6.4
Water Reuse

6.4.2 Water Reuse Measurement

MRIIRS Weblink to SDG 6:

https://mriirs.edu.in/sdg06-clean-water-and-sanitation/

Water Reuse Measurement

MRIIRS generates monthly Av 151KL water through STP (1810 KL Annum) which is 5700litre/day. This reclaimed water is used for horticulture and toilet flushing. It not only saves precious groundwater but also reduce energy consumption in extracting groundwater from aquifer. So, as it helps in conserving groundwater resource. Thus, recycling of water is reducing carbon foot print of the campus.MRIIRS has also installed rain water harvesting system in the campus.

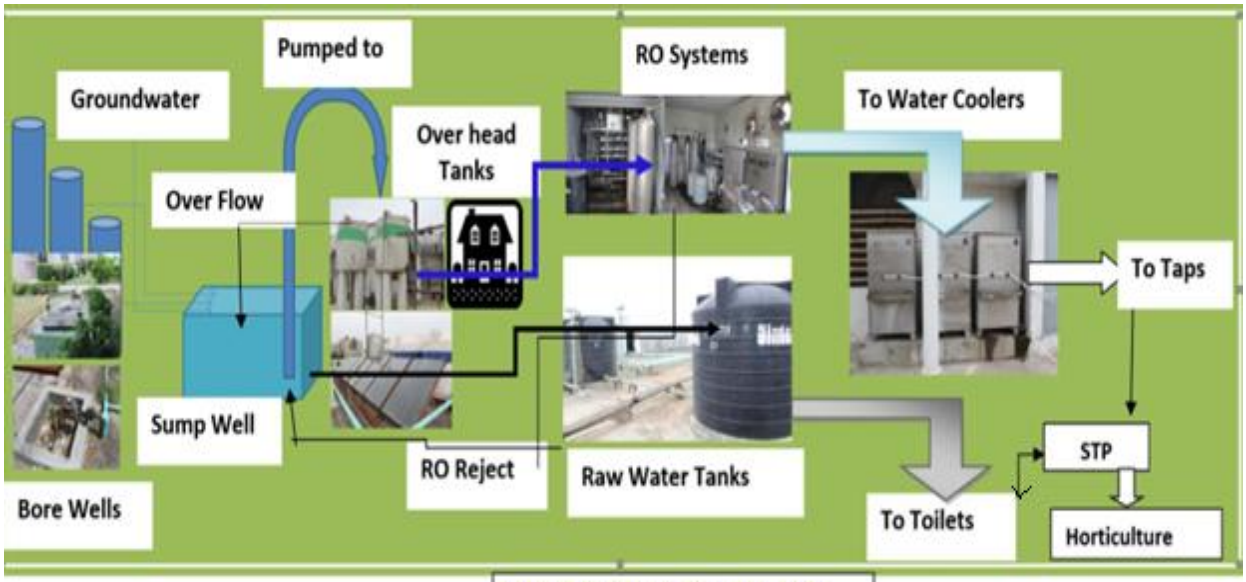
Following evidence in support to 6.4.2 are available

- ✓ **flow of water management system at MRIIRS**
- ✓ **video/geotagged pictures of STP**
- ✓ **Rain water harvesting system** (RWH) structure has been installed at MRIIRS and the detailed have been appended as a **consolidated report along with geotagged pictures**.The campus is situated in arid region, which stands in water scarcity zone. These practices help in recharging the ground water resource system.

All the data are also available in public domain through web site of MRIIRS.

Water Management System at MRIIRS:

MRIIRS has installed a 200KL/Day Sewage Treatment Plant (STP) to treat the sewage generated within the campus. Underground drains are constructed connecting all the buildings to the STP. The site of STP is kept in the down slope end of the campus, so as to facilitate the gravitational movement of sewage to STP.



WATER MANAGMENT FLOW CHART

The detailed flow of water management system at MRIIRS is as presented above. As shown in the flow, the treated water from STP is used for horticulture and toilet flushing. The reuse of water across the University is measured to keep the record and for further planning.

A register/log book is maintained by university **care taker** to record daily units of water reuse readings of the STP. Monthly data of water reuse is reported to the **Supervisor**. The supervisor reports the compiled monthly data to the **Manager-maintenance** for data storage/record keeping in the university MIS. Supervisor also keep track of maintenance of STP and testing of water samples in regular interval.

The sewage generated in the campus is collected and processed at installed STP of 200 m^3/day capacity. It can be noted from the results that the performance of plant

is adequate to achieve discharge standards with respect to Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS).

