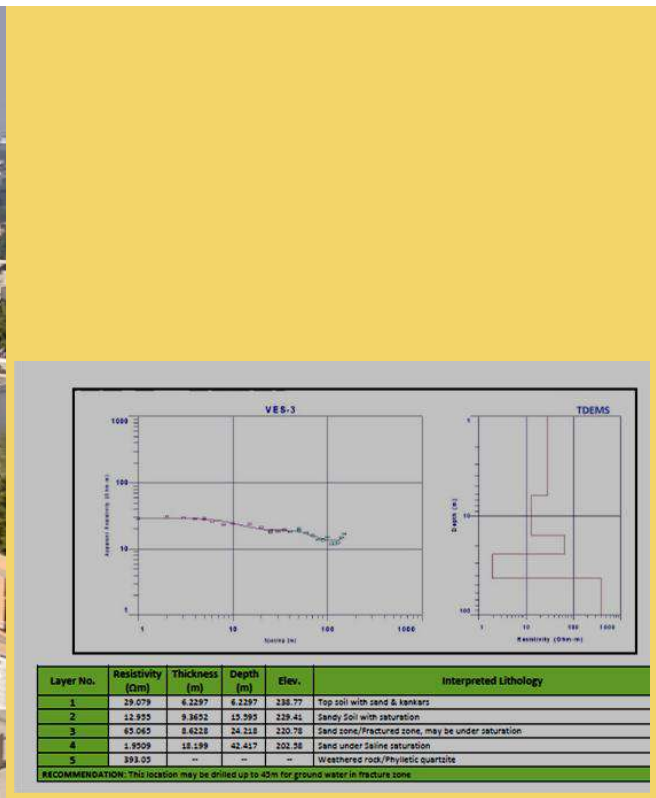


MARUTI SUZUKI FOUNDATION



Detailed Investigation Report for Rain Water Harvesting in Khoh



**Centre for Advance Water Technology and Management,
Manav Rachna International Institute of Research & Studies, Faridabad**
(Deemed to be University Under Section 3 of UGC act 1956)

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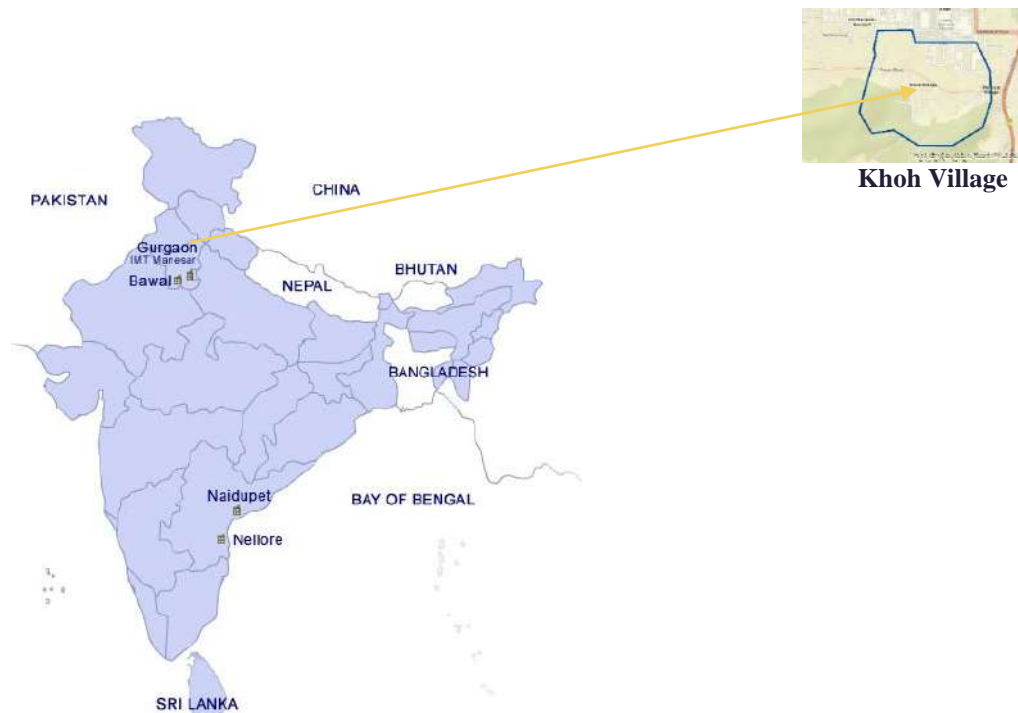
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Report prepared by Prof Arunangshu Mukherjee, CAWTM, MRIIRS, Faridabad

1. INTRODUCTION

Village Khoh (76° 55' 44" E; 28° 21' 15" N) is situated in the northern parts of foot hill zone of residual Aravali hill near Manesar, where the hill is having steep slope. Khoh is approachable by Delhi Gurgaon Manesar Road. Geologically area around Khoh is occupied by Delhi Group argillite's intercalated with quartzite bands. Thin layers of alluvium are found above argillite away from hill slope. Pockets of Aeolian sands are also found in the area. The area falls under hot semi-arid zone and the average annual rainfall for the area is about 596 mm. On the basis of groundwater development the entire Manesar block of Gurgaon district is categorized as over exploited, thus having groundwater regulation on abstraction. To improve the sustainability and availability of water in and around Khoh, it is proposed to use integrated micro watershed management plan following the ridge to valley concept. Village Khoh is having an area of about 200ha, where main land use is residential followed by hill & forest and Industry; agricultural land use is very limited. Therefore, demand of water is largely domestic, govern by large floating populations. The domestic water needs are presently catered by abstraction of groundwater, resulted depletion in groundwater level down to 60m or more. The aquifer in the area is in poor water bearing capacity and is restricted only to weathered zone and connected shallow fractures.



