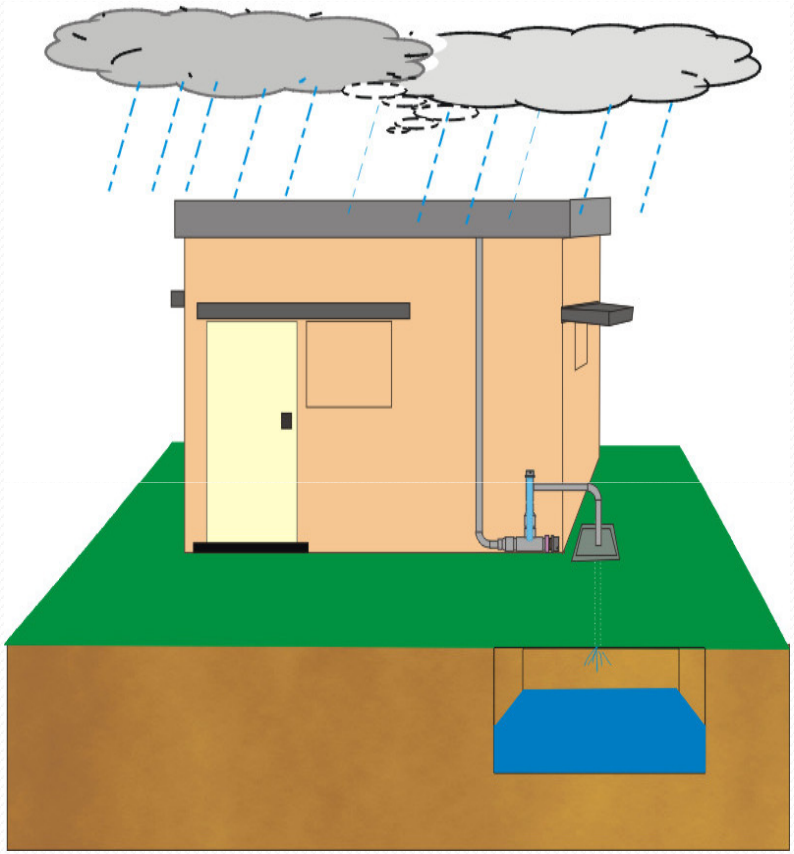
- The diameter of recharge shaft is proposed to be 200 mm.

- These wells would be helpful in recharging both confined and unconfined aquifers situated at various depths below the ground surface.

- These recharge shafts are more beneficial where deep aquifers which are depleted are to be recharged and also where economy of space is important criterion.

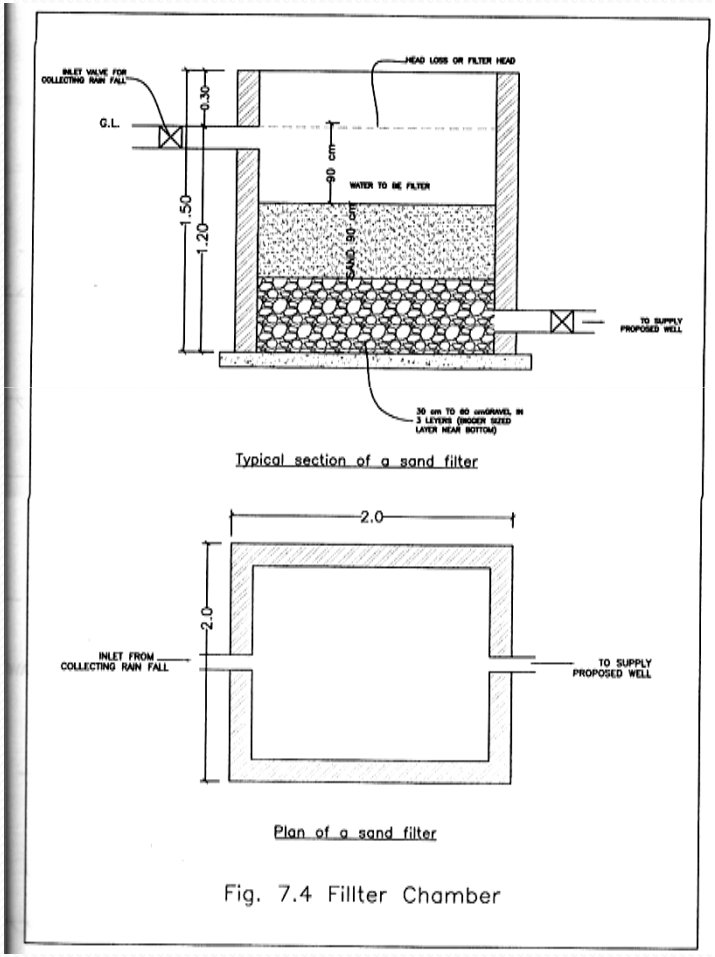
Undertaking from the Agency for O & M of Recharge Facility, cont…

- Bore wells, if abandoned shall be used as recharge wells by constructing rain water harvesting pits, by making slots to the casing pipe. These will recharge the deeper aquifers directly.



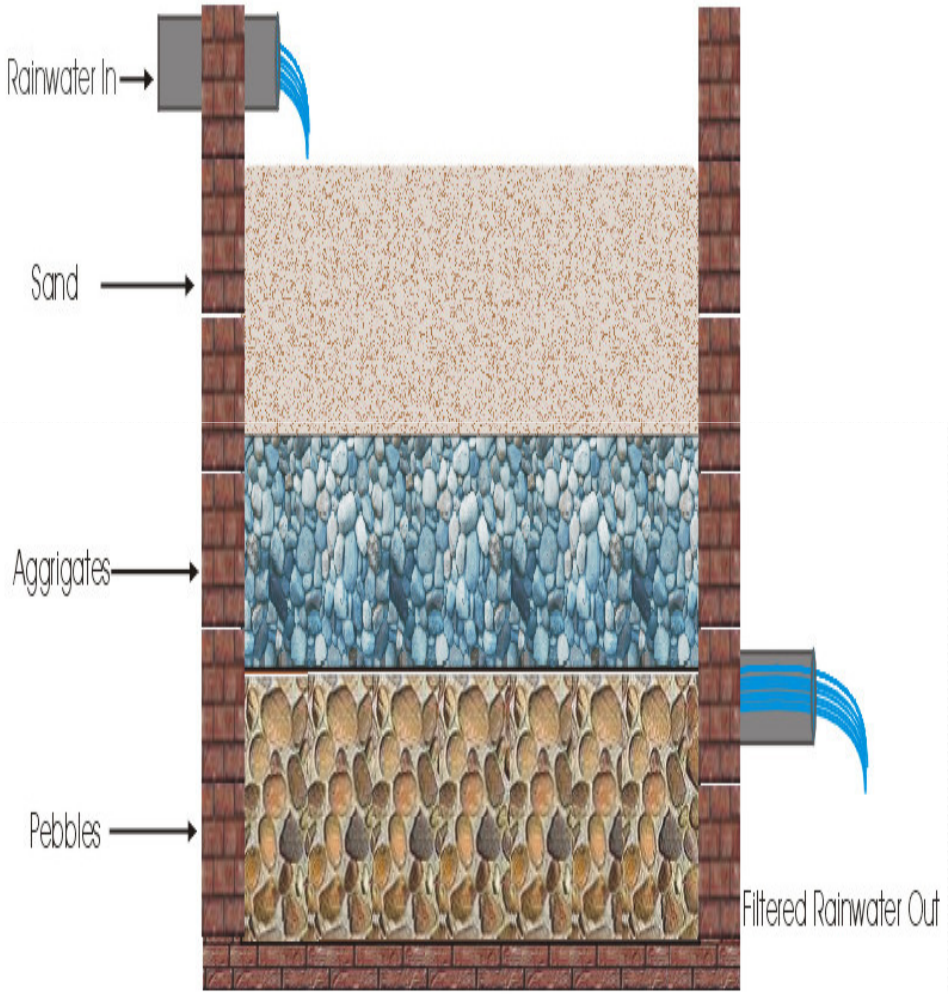
Undertaking from the Agency for O & M of Recharge Facility, cont…

- Occasionally, filter beds shall be cleaned by removing the sand and gravel, and fresh sand and gravel may be replaced once in two years or when ever the situation demands.



Undertaking from the Agency for O & M of Recharge Facility, cont…

- Removal of silt in the silt chambers, storage tanks, recharge pits shall be taken up at regular intervals for proper maintenance of the recharge structures.