Table 1: Characteristics of sample

Parameters	Raw Sewage	Treated Water
pH	6.53	6.54
Oil and Grease	< 2	< 2
Odour	Faint	Odourless
TSS (mg/L)	112	29
BOD (mg/L)	46	8
COD (mg/L)	660	60

The monthly records of MRIIRS STP discharge during the year are as presented below:

MRIIRS STP Discharge Data Log (1 unit=1000 L)					
Month	**Start Reading**	**End Reading**	**Total monthly unit discharge**	**Unit Discharge Av/day**	**Per day Unit Discharge - Act days**
Nov-21	6030	6120	90	3.000	3.9130
Dec-21	6120	6190	70	2.258	3.3333
Jan-22	6190	6212	22	0.710	3.1429
Feb-22	6212	6300	88	3.143	4.0000
Mar-22	6300	6430	130	4.194	5.0000
Apr-22	6430	6617	187	6.233	7.1923
May-22	6617	6835	218	7.032	7.2667
Jun-22	6835	7065	230	7.667	8.2143
Jul-22	7065	7236	171	5.516	6.5769
Aug-22	7236	7458	222	7.161	7.1613
Sep-22	7458	7674	216	7.200	7.2000
Oct-22	7674	7840	166	5.355	5.5333
			1810	**4.9557**	**5.7112**

Annual discharge of STP is 1810 KL (2021-22). From the measurement it is calculated that Av 5.7KL/Day discharge obtained from STP. It is used to generate sufficient treated waste water of around 5700 liter per day to irrigate 2.87ha planted landscape within the lush green campus and toilet flushing. The output

water quality of STP is maintained keeping Biochemical Oxygen Demand (BOD) within permissible level. Frequent analysis of output water is done to keep check on its quality.

Geotagged Pictures
of
Sewage Treatment Plant (STP)
installed at MRIIRS

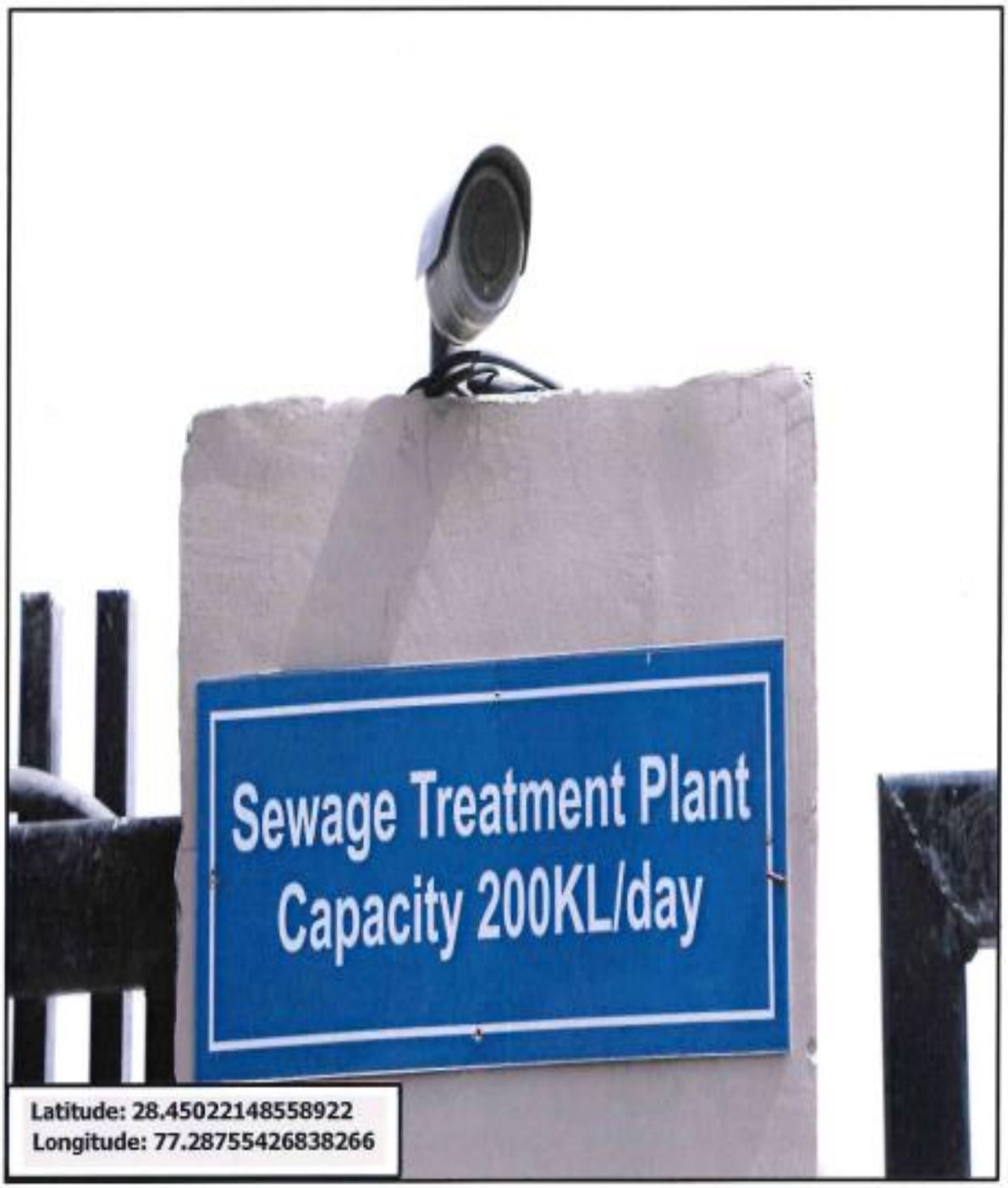
S. No	Relevant documents
1	Sewage Treatment Plant -Geotag Link to Google Maps
2	Sewage Treatment Plant Display Board
3	Sewage Treatment Plant Specifications
4	Sludge Tank Sewage Treatment Plant
5	Sludge Dry Bed Sewage Treatment Plant
6	Treated Water Distribution, Sewage Treatment Plant