2. PROJECT BACKGROUND

Khoh is having an area of about 200ha out of this about 40ha is occupied by built up area. Therefore, demand of water is largely domestic. The aquifer in the area is having poor water bearing capacity and is restricted only to weathered zone and connected shallow fractures zone. To improve the sustainability and availability of water in the area the Maruri Suzuki Foundation (MSF) under CSR activity initiated activities. A MOA was signed among MSF and MRIIRS to take up a detailed investigation in the village area assigning following scope of work

- Data collection- Meteorological, Geological, Hydrological, hydrogeological Remote Sensing-GIS investigations
- Groundwater inventory in post monsoon & water budgeting of the village
- Water & Soil quality analysis- testing
- Geophysical Investigations for locating community water well site & Artificial Recharge sites
- Pond hydrological studies for revival
- Study of Plantation along hill slope – Survey, tests and recommendations &
- Preparation of overall Investigation report of project

Accordingly CAWTM, MRIIRS has planned to investigate the area of Khoh village appreciating the significance of Integrated Micro Watershed Management which involve:

- ❖ Improvement in water security, ecology & livelihood by increasing water availability
- ❖ Data collection- Meteorological, Geological, Hydrological, hydrogeological ,Remote Sensing-GIS investigations
- ❖ Groundwater inventory in post monsoon & water budgeting of the village
- ❖ Geophysical Investigations for locating community water well site & Artificial Recharge sites
- ❖ Improvement in happiness level among habitat

2.1 Major Concern about water situation on Khoh Village

Due to rapid population growth and huge change in land use pattern of Khoh during last two decade, the natural resources in the area are under tremendous pressure, warrant immediate intervention for remediation. Integrated micro watershed management plan will be a multi-dimensional approach to address these issues of the area. This will not only includes demand & supply side assessment of water and suggests possible solution but also include Soil and Water conservation methods, plantation/afforestation- type and methods, revival/renovation of surface and groundwater structures, Rain Water Harvesting & Artificial Recharge of GW and efforts for participatory support and behavioral changes. Groundwater at present is the only source of water in village.

Population of village increased tremendously after 2006. In absence of actual population data of village a provisional data of 37041 is taken based on approximation of MSF. All 5 dug wells and almost all tube wells (TW) of village in depth range from 250 to 270 feet have gone dry. The numbers of dry TWs in Khoh are few hundreds. Concentration of dry wells is more along foot hill zone where hard rock aquifer is being tapped. Discharge & sustainability of wells tapping water from 280 to 350 feet depth range is reducing fast. Earlier each house was having their own TW but due to well failures & increasing requirements, dependency on supply water is raising day-by-day.

2.2 Change of Land Use pattern in Khoh Village

The distribution of land utilization including uncultivable land, forest, land available for cultivation, waste land, urban area and other lands have been depicted in the map. The land use map of Khoh Village has following five land use classes: Hill Area, Forest, Household Areas, Wasteland, Water bodies, etc.

Khoh is having an area of about 200ha, where main land use is residential followed by hill & forest and Industrial; agricultural land use is very limited. Therefore, demand of water is largely domestic, govern by large floating populations. From May 2002 due to sudden & abnormal increase in population of the village land use pattern has totally altered.

May 2002



Feb 2010



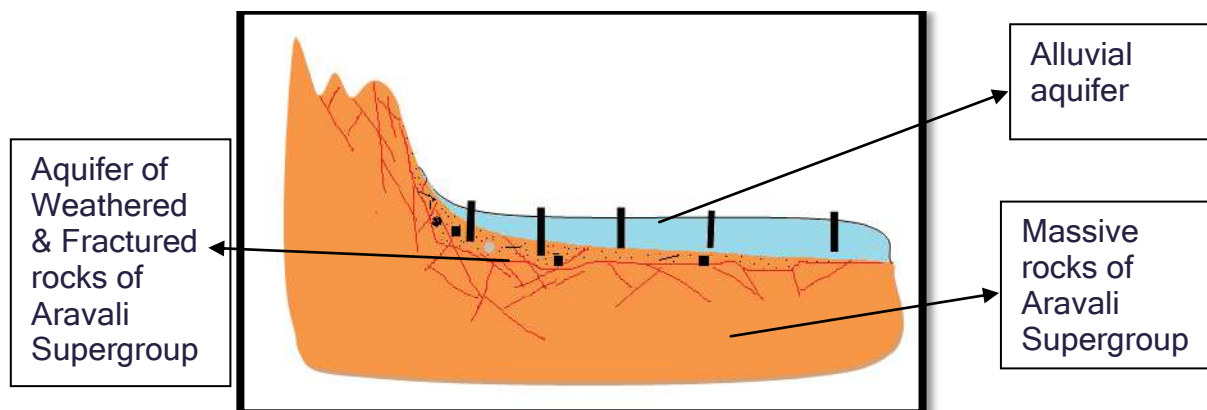
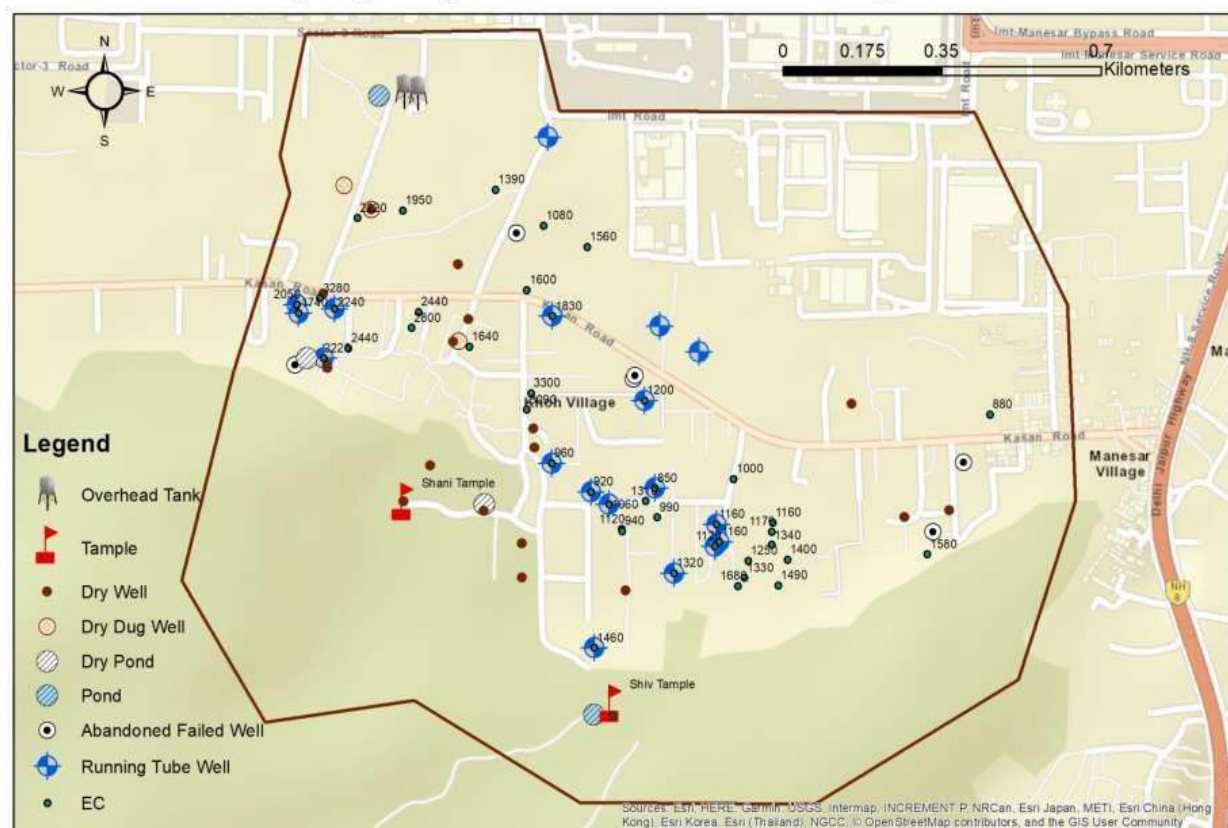
April 2018