Undertaking from the Agency for O & M of Recharge Facility, cont…

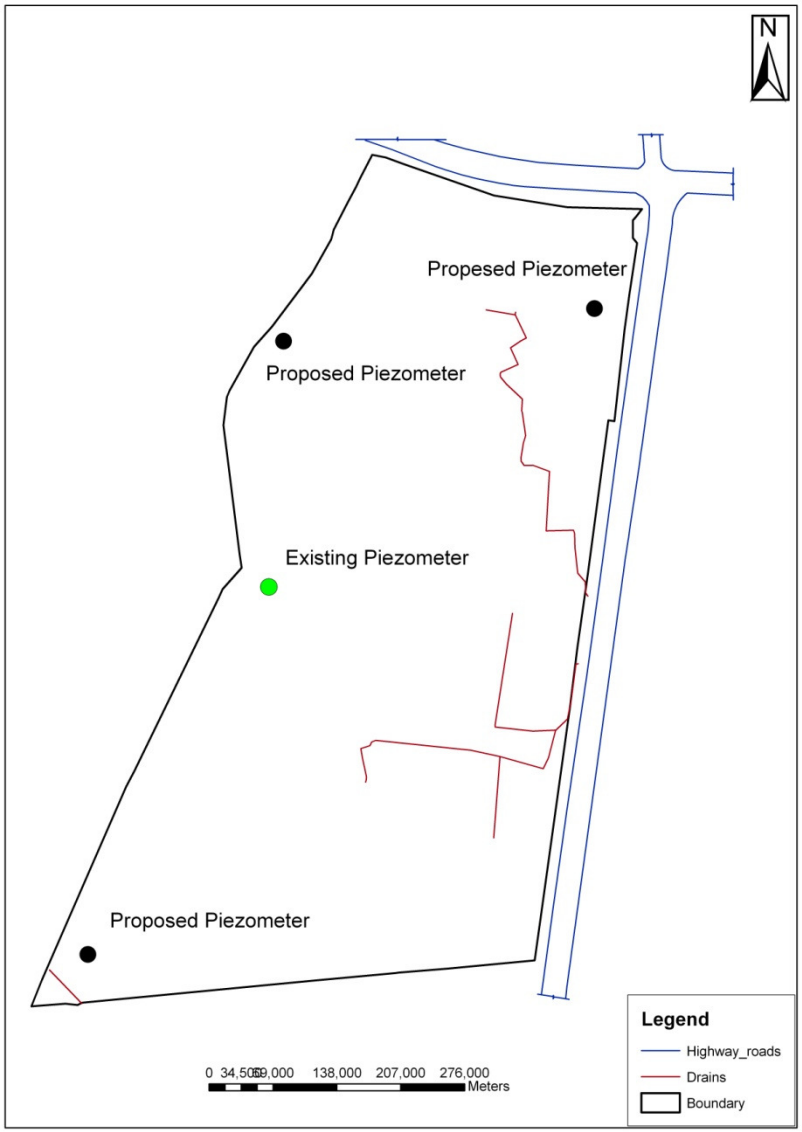
- During the rainy season, after every rain spell in each month the mud cake and waste material on top of the sand layer shall be removed and cleaned properly for the effective filtration of rain water.



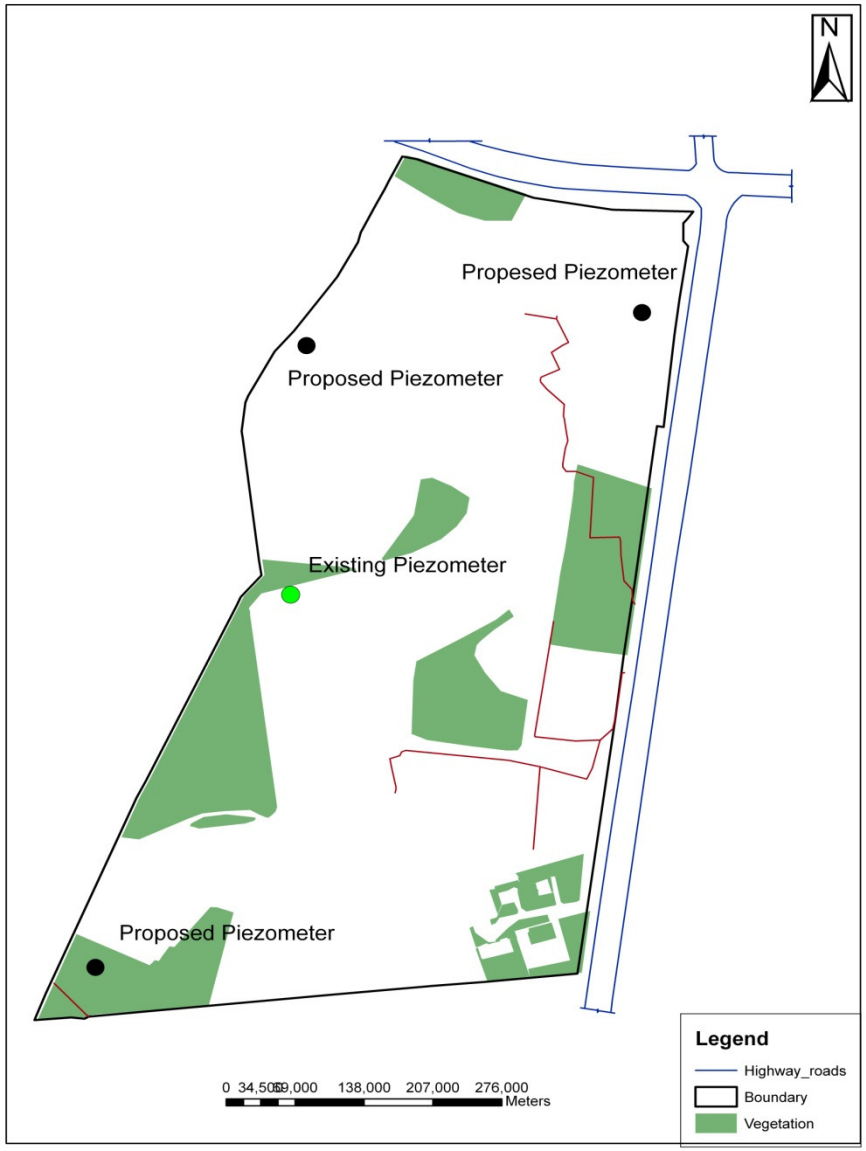
Proposed piezometer locations along with its influence as calculated using Thiessen polygon network method in GIS environment