Video link of STP installed at MRIIRS

Sewage Treatment Plant: Screenshot of Geotag Link to Google Maps

Geotag Link to Google Maps showing STP installed at MRIIRS:

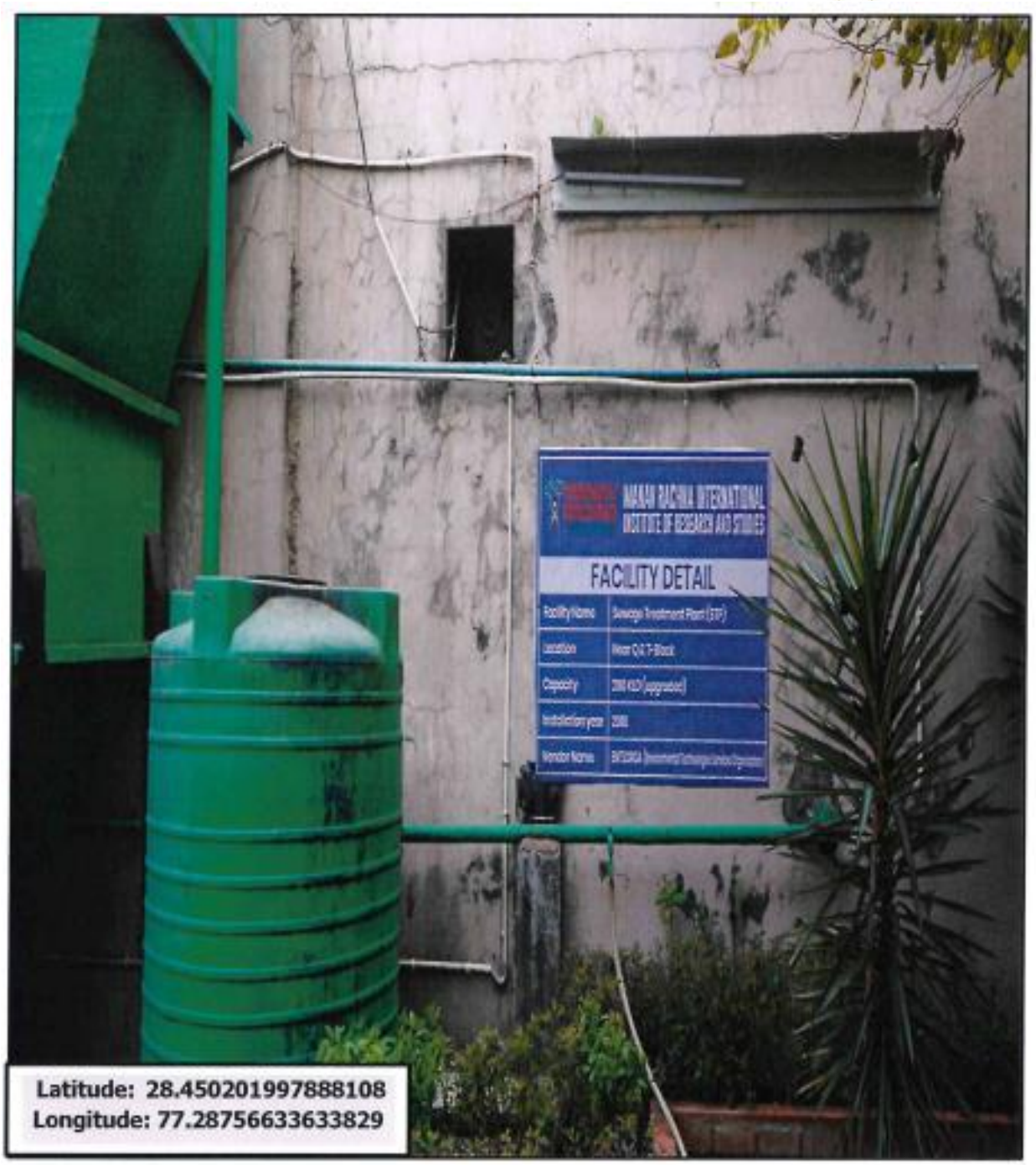
https://www.google.co.in/maps/place/STP/@28.4501691,77.2854833,18z/data=!4m12!1m6!3m5!1s0x390ce0ab6fec0aab:0x87c9e10e1ae0b0fc!2sManav+Rachna+International+Institute+Of+Research+And+Studies!8m2!3d28.4503781!4d77.2837474!3m4!1s0x390ce76550791101:0x258f2807dc40ea99!8m2!3d28.4501966!4d77.2875689