3. HYDROGEOLOGICAL INFORMATION

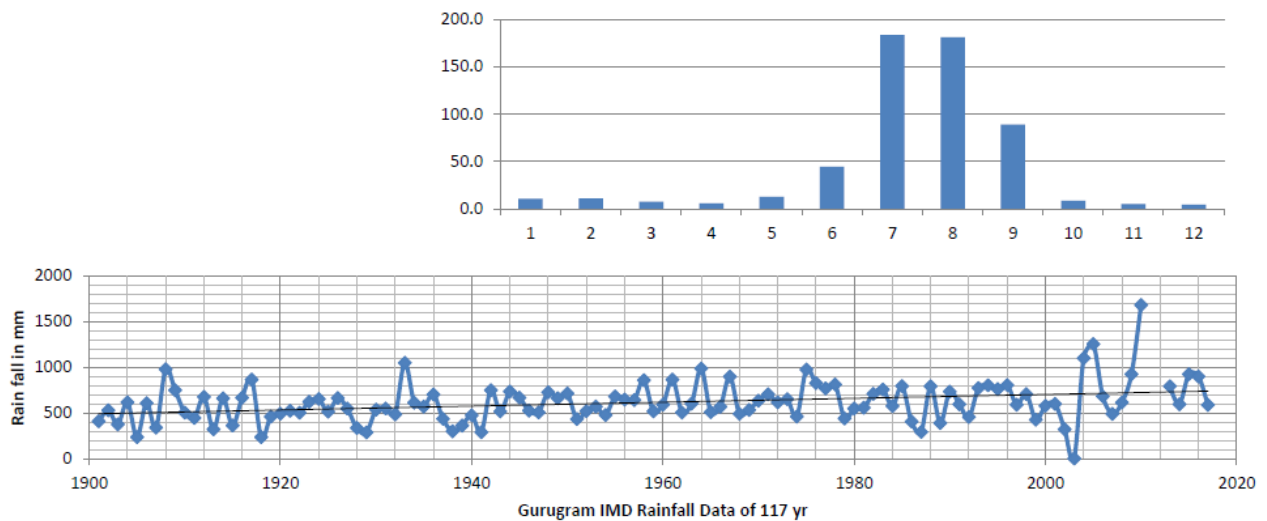
The hydrogeological conditions prevailing in the entire Khoh Village are highly diversified. Based on mode of occurrence of ground water in similar geological formations, nature and extent of aquifer bodies and its hydrogeological properties in relation to ground water flow characteristics under prevailing hydrodynamic and hydro chemical conditions. This Village Area occupied by residual hills and stable dunes, geologically the hills are of folded Aravalli meta -sedimentary rocks, consist of quartzite and argillite's. The plain lands are covered with Aeolian sands of variable thickness.

Hydrogeological Information of Khoh Village



3.1 Rain Fall Pattern in Khoh Village

The prevailing climate in Gurgaon is known as a local steppe climate. There is little rainfall throughout the year. This climate is considered to be hot semi-arid climates according to the Köppen-Geiger climate classification. In past 100 yr the avg. rainfall in Gurgaon district is 596 mm (IMD). A lot of rain falls in the months of July, August and September.

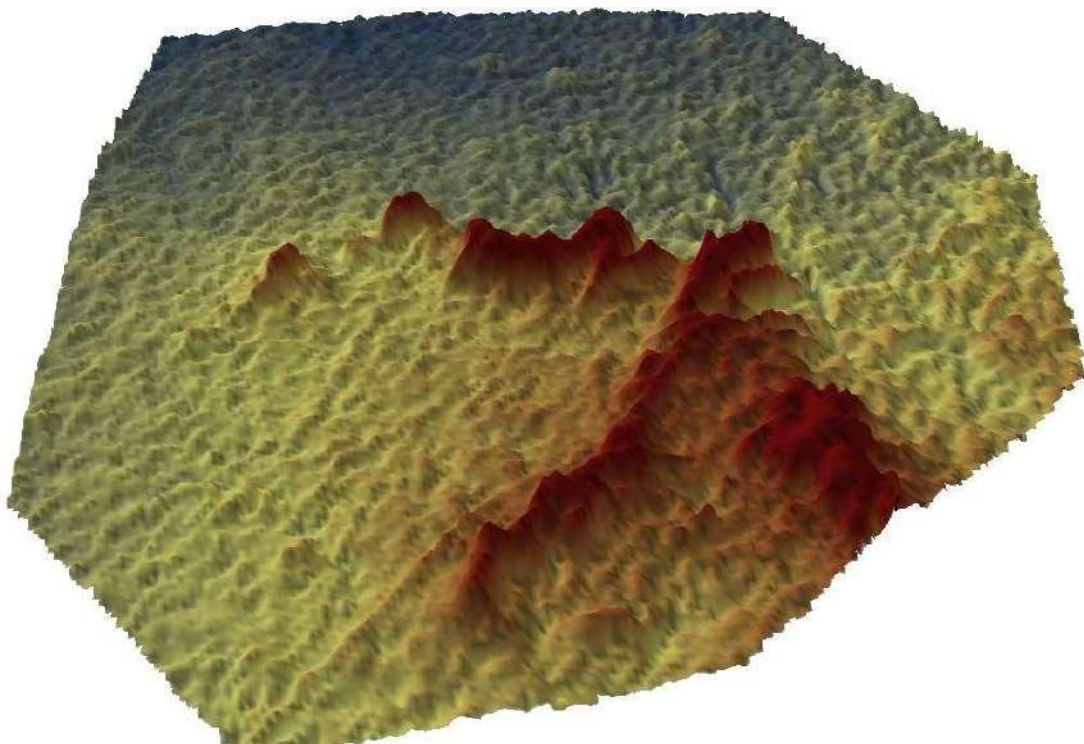
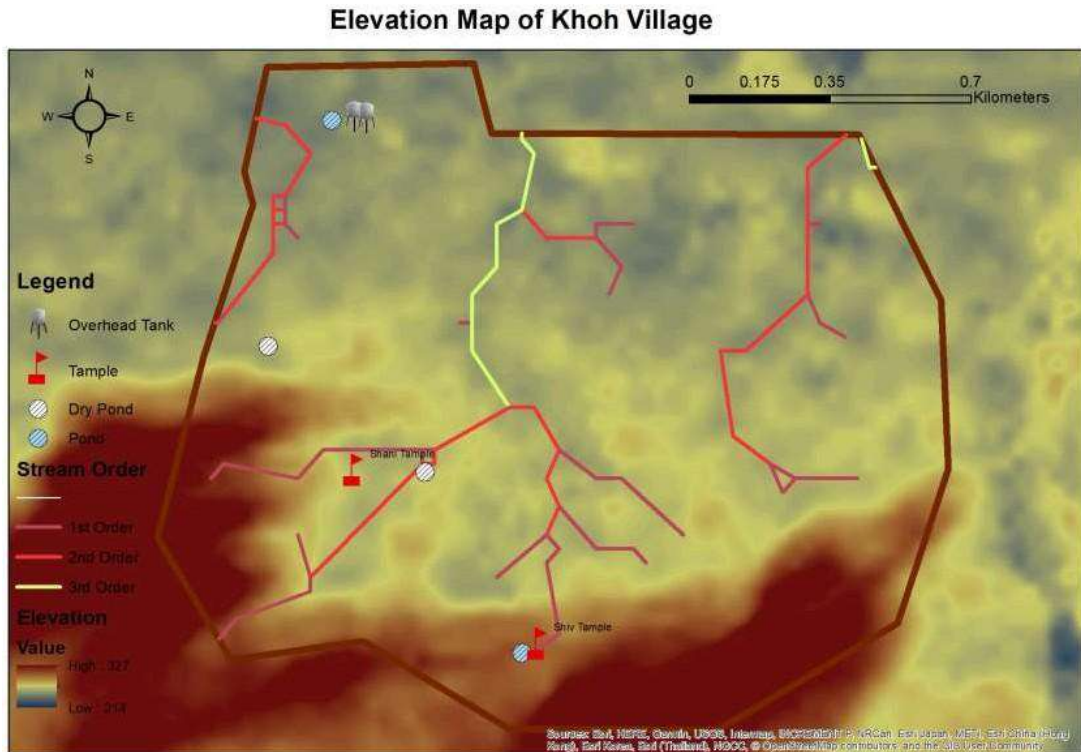