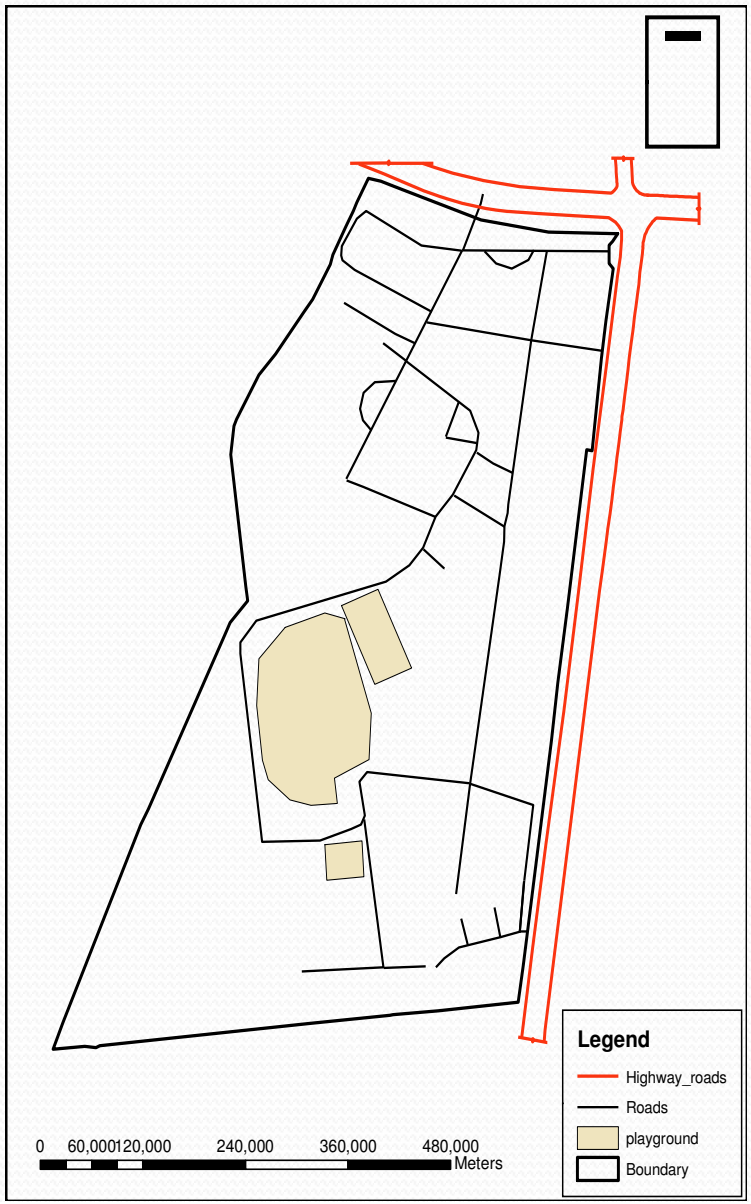
Drainage area



Vegetation area



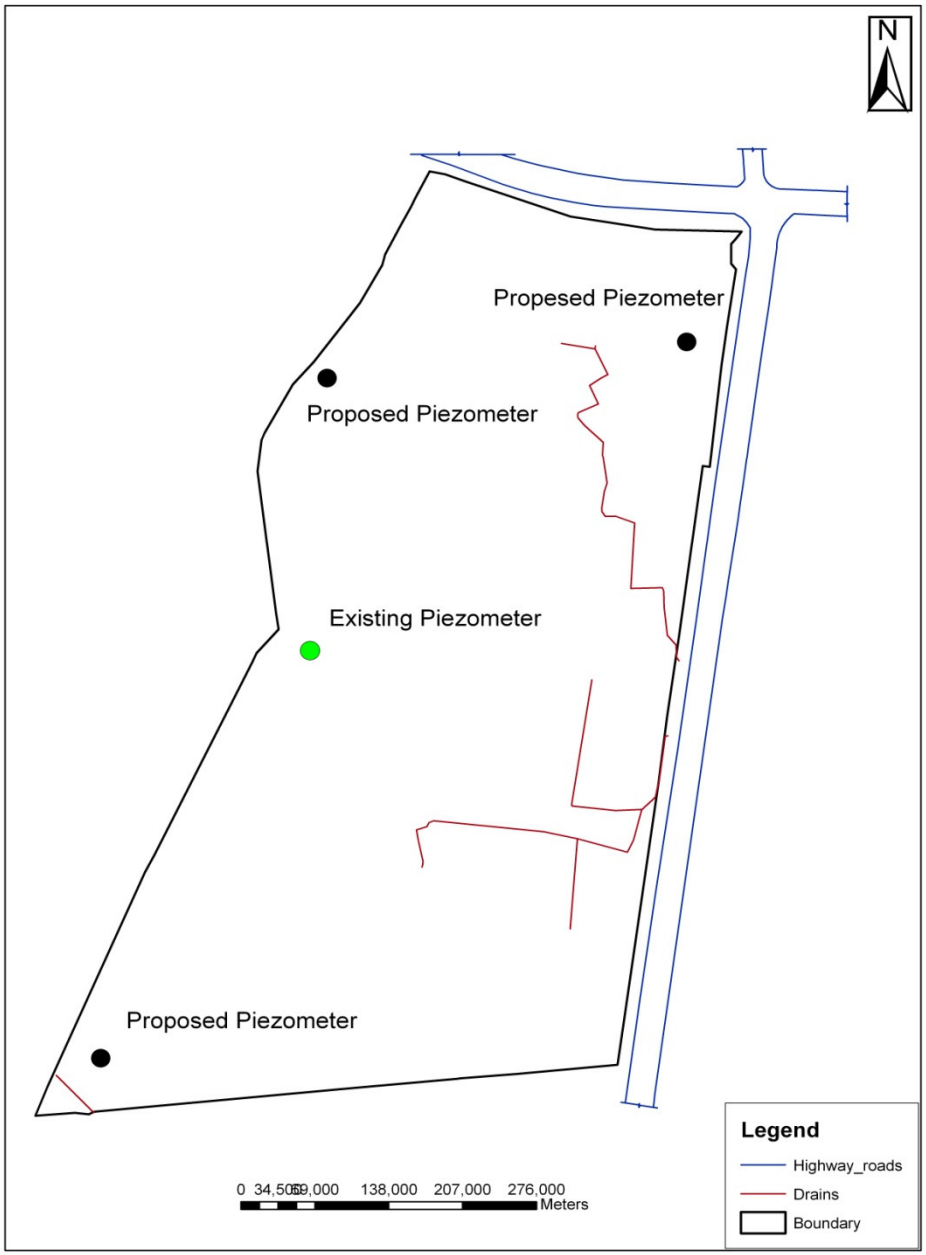
Roads along with Playground



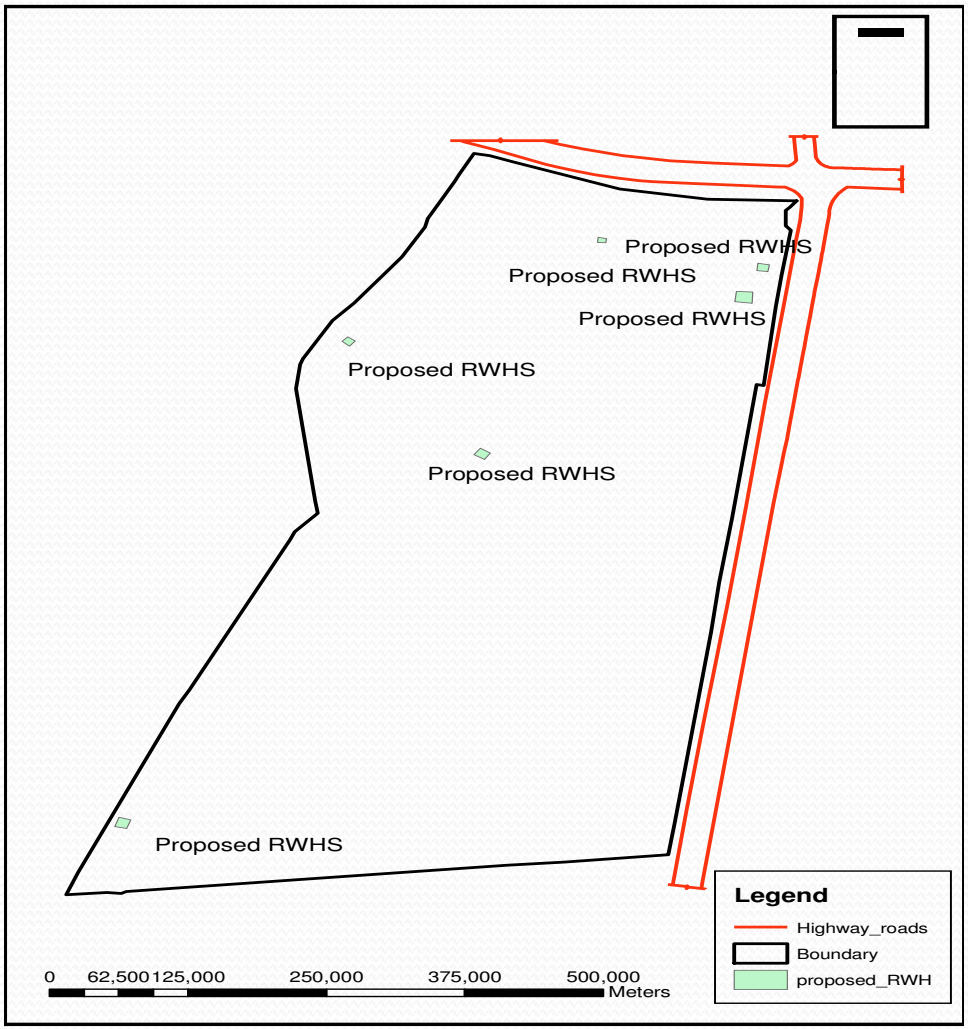
Buildings along with Roads



Piezometer well locations

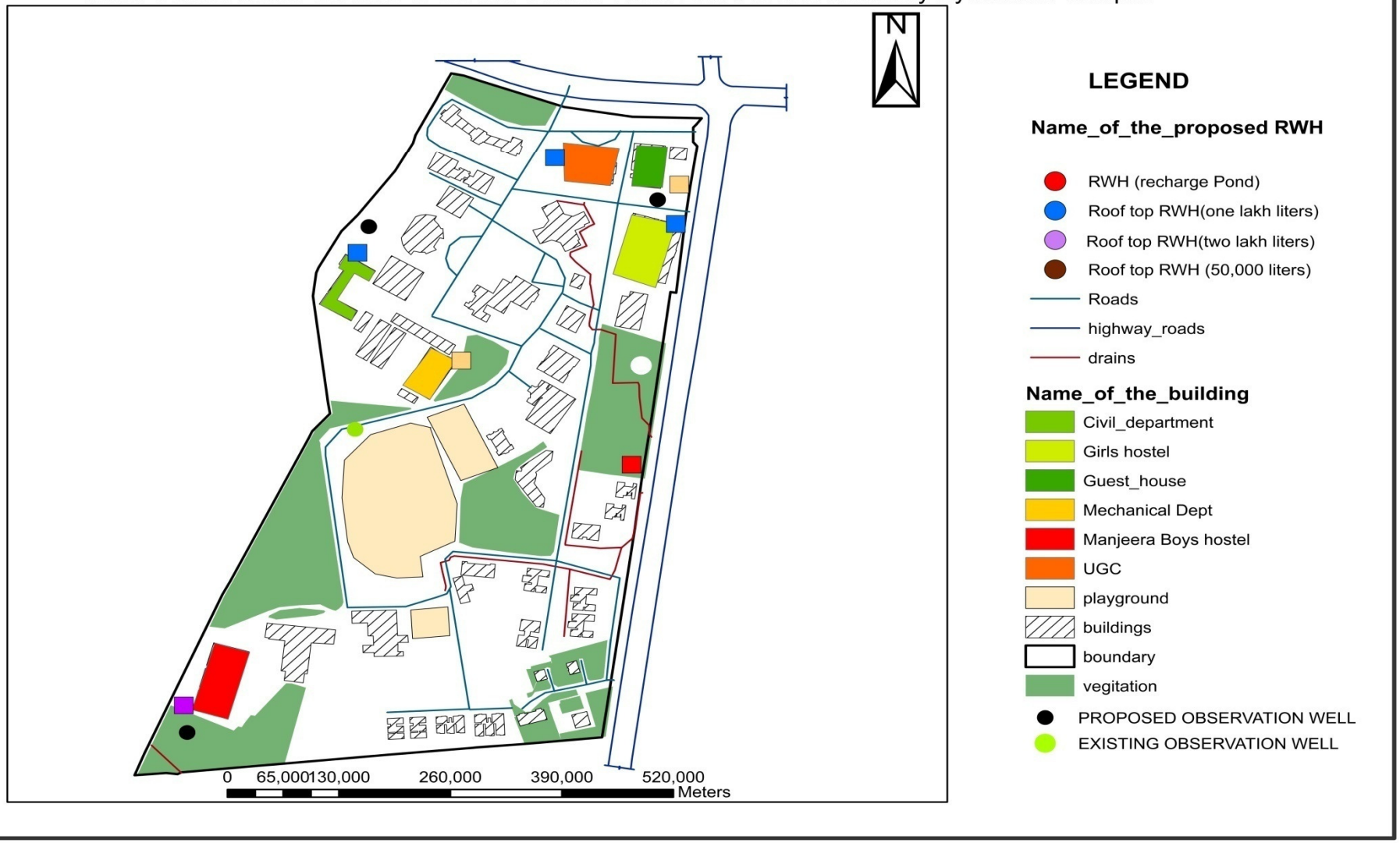


Locations of proposed Rainwater Harvesting Structures

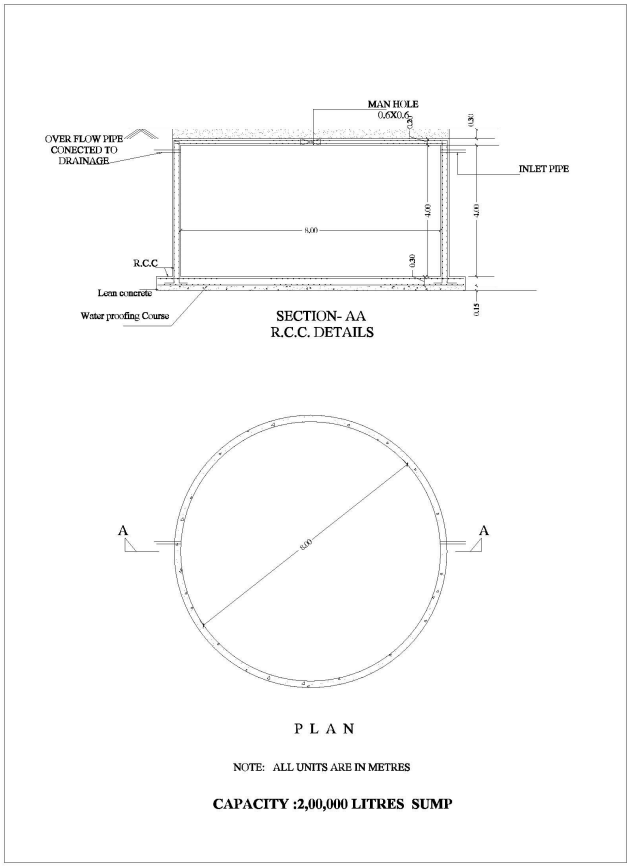


Locations of Existing buildings and proposed Rainwater Harvesting Structures along with layout of the Campus

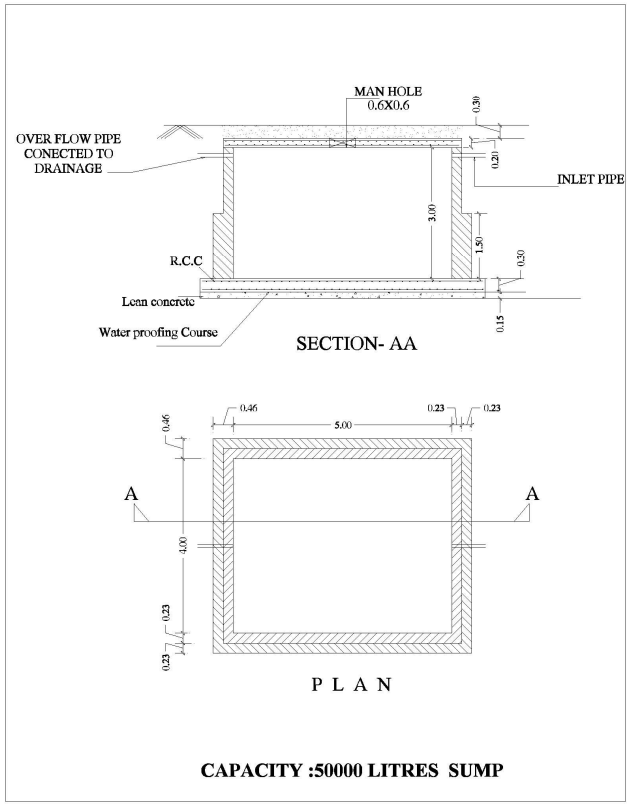
Fig.14. Proposed rainwater harvesting structures
under Central Sector Scheme of Central Ground Water Board in JNTUniversity Hyderabad Campus



Roof top rainwater harvesting with a capacity of two lakh liters and re-use



Roof top rainwater harvesting with a capacity of 50,000 liters with brick walls



Impact of Artificial Recharge of Rainwater in JNTU Hyderabad campus

STRUCTURES CONSTRUCTED

Sl. No	Title of the structure	Location
1	**Main structure:** Recharge pond with two recharge shafts	Besides Mechanical Engineering building, JNTUH Campus
ASSOCIATE STRUCTURES		
Piezometers – 03 Nos		
2	Piezometer -1 with a depth of 30mts	Between Girls hostel compound wall and new incubator building, JNTUH Campus
3	Piezometer – 2 with a depth of 30mts	Behind EEE Department, College of Engineering, JNTUH Campus
4	Piezometer -3 with a depth of 30mts	Behind new JNTUHIST Building, JNTUH Campus
Sump (50,000lit capacity) - 02 Nos		
5	Roof top rainwater harvesting structure with a capacity of 50,000 liters for reuse.	Behind old quarters, JNTUH Campus
6	Roof top rainwater harvesting structure with a capacity of 50,000 liters for reuse.	Behind New quarters, JNTUH Campus

STRUCTURES CONSTRUCTED

Sump (2,00,000 lit capacity) – 01 Nos.		
7	Roof top rainwater harvesting sump with a capacity of 2,00,000 liters for reuse.	In front of Manjeera Hostel, JNTUH Campus
Sump (1,00,000 lit capacity) – 03 Nos.		
8	Roof top rainwater harvesting structure with a capacity of 1,00,000 liters along with two bore well for recharge.	Behind EEE Department, College of Engineering, JNTUH
9	Roof top rainwater harvesting structure with a capacity of 1,00,000 liters along with two bore well for recharge.	Between Girls hostel compound wall and new incubator building