Sewage Treatment Plant Display Board

Latitude: 28.45022148558922, Longitude: 77.28755426838266
28°27'00.8"N 77°17'15.2"E

SDG 6- CLEAN WATER AND SANITATION



Sewage Treatment Plant Specifications

Latitude: 28.450201997888108, Longitude: 77.28756633633829
28°27'00.7"N 77°17'15.2"E

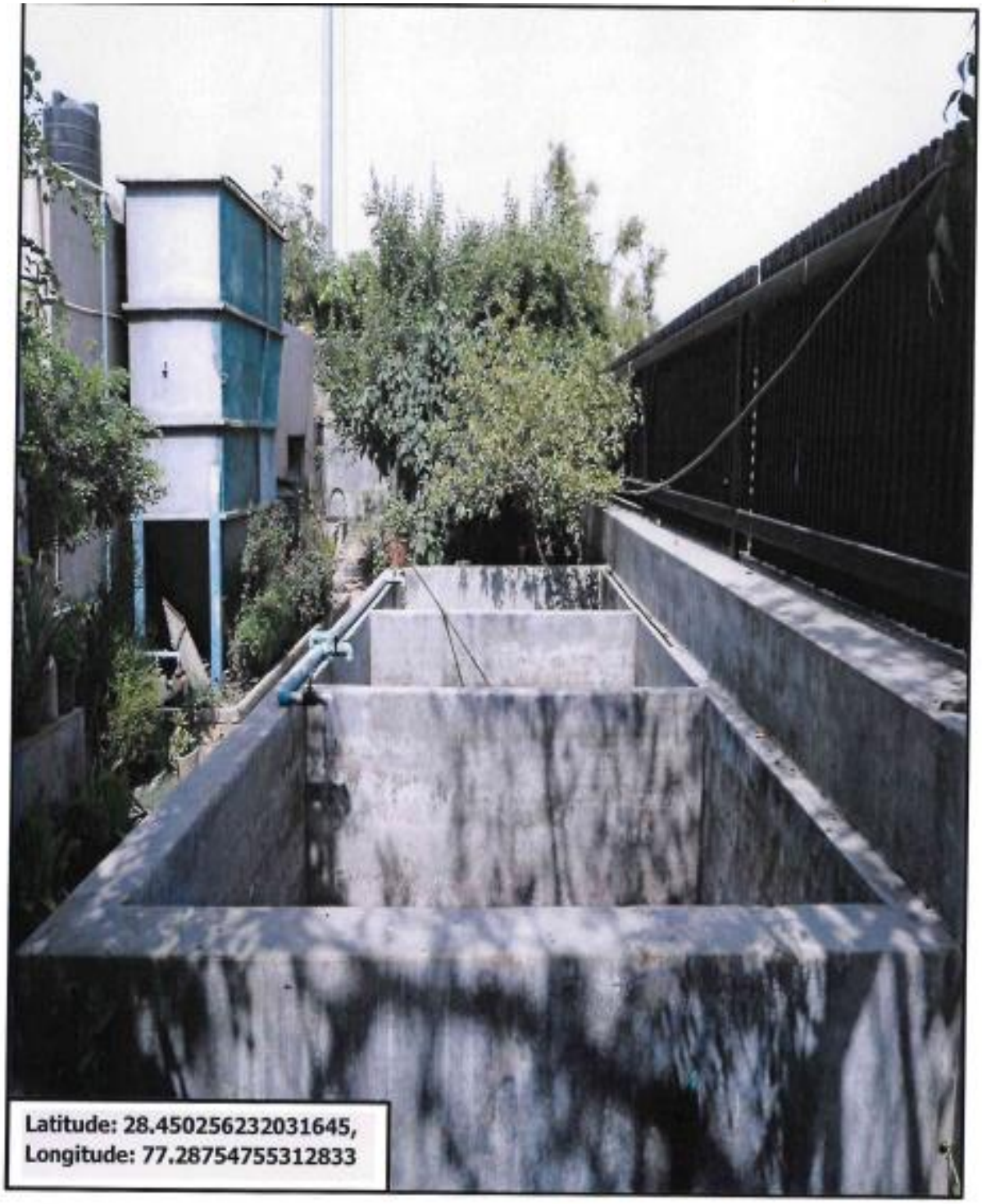
Sludge Tanks ,Sewage Treatment Plant

Latitude: 28.450211432035662, Longitude: 77.28756361756224
28°27'00.8"N 77°17'15.2"E