3.2 Geomorphology and Geology

Large parts of this area is occupied (i) by scattered isolated strike ridges of old rocks, former Aravali mountain chain of Pre-Cambrian and alluvium, sand of recent to sub-recent origin. Geologically the hills are of folded Aravalli Meta -sedimentary rocks, consist of quartzite and argillites.



Below is the Elevation map of Khoh Village, which displays range of elevation (322m to 244m) with different order drainage streams. The elevation map of Khoh Village is generated using elevation data from USGS resolution SRTM data. The maps also provides idea of topography and drainage system of Khoh village.



3.3 Hydrology of Khoh Village

Village	Area (Ha)	Normal Rain fall (mm)	Catchment type	Total Precipitation (Ham)	Runoff (Ham)	Utilizable Runoff 25% (Ham)
Hilly	100.0	596	Average	59.6	7.45	1.86
Open	60.0	596	Bad	35.76	4.47	1.12
Built up	40.0	596	Good	23.84	5.98	1.50
Khoh	200.0	596	Total	119.2	17.90	4.48

3.4 Groundwater Inventory

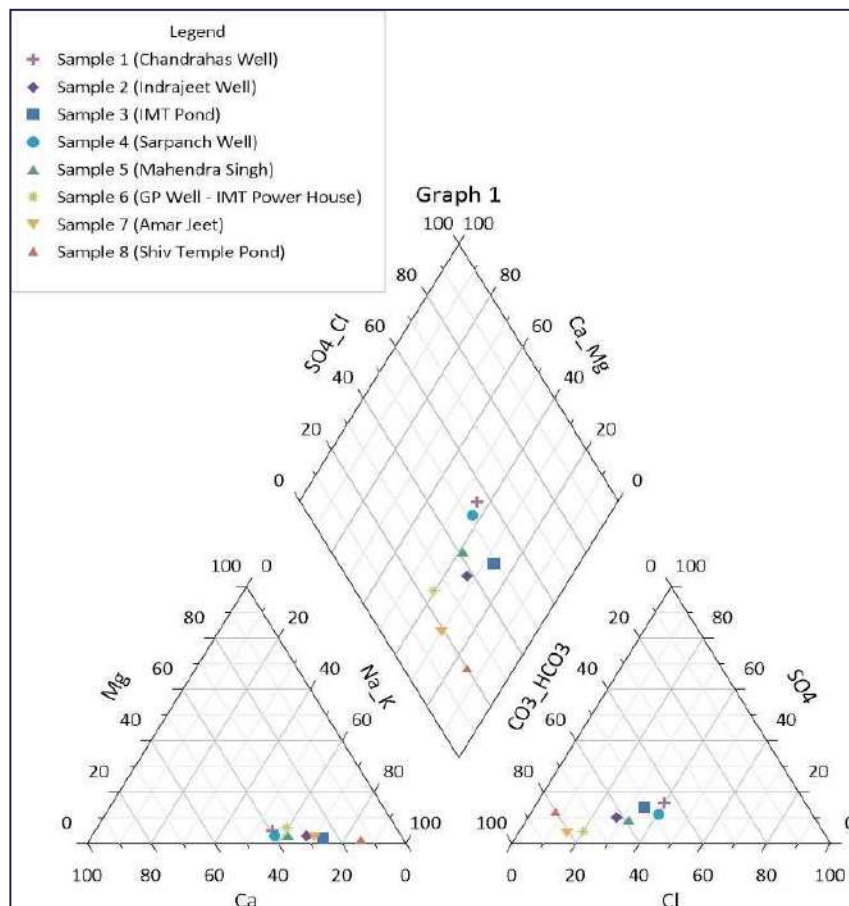
Khoh village has been close to a water crisis since 2015 when the entire village population increase rapidly and construction activities for rent houses that drive up water demand. That is a main reason to faster depletion rate in entire village. Khoh Village's water table has seen a precipitous 70-80% decline in the last 10 years. As per data collected by CAWTM team groundwater level in the village varies between 70 to 140m bgl. Tube Well depth ranges from 90 to 225m bgl. Well discharge is generally low, varies largely from 0.1 to 2.0 lps.