10	Roof top rainwater harvesting structure with a capacity of 1,00,000 liters along with two bore well for recharge.	Behind new JNTUHIST Building, JNTUH

RECHARGE OF RAINWATER THROUGH INJECTION WELLS IN THE JNTUH CAMPUS:

LOCATION OF THE STRUCTURE: NEAR LIBRARY

ESTIMATED COST: 5, 50,000 RUPEES

QUANTITY OF RAINWATER HARVESTED AND RECHARGED DURING THE YEAR 2012 AND 2013

Sl. No	Month	Rainfall (mm)		Quantity of rainwater recharged (lts)	
		2012	2013 (25-11-2013)	2012	2013 (25-11-13)
1	April	---	72	---	66096
2	May	---	14	---	12852
3	June	200.1	120.4	183691.8	110527.2
4	July	193.2	380.1	177357.6	348931.8
5	August	170	160.6	156060	147430.8
6	September	94.8	170.2	87026.4	156243.6
7	October	61.6	168.8	56548.8	154958.4
8	November	55	13.8	50490	12668.4
9	December	---	---	---	--
	Total	774.7	1099.9	**7,11,174.6**	**10,09,708.2**

Location of the structure: Near Girls Hostel

Estimated Cost: 5, 50,000 Rupees

Quantity of rainwater harvested and recharged during the year 2012 and 2013

Sl. No	Month	Rainfall (mm)		Quantity of rainwater recharged (lts)	
		2012	2013 (25-11-2013)	2012	2013 (25-11-13)
1	April	---	72	---	83073.6
2	May	---	14	---	16153.2
3	June	200.1	120.4	230875.38	138917.52
4	July	193.2	380.1	222914.16	438559.4
5	August	170.0	160.6	196146	185300.28
6	September	94.8	170.2	109380.24	196376.8
7	October	61.6	108.8	71074.08	194761.4
8	November	55.0	13.8	63459	
9	December	---	-----	---	
	Total	774.7	1099.9	8,93,848.86	1269064.62

Total quantity of rainwater recharged through this structure: 21,62,913.48

(Twenty one Lakhs sixty two thousand nine hundred and thirteen liters)

Location of the structure: Near New IST

Estimated Cost: 5, 50,000 Rupees

Quantity of rainwater harvested and recharged during the year 2012 and 2013

Sl. No	Month	Rainfall (mm)		Quantity of rainwater recharged (lts)	
		2012	2013 (25-11-13)	2012	2013 (25-11-13)
1	April	---	72	---	44128.8
2	May	---	14	---	8580.6
3	June	200.1	120.4	122641.29	73793.16
4	July	193.2	380.1	118412.28	232963.3
5	August	170.0	160.6	104193	98431.74
6	September	94.8	170.2	58102.92	104315.6
7	October	61.6	108.8	37754.64	103457.5
8	November	55.0	13.8	33709.5	8458.02
9	December	---	---	---	---
Total		**774.7**	**1099.9**	**4,74,813.63**	**6,74,128.71**