SDG 6- CLEAN WATER AND SANITATION

Sludge Dry Bed Sewage Treatment Plant

Latitude: 28.450216115470344, Longitude: 77.28756896417298
28°27'00.8"N 77°17'15.3"E



Sludge Dry Bed Sewage Treatment Plant Alternate View

Latitude: 28.450256232031645, Longitude: 77.28754755312833
28°27'00.9"N 77°17'15.2"E

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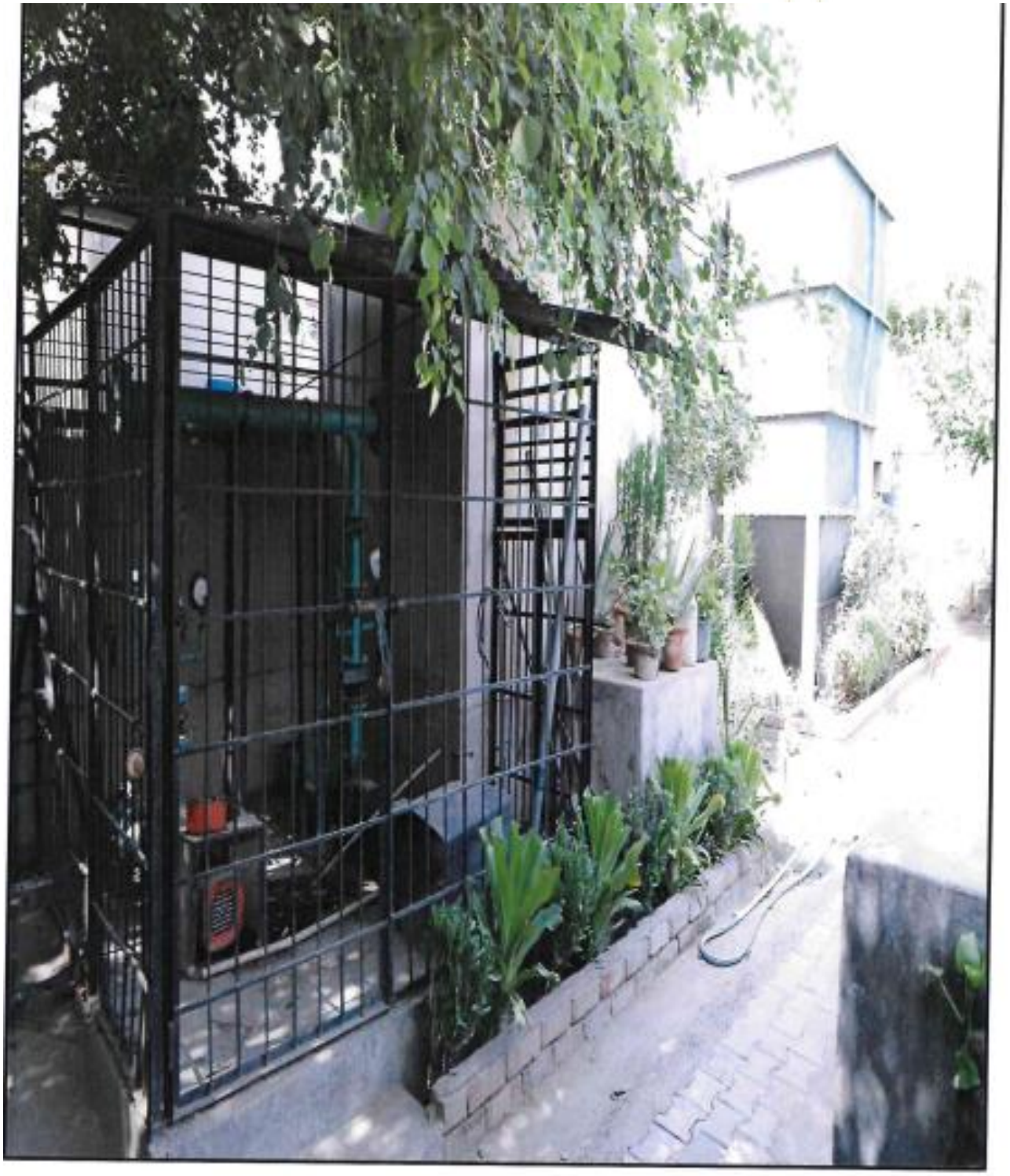


Treated Water Distribution, Sewage Treatment Plant

Latitude: 28.45024675657095, Longitude: 77.28755558871049
28°27'00.9"N 77°17'15.2"E