Some facts about water budgeting for Khoh Village

- Total Village area = 200ha or 2000000m²
- Total hilly & Barren area = 1000000 m²
- Total build up area of village = 400000 m²
- Total irrigated area = 25000 m²
- Total open land area = 575000 m²
- Total population of village = 37000 (approx)
- Total per day domestic water requirement @ 100lpcd = 3700m³ = 0.0037MCM
- Annual total domestic water requirement = 1.35MCM
- Annual Total irrigational water requirement = 2.5 * 1.25m = 3.13ham
- Total water supply per day by 4 community supply wells = 5000m³ to 7000m³
- Individual abstraction of GW = 1000m³/day

3.5 Ground Water Quality

In this village the groundwater quality is found fresh to slightly brackish and EC range from 850 to 3300 us/cm. **Water Analysis Results of different locations across Khoh Village mention in annexure 1.** Piper plot is comprised of three components: a ternary diagram in the lower left representing cations (magnesium, calcium, and sodium plus potassium), a ternary diagram in the lower right representing anions (chloride, sulfate, and carbonate plus bicarbonate), and a diamond plot in the middle which is a matrix transformation of the two ternary diagrams. Each sample is normalized to 100 (sum of cations = 100 and sum of anions = 100), so the relative concentrations are on a percentage basis.



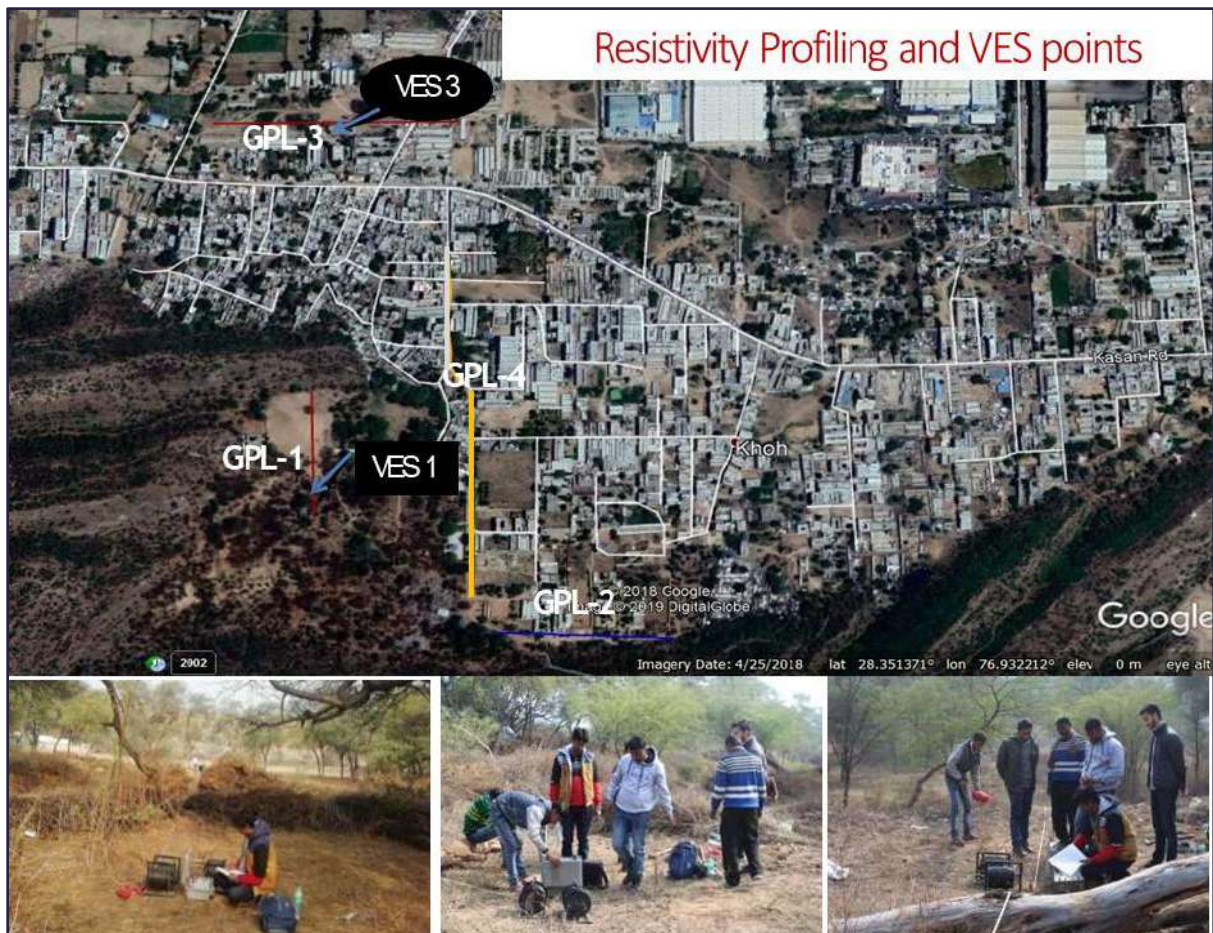
Parameters	Unit	Standard IS:10500:2012	Chandahas Well	Indrajeet Well	IMT Pond
pH	-	6.5 – 8.5	7.12	7.08	7.17
Colour	Hazen Unit	5	Colourless	Colourless	7
Turbidity	NTU	5	<1	<1	3
Total Dissolved Solids	mg/l	2000	1680	1030	1390
Conductivity	mmhos/cm	-	2250	1390	1920
Bicarbonate	mg/l	600	380	290	360
Total Hardness as CaCO ₃	mg/l	600	540	280	320
Chlorides as Cl	mg/l	1000	340	130	240
Nitrates as NO ₃	mg/l	45	4.2	6.2	7.8
Sulphate as SO ₄	mg/l	400	134	48	100
Fluoride as F	mg/l	1.5	0.52	0.48	0.46
Dissolved Oxygen	mg/l	-	Nil	Nil	0.3
BOD, 3 days 27 ⁰ C	mg/l	-	<0.1	<0.1	93
COD	mg/l	-	22	20	60
Sodium as Na	mg/l	-	235	206	308
Potassium as K	mg/l	-	19	11.8	24
Calcium as Ca	mg/l	75	180	96	112
Magnesium as Mg	mg/l	30	21.9	9.7	9.7
Iron as Fe	mg/l	0.3	0.22	0.26	1.2
Copper as Cu	mg/l	1.5	0.2	0.21	0.32
Lead as Pb	mg/l	0.01	0.06	0.07	0.15
Total Chromium as Cr	mg/l	0.5	0.06	0.07	0.11
Zinc as Zn	mg/l	15	0.81	1.01	4.21
Mercury as Hg	mg/l	0.001	<0.001	<0.001	<0.001
Arsenic as As	mg/l	0.05	<0.001	<0.001	<0.001
Selenium as Se	mg/l	0.01	<0.01	<0.01	0.02
Total coliform	MPN/100ml	Nil	Nil	Nil	14110
Fecal coliform	MPN/100ml	Nil	Nil	Nil	1280