Total quantity of rainwater recharged through this structure: **11, 48,942.34**

(Eleven Lakhs forty eight thousand nine hundred and forty three liters)

LOCATION OF THE STRUCTURE: NEW QUARTERS

ESTIMATED COST: 5, 00,000 RUPEES

QUANTITY OF RAINWATER HARVESTED AND RECHARGED DURING THE YEAR 2012 AND 2013

Sl. No	Month	Rainfall (mm)		Quantity of rainwater recharged (lts)	
		2012	2013 (25-11-13)	2012	2013 (25-11-13)
1	April	---	72	---	143596.8
2	May	---	14	---	27921.6
3	June	200.1	120.4	399079.44	240125.76
4	July	193.2	380.1	385378.08	758071.44
5	August	170.0	160.6	339048	320300.64
6	September	94.8	170.2	189069.12	339446.9
7	October	61.6	108.8	122855.04	336654.7
8	November	55.0	13.8	109692	27522.72
9	December	---	---	---	----
Total		774.7	1099.9	15,45,121.68	21,93,640.56

Total quantity of rainwater recharged through this structure: 37, 38,702.24

(Thirty Seven Lakhs thirty eight thousand seven hundred and two liters)

Location of the structure :Old Quarters

Estimated Cost: 5, 00,000 rupees

Quantity of rainwater harvested and recharged during the year 2012 and 2013

Sl. No	Month	Rainfall (mm)		Quantity of rainwater recharged (lts)	
		2012	2013 (25-11-2013)	2012	2013 (25-11-2013)
1	April	---	72	---	63180
2	May	---	14	---	12285
3	June	200.1	120.4	175587.75	105651
4	July	193.2	380.1	169533	333537.75
5	August	170.0	160.6	149175	140926.5
6	September	94.8	170.2	83187	149350.5
7	October	61.6	108.8	54054	148122
8	November	55.0	13.8	48262.5	12109.5
9	December	---	---	---	----
Total		774.7	1099.9	6,79,799.25	9,65,162.25

Total quantity of rainwater recharged through this structure: **16,44,961.5**

(Sixteen Lakhs forty four thousand nine hundred and sixty one liters)

Recharge through open pond with two recharge wells:

IN 2012

- Amount of rainfall received during the year 2012: 774.7
- Catchment area : 05 acres: 20235 m^2
- Runoff =7,830.945 m^3
- Total quantity of rainfall received and harvested : 7830 m^3 or 78,30,000 liter

IN 2013 (Till 25- 11-2013

- Amount of rainfall received during the year 2013 upto 25-11-2013: 1099.9mm
- Catchment area : 05 acres: 20235 m^2
- Runoff = 11119 m^3
- Total quantity of rainfall received and harvested : 11,119 m^3 or 1,11,19,000 liters

TOTAL QUANTITY OF RAINWATER RECHARGED DURING THE YEAR 2012 AND 2013

Sl. No	Location of the structure	Quantity of rainwater recharged during the year 2012	Quantity of rainwater recharged during the year 2013	Total till 25-11-2013
1	**Near library**	7,11,174.6	5,38,407	**12,49,582**
2	**Near Girls Hostel**	8,93,848.86	6,76,703.7	**15,70,553**
3	**Near New IST**	4,74,813.63	35,9,465.9	**8,34,280**
4	**New Quarters**	15,45,121.7	11,69,716	**27,14,837**
5	**old Quarters**	6,79,799.25	9,65,162.3	**16,44,962**
6	**Open pond**	1,56,76,054	2,22,57,000	**3,79,33,054**
			Total	**4,59,47,268**

Total quantity of rainwater recharged through this structure: **4,59,47,268**

(Four crores fifty nine Lakhs forty seven thousand two hundred and sixty eight liters)

REUSE OF RAINWATER IN THE JNTUH CAMPUS:.

LOCATION OF THE TANK: MANJEERA HOSTEL

ESTIMATED COST: 9, 50,000 RUPEES

QUANTITY OF RAINWATER HARVESTED AND REUSED DURING THE YEAR 2012 AND 2013

Sl. No	Month	Rainfall (mm)		Quantity of rainwater reused (lts)	
		2012	2013 (25-11-2013)	2012	2013 (25-11-2013)
1	April	---	72	---	40176
2	May	---	14	---	7812
3	June	200.1	120.4	111655.8	67183.2
4	July	193.2	380.1	107805.6	212095.8
5	August	170.0	160.6	94860	89614.8
6	September	94.8	170.2	52898.4	94971.6
7	October	61.6	108.8	34372.8	94190.4
8	November	55.0	13.8	30690	7700.4
9	December	---	---	---	---
Total		**774.7**	**1099.9**	**4,32,282.6**	**2,86,477.2**

Total quantity of rainwater recharged through this structure**: 10, 46,026.8 liters**

(Ten Lakhs forty Six thousand twenty six liters**)**

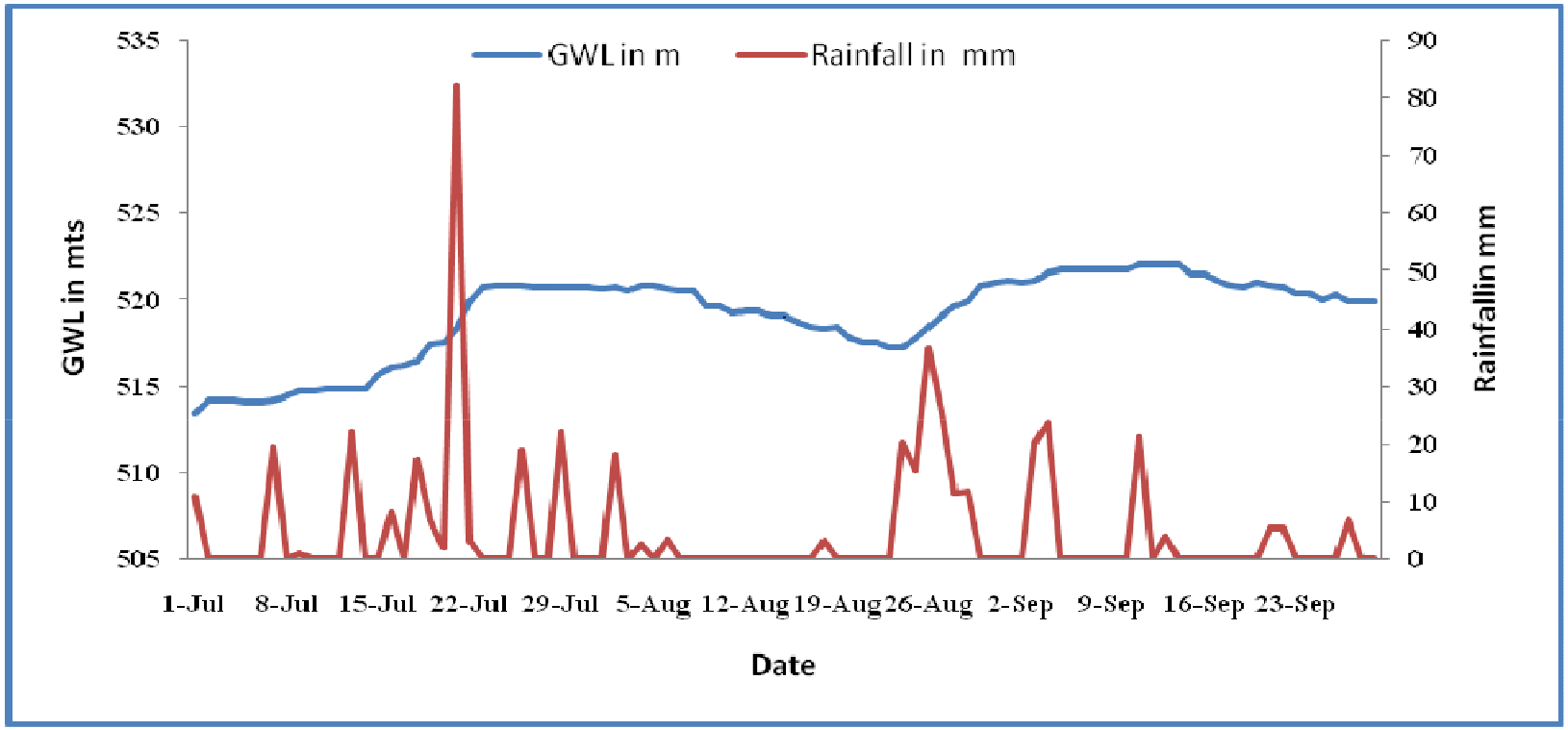
TOTAL QUANTITY OF RAINWATER RECHARGED DURING THE YEAR 2012 AND 2013

Sl. No	Location of the structure	Quantity of rainwater recharged during the year 2012	Quantity of rainwater recharged during the year 2013	Total till 31-07-2013
1	Near library	711174.6	538407	1249582
2	Near Girls Hostel	893848.86	676703.7	1570553
3	Near New IST	474813.63	359465.9	8,34,280
4	New Quarters	1545121.7	1169716	2714837
5	old Quarters	679799.25	965162.3	1644962
6	Open pond	15676054	22257000	37933054
Total	Total			4,59,47,268