SDG 6- CLEAN WATER AND SANITATION

Report

on

Rain Water Harvesting System

At MRIIRS

Introduction:

India is suffering from a severe water crisis the likes of which the country has never seen and millions of lives and livelihoods are under threat. The need of the hour is sustainable, efficient and economic techniques which can tackle water scarcity. One such technology is rain water harvesting. Rainwater harvesting is the collection and storage of rainwater that runs off from the building tops, paved roads and other kinds of open spaces such as parks. The technology has proved itself on varied parameters and has emerged as one of the most important techniques a building can adopt in order to reduce its carbon footprint and enhance its eco friendliness. Manav Rachna being an institution which understands its responsibility of being eco-friendly has successfully installed and introduced the technology in its buildings. The report explains the rain water harvesting system of the institution in a detailed, elaborative, and lucid manner.

The rain water harvesting system was installed at MRIIRS with the following objectives:

- To increase recharge of groundwater by capturing and storing rainwater.
- To prevent water logging and thus thegrowth of disease producing bacteria.

Location of Rain Water Harvesting System installed at MRIIRS: C Block and T Block

Structural details of the rain water harvesting system:

Manav Rachna International Institute of Research and Studies have total area of 18.37 hectare. The potential annual runoff ofthe campus is estimated as 0.044 million cubic meters (MCM). Taking 50% efficiency, the potential runoff available for harvesting is 2.2 ham/yr. Thus, the harvesting of runoff water is planned in such a way that it is stored at the nearest possible site where it gets generated. The places of accumulation of runoff leading to the water logging in certain areas are indicated in the campus. So, four rainwater harvesting systems have installed in Block A Parking, Block C, near Gate No. 7 of Block T and Block Q of the campus.

A-block Parking: The harvested rain water from roof top and paved area of A-Block is entered into the storage tank from where water is entered into six wells of 3-meter diameter and 6-meter depth**.** The details of this structure are summarised below:

RWH Detail	
Location No.	1
Location Name	A-Block
Installation year	2002
Catchment Area	10,543 m^2
Dimension	3 m dia 6 m deep

D-BlockRainwater harvesting System: The harvested rain water from roof top and paved area is collected in a chamber of 37500 litre capacity. Then the silt free water is passed through filter and brought to the tube well for recharge of ground water. The filter is of 1.5 m^3 volume, filled with boulder, gravel and coarse sand. The filtered water enters the well through slotted pipe. The recharge well is 60 meter deep and is telescopic in structure with 8 inches diameter of 18-meter length and 6 inches diameter of 27-meter length then 6 inches diameter of 12-meter length slotted pipe ended with 3-meter bail plug. The well has been constructed using rotary rig and gravel all through 6 inches diameter tube. Roof water and water from paved area is collected through storm water drain. The floor of the storm water

drain is designed to trap silt in it. The details of this structure are summarised in the next table.

RWH Detail	
Location No.	2
Location Name	C-Block
Installation year	2017
Catchment Area	58,710 m^2
Dimension	0.203 m dia, 60 m deep

Gate No. 7 of T-Block Ground Water Recharge: The harvested rain water from roof top and paved area is made to enter into the recharge shaft of 2-meter diameter and 3-meter depth. The lower 1-meter part is filled with coarse sand to trap silt. The bottom of the shaft has been kept open against the aquifer for facilitating recharge. The over flow of the shaft has been connected with storm water drain. The details of this structure are summarised below:

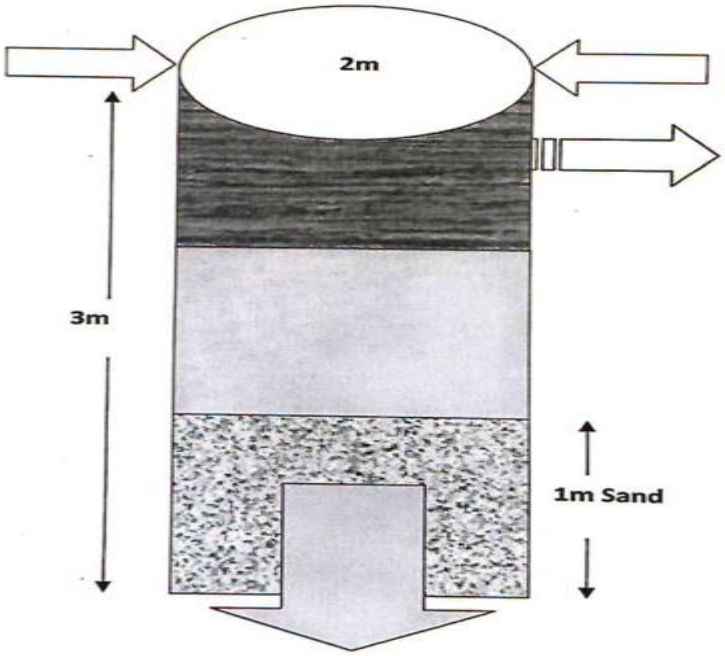
RWH Detail	
Location No.	3
Location Name	T-Block
Installation year	2006
Catchment Area	57791 m^2
Dimension	2 m dia, 3 m deep