Parameters	Unit	Standard IS: 10500:2012	Sarpanch Borewell	Mahender Borewell	GP Well – IMT PH	Amarjeet Borewell	Shiv Temple
pH	-	6.5 – 8.5	7.29	7.38	7.82	7.77	7.5
Colour	Hazen Unit	5	Colourless	Colourless	Colourless	Colourless	Colourless
Turbidity	NTU	5	<1	<1	<1	<1	2
Total Dissolved Solids	mg/l	2000	1410	1210	790	620	520
Conductivity	mmhos/cm	-	1960	1680	1090	830	660
Bicarbonate	mg/l	600	300	310	280	240	190
Total Hardness as CaCO ₃	mg/l	600	450	310	260	150	90
Calcium as Ca	mg/l	75	160	112	80	52	32
Magnesium as Mg	mg/l	30	12.2	9.7	14.6	4.8	2.4
Chlorides as Cl	mg/l	1000	250	170	75	45	18
Nitrates as NO ₃	mg/l	45	7.2	5.2	3.8	2.8	3.8
Sulphate as SO ₄	mg/l	400	69	48	16	11.7	28
Fluoride as F	mg/l	1.5	0.45	0.68	0.62	0.62	0.42
Sodium as Na	mg/l		218	186	134	128	180
Potassium as K	mg/l	-	11.5	8	5.8	5.2	21
Dissolved Oxygen	mg/l	-	Nil	Nil	Nil	Nil	Nil
COD	mg/l	-	18	20	16	12	12
BOD							39

4. GEOPHYSICAL SURVEY

This village is surrounded with local population & homes so planning was very difficult to execute the survey. Team was site for carrying only VES at locations but as per site geology & geomorphological situation Team decided for execution of GRP (Gradient Resistivity Profiling) & VES (Vertical Electrical Sounding) at given locations to get better results for given task. The availability of space for survey was another problem at site, so team tried to execute the work as per available site space for work to get maximum output.

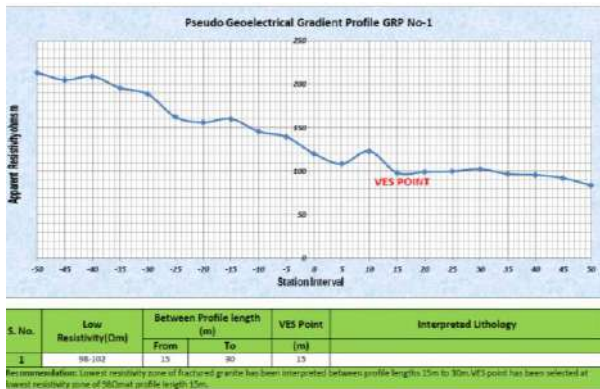
Total four numbers of GRP & VES have been carried out at site for detection of ground water in fractured zone of subsurface by using Gradient Resistivity Profiling & Vertical electrical sounding. All the data sheets mentions in annexure 9, 10,11,12,13,14,15,16.



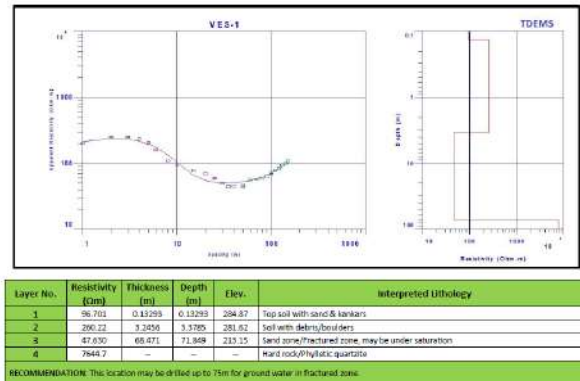
VES No:	VES Location	Easting (Degree)	Northing (degree)
VES-1	Lord Shani Temple	76.92331	28.35324
VES-2	Dabli Temple	76.92604	28.35137
VES-3	Near Pradhan Home	76.92274	28.3854
VES-4	Near Aganbadi Centre	76.92541	28.35280

Location -1

GRP -1



VES - 1

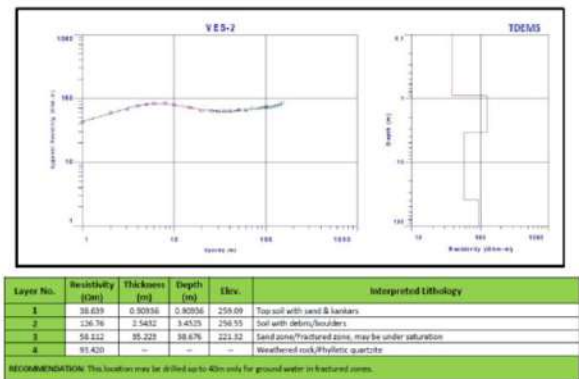


Location -2

GRP -2

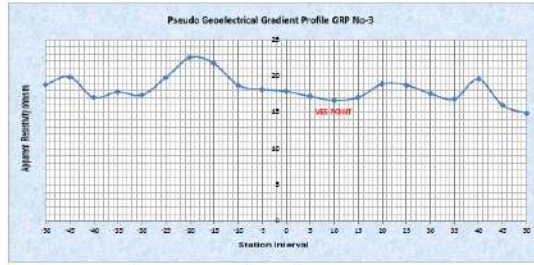


VES - 2



Location - 3

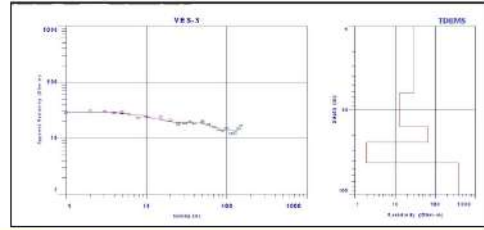
GRP - 3



S. No.	Low Resistivity (ohm)	Between profile length (m)		VES Point	Interpreted Lithology
		FROM	TO		
1	10-20	10	15	10	Fracture zone may be present in subsurface