Total quantity of rainwater recharged through this structure: **4,59,47,268**

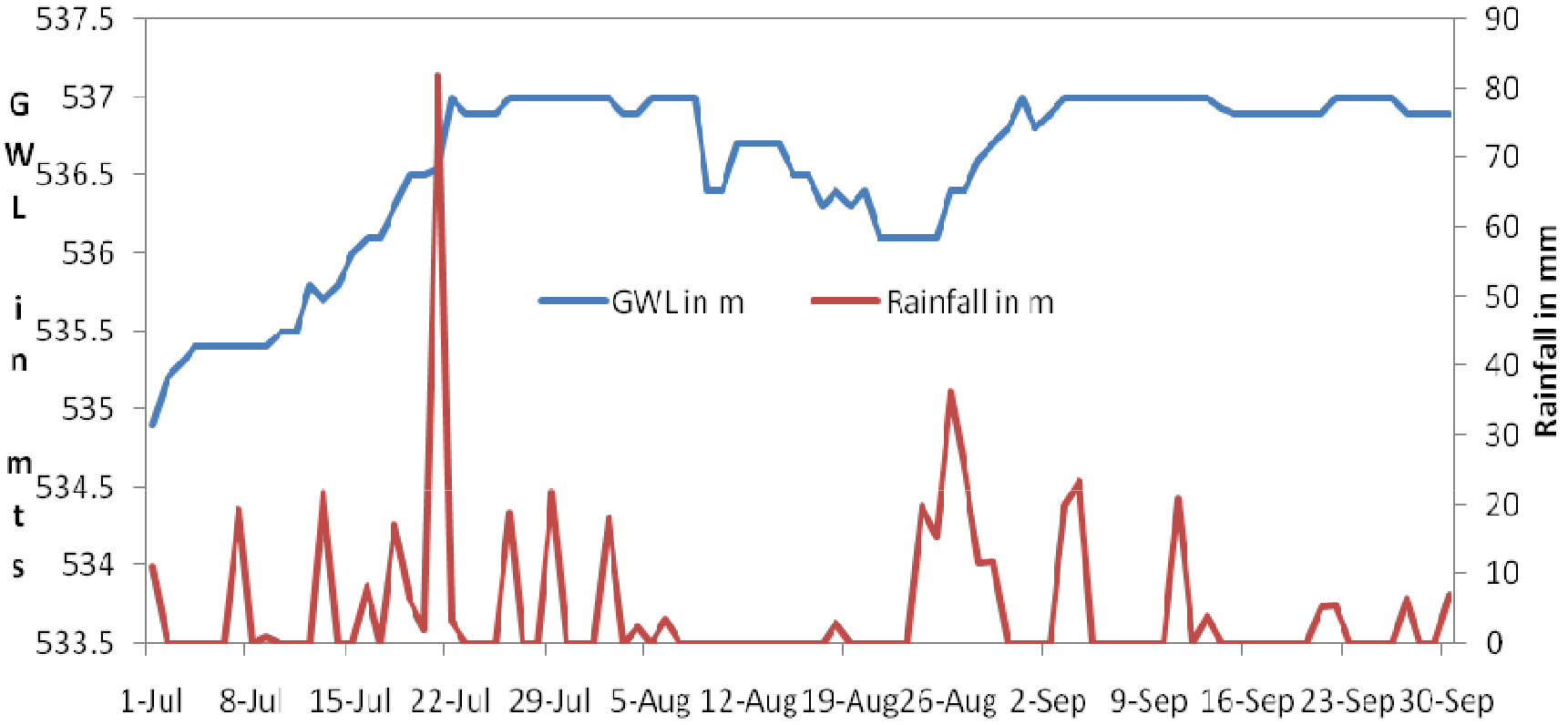
(Four crores fifty nine lakhs forty seven thousand two hundred and sixty eight liters)

VARIATION OF DAILY GROUNDWATER LEVEL AND RAINFALL FOR THE MONTHS OF JULY TO SEPTEMBER 2012 FOR THE PIEZOMETER LOCATED BEHIND LIBRARY BUILDING IN THE CAMPUS.



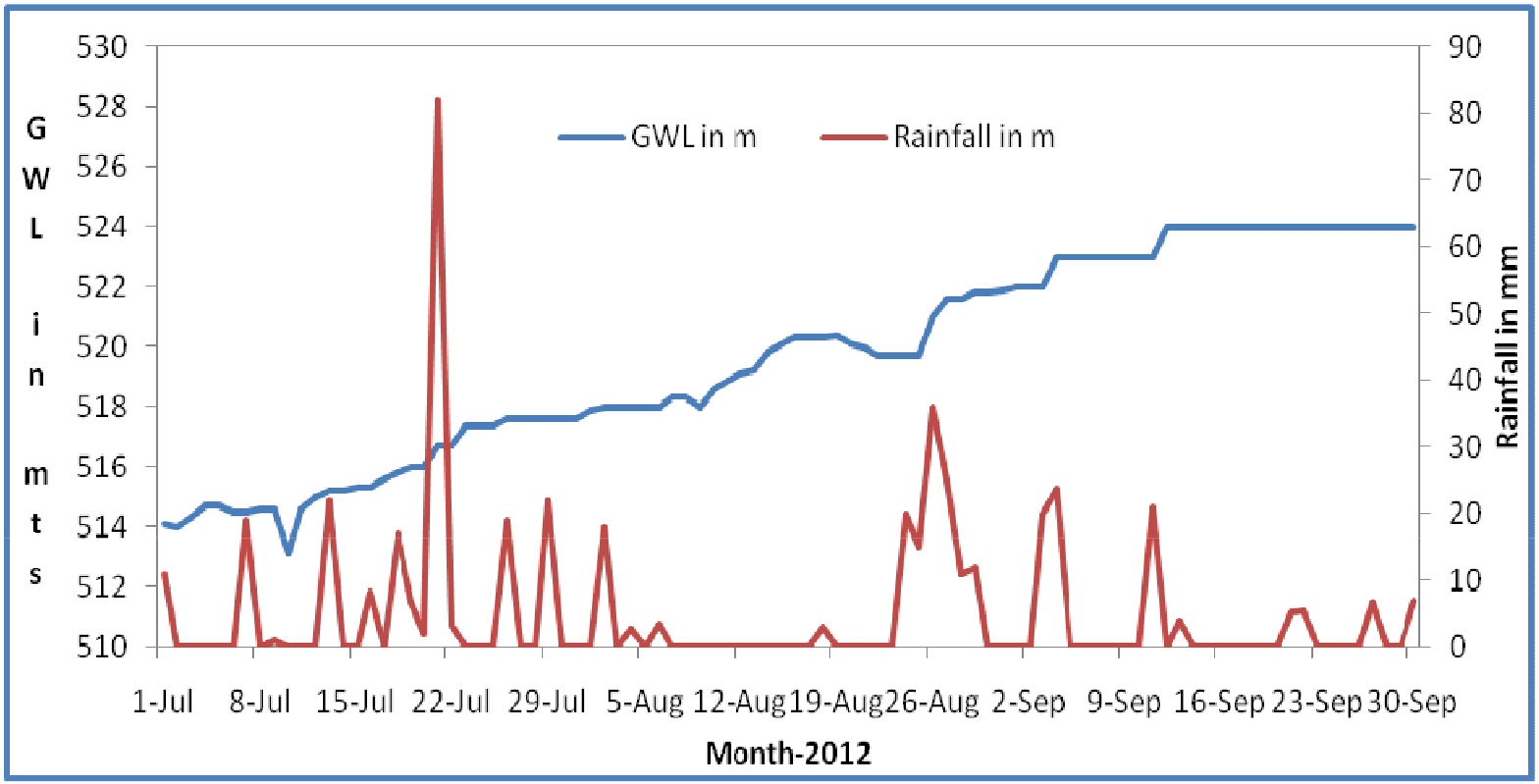
- Lowest ground water level 513.4 msl observed on 01-07-2013
- Maximum ground water level 522.0 msl observed 14-09-2013
- Static water level rise is around **8.6 m** due to recharge of rainwater in this watershed.