Q-BlockParking: The harvested rain water from roof top and paved area of Q-Block is entered into the storage tank from where water is made to enter intoone well of 3-meter diameter and 6-meter depth**.** The details of this structure are summarised below:

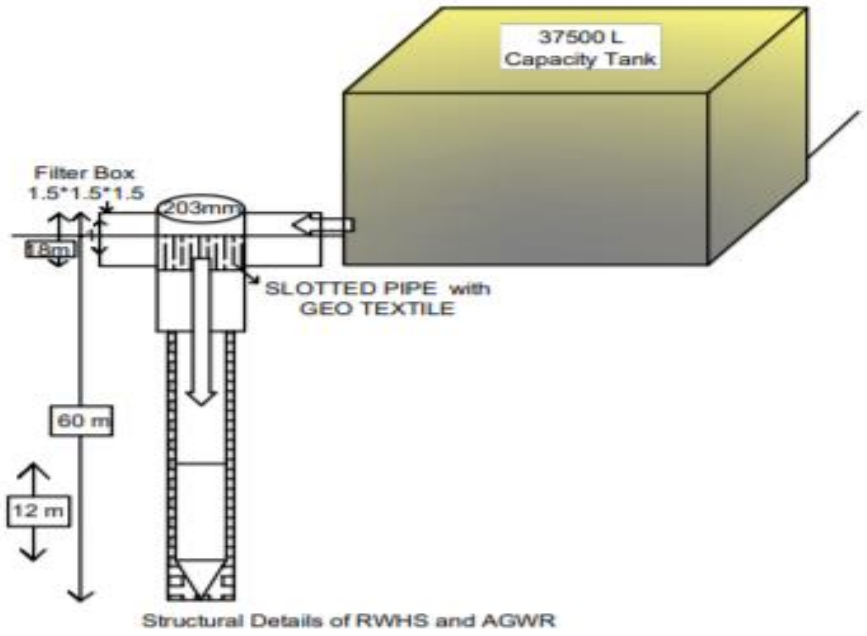
RWH Detail	
Location No.	4
Location Name	Q-Block
Installation year	2006
Catchment Area	56656 m^2

Dimension	3 m dia 6 m deep

Schematic Diagram of Rainwater Harvesting System at MRIIRS



Gate No. 7 of T-Block Ground Water Recharge



Structural Details of RWHS and AGWR

C-BlockRainwater harvesting and artificial ground water recharge

Water harvesting Capacity of MRIIRS Campus

Total quantity of runoff generated from the campus is **4.4375 ham/ year**. It is assumed that 50% of generated runoff (i.e.**2.2 ham/ year**) will percolate down into ground water for recharging.

Details of land use and Runoff generation at MRIIRS Campus

Land Use	Zone 1	Zone 2	Zone 3	Total Area	Av. Annual Rainfall	Runoff coefficient	Zone 1	Zone 2	Zone 3	Total Runoff	
	Area						Area Wise Annual Runoff				
Unit	m^2	m^2	m^2	m^2	m		m^3	m^3	m^3	m^3/yr	ham/yr
Roof Top	13413	11822	10911	36146	0.523	0.85	5963	5255	4850	16069	1.6069
Paved	20430	18200	7805	46435	0.523	0.7	7479	6663	2857	17000	1.7000
Green Belt	10410	9769	8525	28704	0.523	0.15	817	766	669	2252	0.2252
Open	25000	18000	29415	72415	0.523	0.15	1961	1412	5681	9054	0.9054
Total	69253	57791	56656	183700	0.523	-	16220	14097	14058	44375	**4.4375**

The geotagged pictures of rain water harvesting structures at various locations have also been appended.

Geotagged Pictures
of
Rain Water Harvesting System
At MRIIRS

S. No	Relevant documents
1	Rain Water Harvesting Specifications - A Block
2	Rain Water Harvesting A Block
3	Rain Water Harvesting Specifications - C Block
4	Rain Water Harvesting Ground Water Recharge Well - C Block
5	Rain Water Harvesting Specifications - T Block near Gate No 7
6	Rain Water Harvesting Ground Water Recharge Shaft - T Block near Gate No 7
7	Rain Water Harvesting Q Block with specifications