GEOPHYSICAL REPORT OF GROUND WATER INVESTIGATION AT KNDM, MANBERSAR, MIZORAM

VES - 3



Layer No.	Resistivity (ohm)	Thickness (m)	Depth (m)	Elev.	Interpreted Lithology
1	29.075	6.2297	6.2297	230.77	Top soil with sand & gravelly
2	11.9573	6.9652	12.7693	228.80	Sandy soil with gravelly
3	63.082	5.4622	24.535	223.30	Sand zone/fractured zone, may be under saturation
4	1.9504	62.588	62.817	220.50	Sand layer/sandstone
5	338.01	--	--	--	Fractured rock/very fine c. quartzite

RECOMMENDATION: This location may be drilled up to 150m for ground water in fracture zone
 GEOPHYSICAL REPORT OF GROUND WATER INVESTIGATION AT KNDM, MANBERSAR, MIZORAM
 SUBMITTED BY: T.D.S.M.S.P.V.L.I.E

Location - 4

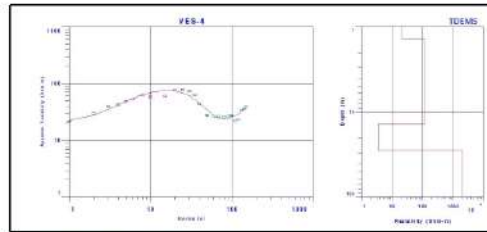
GRP - 4



S. No.	Low Resistivity (ohm)	Between Profile length (m)		VES Point	Interpreted Lithology
		FROM	TO		
1	20-30	15	35	15	Fracture zone may be present in subsurface

GEOPHYSICAL REPORT OF GROUND WATER INVESTIGATION AT KNDM, MANBERSAR, MIZORAM
 SUBMITTED BY: T.D.S.M.S.P.V.L.I.E

VES - 4



Layer No.	Resistivity (ohm)	Thickness (m)	Depth (m)	Elev.	Interpreted Lithology
1	11.214	1.2033	1.2033	230.45	Top soil with sand & gravelly
2	117.15	12.4711	13.6744	217.98	Soil with gravelly
3	5.2600	15.724	27.791	230.21	Sand zone/fractured zone, may be under saturation
4	1388.2	--	--	--	FRACTURED QUARTZITE

RECOMMENDATION: This location may be drilled up to 150m for fracture zone of ground water.
 GEOPHYSICAL REPORT OF GROUND WATER INVESTIGATION AT KNDM, MANBERSAR, MIZORAM
 SUBMITTED BY: T.D.S.M.S.P.V.L.I.E

5. ACTION PLAN

The Khoh area comes under OE block, hence no new Drilled Well can be constructed either for abstraction or recharge without prior permission of CGWA/ State GWA. SGWA recommends Pit. Structures for Artificial Recharge for the block and RTRWH through existing dug wells/drilled wells. The surface runoff of Aravalli Hills diminished substantially for the region. Restrict the falling trend of groundwater level and thus the Environmental degradation Increase the sustainability of well yield Improve the ambient quality of groundwater Rejuvenate ponds Control flash fool generated water logging of streets Improve green cover Adaptation against climate change.

❖ Recommended Methods

- Roof Top Rain Water Harvesting through (Existing dry Dug Wells, Existing dry / running Tube Wells)
- Trench cum Auger hole Recharge
- Recharge through percolation tank (De-siltation of existing tanks and renovation, Transfer of useable water)
- Afforestation along hill slope & water bodies

❖ RTRWH Norms

- Cover at least 10% roof area of a peri urban setup
- Calculation for village Khoh

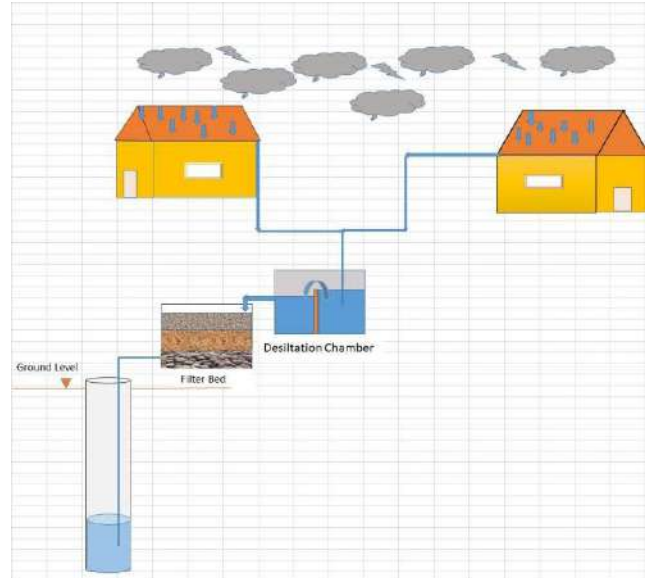
SN	Total number of houses in Khoh	Total Roof area (m ²)	10% Numbers	10% Roof Area (m ²)	Normal annual RF (m)	Total Water @80 % that can be harvested (m ³)	Total expenditure as per the norms of CGWA
1	~995	400000	95	40000	0.596	19072	23.75 lacs

Two team can be constituted to facilitate the RTRWH in village Khoh under a supervisor, each team may include 1 Masson+ 1 Plumber+ 2 Majdoors

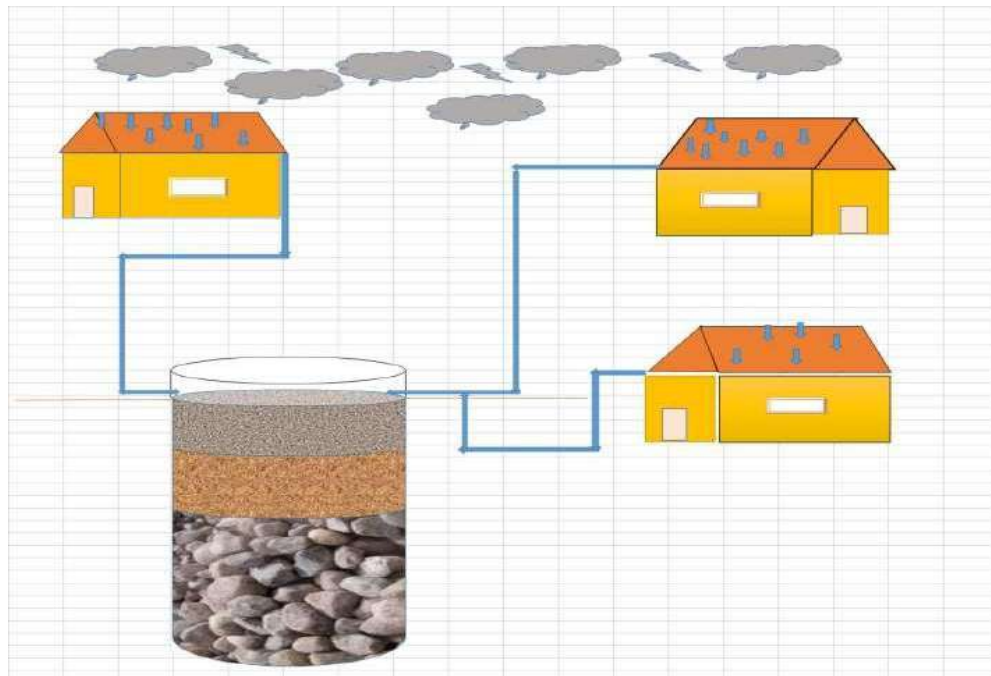
5.1 Rooftop Rainwater Harvesting System Trough TW In Khoh Village