VARIATION OF DAILY GROUNDWATER LEVEL AND RAINFALL FOR THE MONTHS OF JULY TO SEPTEMBER 2012 FOR THE PIEZOMETER LOCATED NEAR GIRLS HOSTEL IN THE CAMPUS



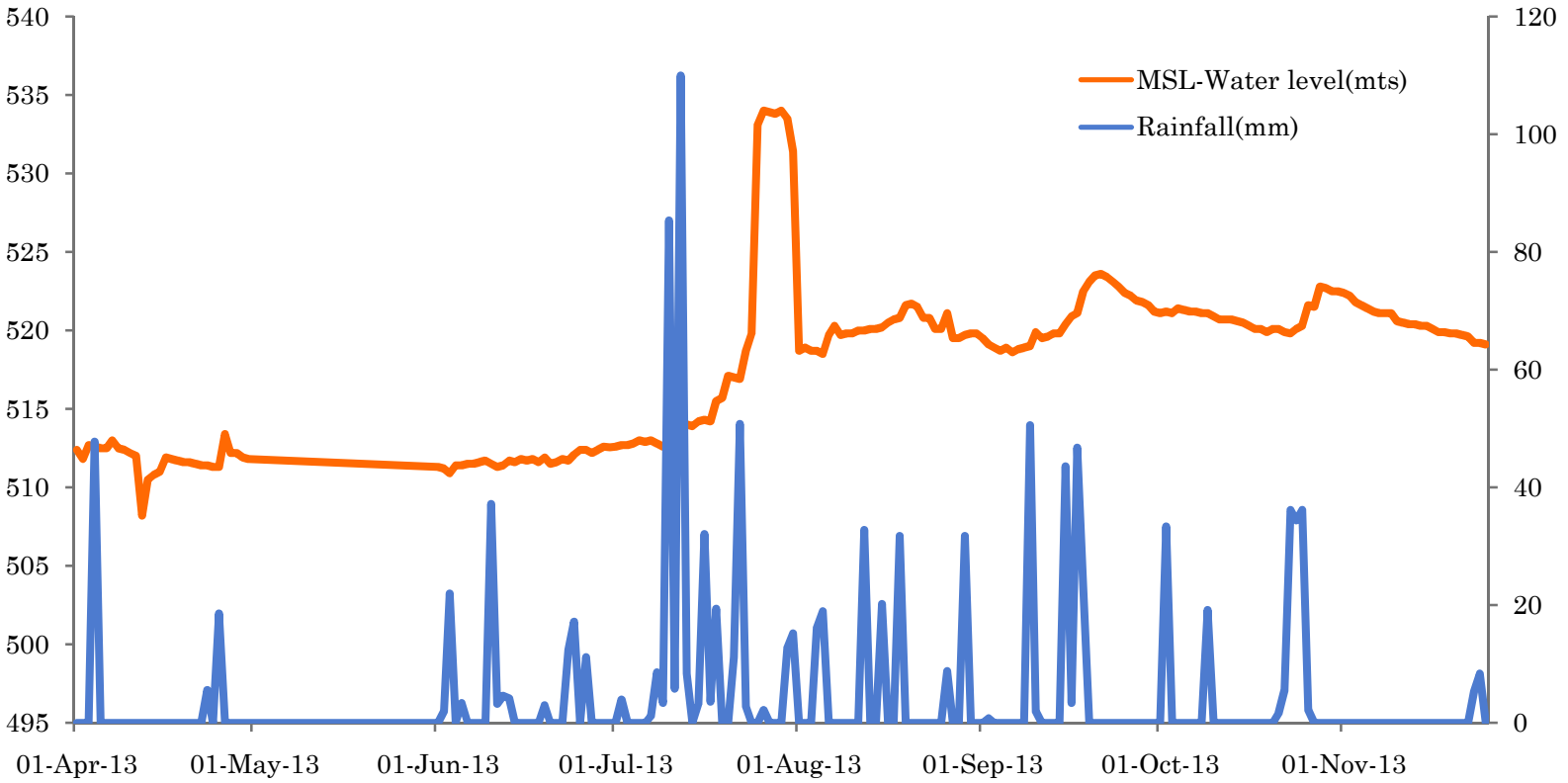
- Lowest ground water level 537.0 msl observed on 22-07-2012
- Maximum ground water level 534.9 msl observed 01-07-2012
- Static water level rise is around **2.1 m** due to recharge of rainwater in this watershed

Variation Of Daily Groundwater Level And Rainfall For The Months Of July To September 2012 For The Piezometer Located Near New IST Building In The Campus.

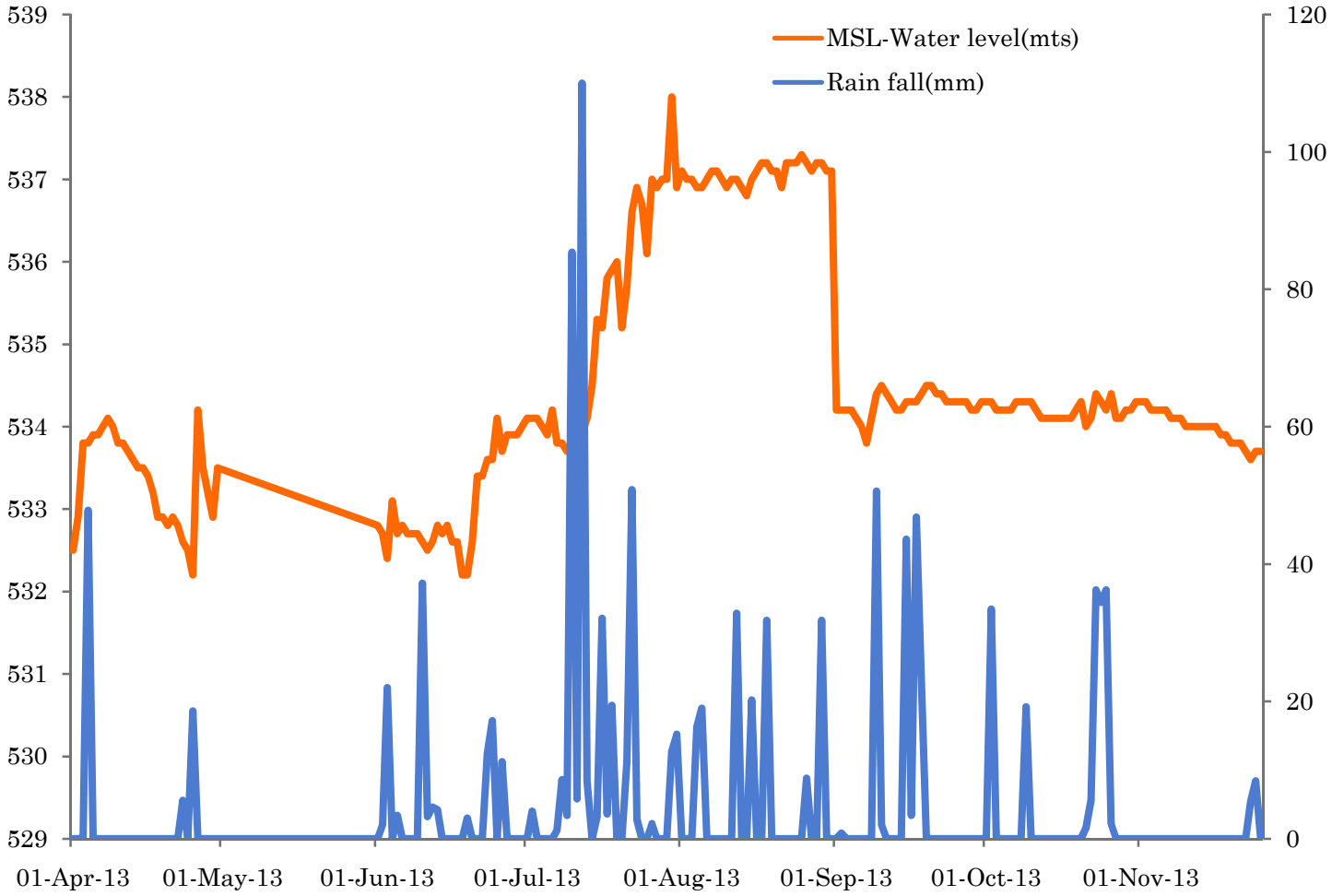


- Lowest ground water level 524.0 msl observed on 09-12-2012
- Maximum ground water level 513.1 msl observed 07-10-2012
- Static water level rise is around 10.9 m due to recharge of rainwater in this watershed