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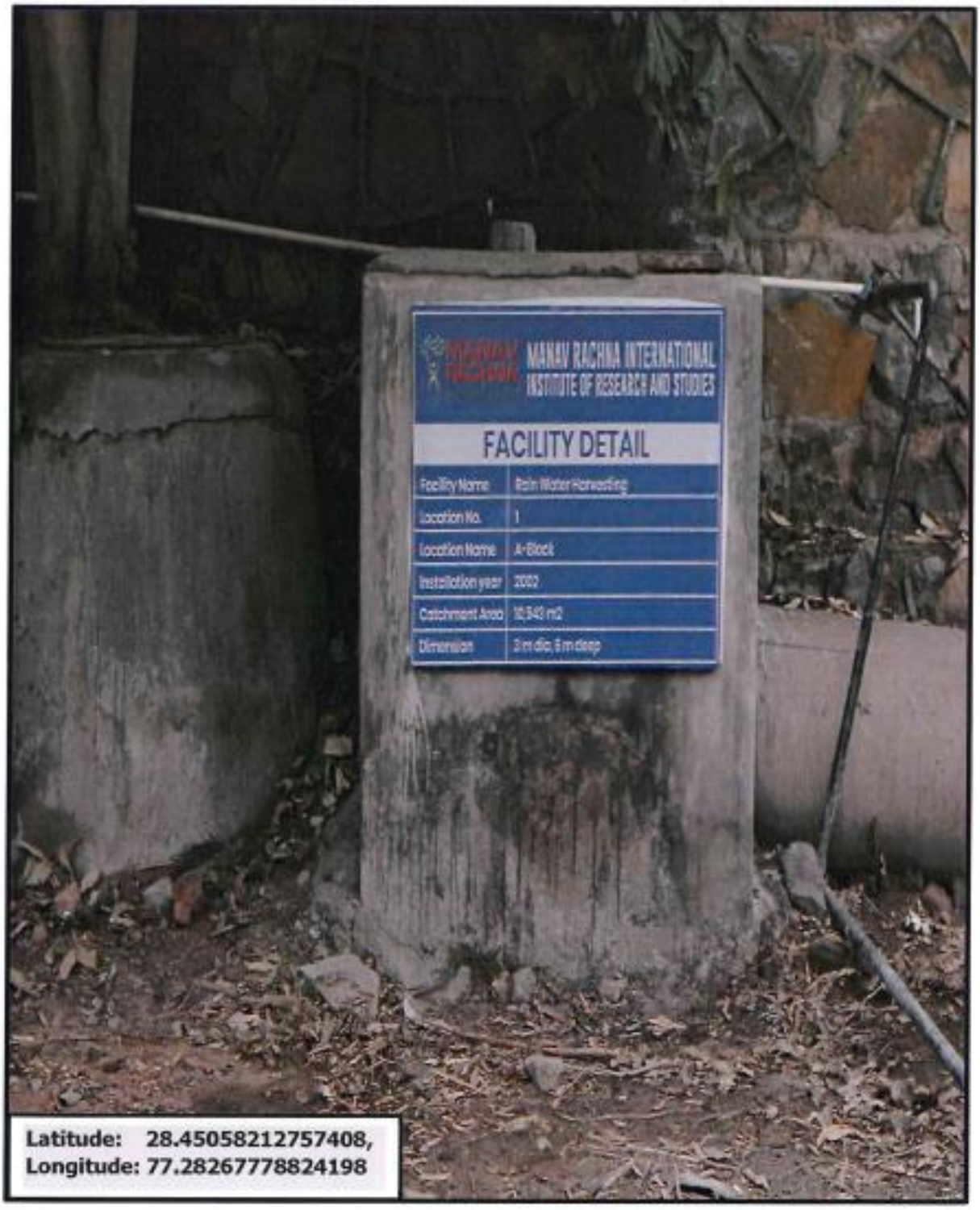

Rain Water Harvesting Specifications A Block

Latitude: 28.45058212757408, Longitude: 77.28267778824198
28°27'02.1"N 77°16'57.6"E

Rain Water Harvesting A, Block

Latitude: 28.45043372846215, Longitude: 77.28271728071604
28°27'01.6"N 77°16'57.8"E

Rain Water Harvesting Specifications C Block

Latitude: 28.449646652682453, Longitude: 77.28266095157997
28°26'58.7"N 77°16'57.6"E

Rain Water Harvesting Ground Water Recharge Well C Block

Latitude: 28.449680103517967, Longitude: 77.2826622628365
28°26'58.9"N 77°16'57.6"E

Rain Water Harvesting Specifications-T Block near Gate No 7

Latitude: 28.449571332093207, Longitude:77.28677887093396
28°26'58.5"N 77°17'12.4"E

Rain Water Harvesting Ground Water Recharge Shaft T Block

Latitude: 28.449561886511788, Longitude: 77.28678960011572
28°26'58.4"N 77°17'12.4"E

SDG 6- CLEAN WATER AND SANITATION

Rain Water Harvesting Q Block

Latitude: 28.450383620880505, Longitude: 77.28761107057075
28°27'01.4"N 77°17'15.4"E