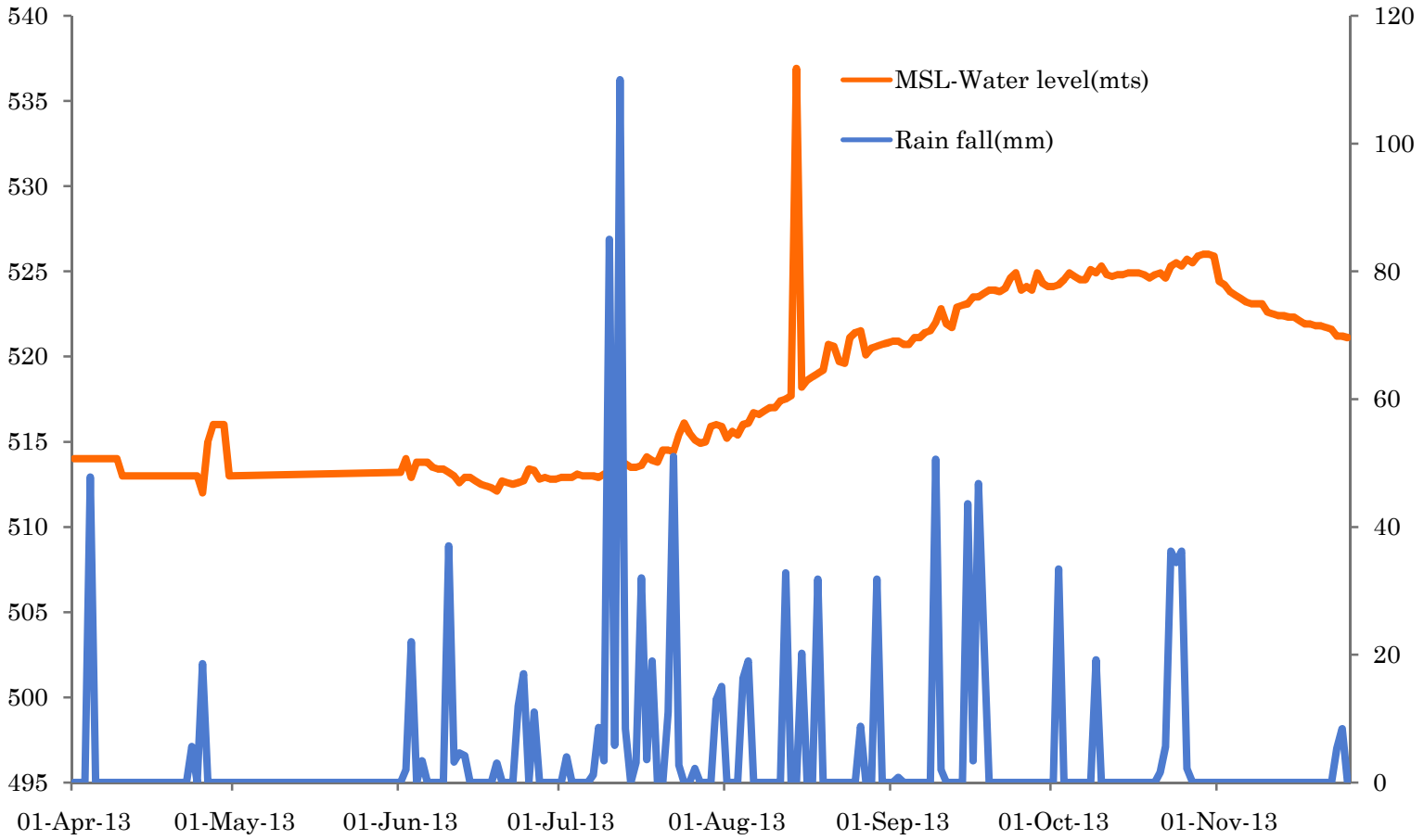
Variation of daily groundwater level and rainfall for the months of April to November (25.11.2013) 2013 for the piezometer located behind library building in the campus.



Variation of daily groundwater level and rainfall for the months of April to November (25.11.2013) 2013 for the piezometer located near girls hostel in the campus

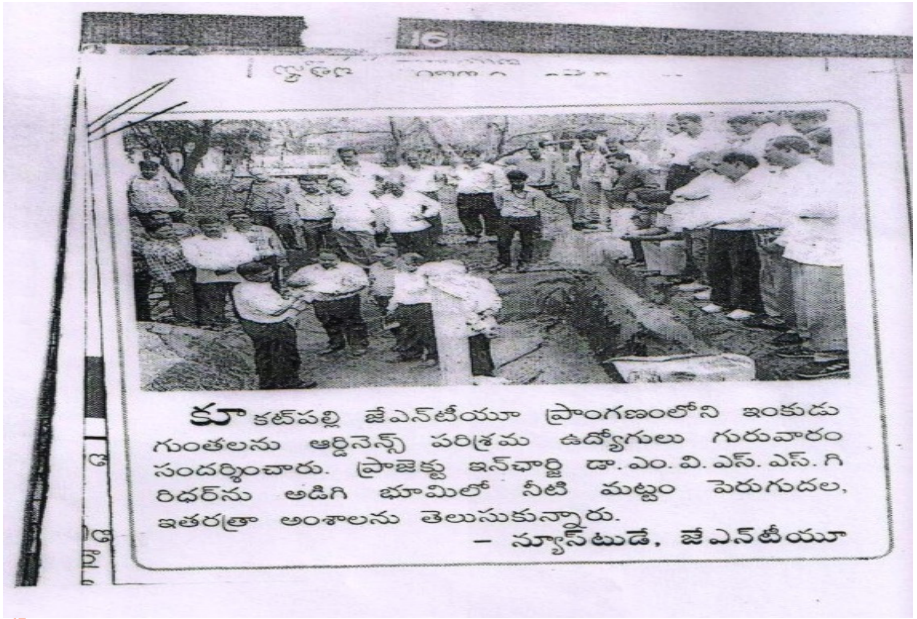


Variation of daily groundwater level and rainfall for the months of April to November (25.11.2013) 2013 for the piezometer located near new IST building in the campus.



Electronic Video Coverage by Media

Sl. No	Name of the channel	Name of the programme	Date and time	Duration	Youtube link
1	ETV	Inkudu Guntalu	10-03-2013, 11.00 am	2min 30sec	http://youtu.be/SSs4OC28Trk
2	ETV2	Inkudu Guntalu	11-03-2013, 8.30 am	2min 30sec	http://youtu.be/0q9BJoNDxf4
3	ETV2	Jala Samrakshanalo JNTU	14-07-2013, 9:30 pm	2min 30sec	http://youtu.be/scAvr_BBTkc
4	ETV2	Jala Samrakshanalo JNTU	15-07-2013, 12:30 pm	2min 30sec	http://youtu.be/scAvr_BBTkc
5	Zee 24 hours (Telugu)	Inkudu Guntalu	25-07-2013, 8:30 pm	45 sec	http://youtu.be/N6ljvYkgw7E



కూకట్‌పల్లి జేఎన్‌టీయూ ప్రాంగణంలోని ఇంకుడు గుంతలను ఆర్డినెన్స్ పరిశ్రమ ఉద్యోగులు గురువారం సందర్శించారు. ప్రాజెక్టు ఇన్‌చార్జి డా. ఎం. వి. ఎస్. ఎస్. గిరిధర్‌ను అడిగి భూమిలో నీటి మట్టం పెరుగుదల, ఇతరత్రా అంశాలను తెలుసుకున్నారు.
– న్యూస్‌టుడే, జేఎన్‌టీయూ

Name of the Organization visited: **Employees of Ordinance Factory, Hyderabad**

Title of the training programme: **2 Day training on Rainwater Harvesting**

Training by: **IIT Hyderabad**

Date of visit: **25.07.1013**

No. of Participants: **40**

Published in: **Eenadu News paper on 26th July in Kukatpally edition**

Visit by: Ordinance Factory Employees

Title: 2 Day training on Rainwater Harvesting

Training by: IIT Hyderabad

Date of visit: 25.07.1013

No. of Participants: 40

Published in: Andhra Jyothi News paper on 26th July in Kukatpally edition



జేఎన్‌టీయూహెచ్‌లో ఇంకుడు గుంతల పరిశీలన

జేఎన్‌టీయూ: జేఎన్‌టీయూహెచ్ సెంటర్ ఫర్ వాటర్ రిసోర్సెస్ విభాగం ఆధ్వర్యంలో వర్సిటీలో ఏర్పాటు చేసిన ఇంకుడు గుంతలను ఐఐటీ హైదరాబాద్, ఆర్డినెన్స్ ఫ్యాక్టరీ సభ్యులు గురువారం సందర్శించారు. వర్సిటీలో సుమారు పది చోట్ల ఇంకుడు గుంతలను ఏర్పాటు చేసి వర్షంనీటిని భద్రపరచి తిరిగి వినియోగిస్తున్నందున వీటిని ఐఐటీ హైదరాబాద్ ప్రతినిధి బృందం సభ్యులు సందర్శించినట్లు సెంటర్ ఫర్ వాటర్ రిసోర్సెస్ విభాగం అసిస్టెంట్ ప్రొఫెసర్ డాక్టర్ ఎం.వి.ఎస్.ఎస్. గిరిధర్ తెలిపారు. ఇంకుడు గుంతలు అనే అంశంపై ఐఐటీ హైదరాబాద్‌లో జరుగుతున్న రెండు రోజుల నదస్సుకు హాజరైన ఆర్డినెన్స్ ఫ్యాక్టరీ సభ్యులకు ప్రయోగంలో భాగంగా గురువారం వీటి పనితీరును తెలిపామన్నారు. కార్యక్రమంలో సెంటర్ ఫర్ వాటర్ రిసోర్సెస్ విభాగం జేఆర్.ఎఫ్ వి.సౌమ్య, ఎంటెక్ విద్యార్థులు శ్రీనివాస్, నాగేశ్వరరావు, మధుసూదన్, ఎస్.వెంకటరెడ్డి పాల్గొన్నారు.

ఇంకుడు గుంతలను పరిశీలిస్తున్న ఐఐటీ హైదరాబాద్ ప్రతినిధి బృందం

PHOTOS DURING CONSTRUCTION OF THE STRUCTURES














Research Project Name: Demonstrative Rainwater Harvesting Structures in JNTUH, Kukatpally Campus, Hyderabad.
Sponsored by: Central Ground Water Board, Ministry of Water Resources, Govt. of India.
Structure: Recharge Pit with recharge shaft
Capacity: 50,000 Lit. Size: 5mX4mX2.5m
Depth of Recharge Shaft: 60m.
Principal Investigator: Dr. M.V.S.S. Giridhar, Asst. Prof., Centre for Water Resources, Institute of Science and Technology, JNTUH.


Research Project: Demonstrative Rainwater Harvesting Structures in JNTUH, Kukatpally Campus, Hyderabad.
Sponsored by: Central Ground Water Board Ministry of Water Resources, Govt of India
Structure: Recharge pit with Two Recharge Shaft's
Principal Investigator: Dr.M.V.S.S.Giridhar, Asst.Prof, Centre for Water Resources, IST, JNTUH.


Thank You