The Rainwater from roof other areas the water is diverted into a recharge well through a series of chambers and interconnected pipes from roof. These recharge well have 8" in diameter and 80-100m deep. The recharge well is connected with desalination chamber and filter bed.

During this survey it is possible to minimize water logging in colonies through rainwater harvesting. The roads of Khoh Village became waterlogged even after a short shower. The water level was recorded at 80-150 m below ground level (bgl). Concerned with declining water tables and water logging, the Villagers and the important role of Maruti and MRIIRS team has decided to adopt rainwater harvesting throughout the whole village.



5.2 Rooftop Rainwater Harvesting System Trough Dugwell In Khoh Village



Dugwells Location

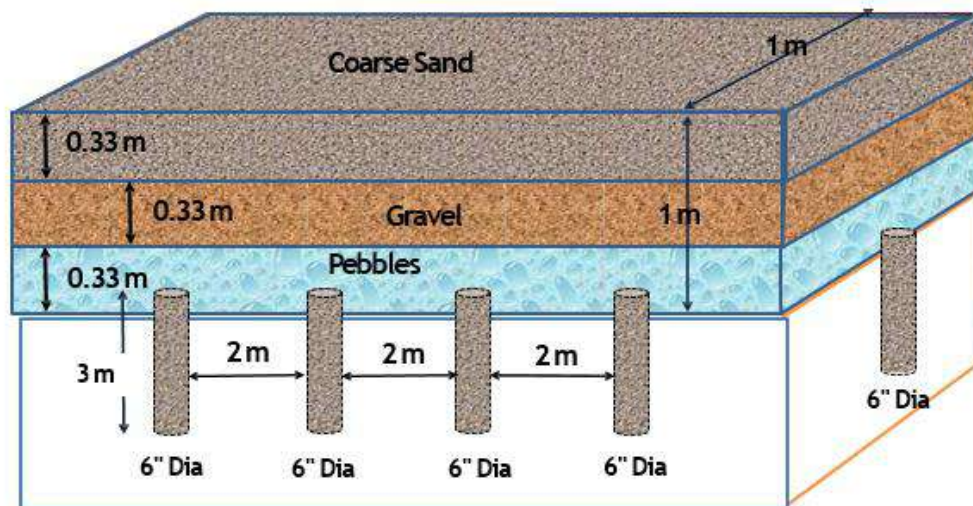
S.No	Lat	Long	Dia (m)	Depth (m)		Location
1	28.359	76.922	2.3	15.3	63.53	IMT Pond street, Sh Narender Well
2	28.35676	76.92362	2.62	11.1	59.80	Near Water ATM , Govt Well
3	28.35758	76.92105	2	15.50	48.67	IMT Pond street, Sh Jai Veer Well
4	28.35533	76.92052	3.215	25	202.84	Behind Carpenter Shop, Govt Well
5	28.35768	76.92052	1.73	21	49.34	Inside Anganwadi Govt Well
					424m³	

5.3 Trench



Proposed Trench cum Auger hole Recharge Site, Khoh

Trench cum Auger hole



5.4 Pond

S.No	Latitude	Longitude	Location	Area (hec.)	Catchment Area (hec.)
1	28.350434	76.926781	Uphill	0.0551	11.5
2	28.361069	76.922138	Near IMT Overhead Tank	0.6605	14.7
3	28.354272	76.927376	Behind Ajay Kiryana Store	0.0215	4.92
4	28.353246	76.929404	Behind Suman Little Angels School	0.0114	
5	28.356408	76.920826	Near Old Anganbadi	0.0517	3.13
6	28.352122	76.931461	Near Hill	0.0952	
7	28.354377	76.924356	Near Shani Dev Temple	0.72	29

6. PLANTATION & BIODIVERSITY

The steep and severely degraded areas, usually in the close vicinity of Khoh village and others, would be restored with vegetation by affording protection. Soil conservation and water management would be the main purpose for this treatment of afforestation. These lands can be used for settling the landless agricultural laborers. Live fencing would be erected to demarcate and to protect the area encouraging natural vegetation to come up. Naturally occurring species would be favored as native plants generally require less expense and maintenance as well as being visually harmonious with the natural landscape. Native species are to be preferred, but it is sometimes desirable to use exotic species. The sloped, boundary and other forest waste lands near the villages, which do not have sufficient rootstocks to resuscitate and cover the ground, would be rehabilitated for fuel wood and fodder production. Seeding, transplanting living plants, fertilizing, or mulching exposed soil surfaces may be required to achieve the desired level of protection. Mixtures of at least three plant species is recommended to assure continuous, even protection across a slope. The factors to consider in selecting an appropriate mixture include:

- General climatic conditions, including conditions at the time of planting
- Competitive ability of species to be planted in relation to native weed species or desired ultimate vegetation establishment
- Susceptibility to foraging by livestock, rodents, and game
- Visual and aesthetic considerations
- Physical and chemical characteristics of the soil.

The plants adopted will improve the soil fertility, soil organic matter, soil flora and fauna as well as species selected will be well suited to the formation of temporary or preliminary vegetative cover on the poorest soils. This will include trees (mostly belonging to family Fabaceae), shrubs (mostly belonging to family Fabaceae and Malvaceae) and herbs (mostly belonging to family Poaceae).

6.1 Soil Analysis Result

The objective of the soil monitoring is to identify the impacts of ongoing survey for water harvesting and other activities on soil quality and also predict impacts, which have arisen due to execution of various constructions allied activities.

The soil analysis result is attached in given below.

केन्द्रीय मृदा एवं पादप परीक्षण प्रयोगशाला
CENTRAL LABORATORY FOR SOIL AND PLANT ANALYSIS
मृदा विज्ञान एवं कृषि रसायन विज्ञान संभाग
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 (Phone: 011-25843588 Ext. 4332; Email: soilhealth_ssc04@yahoo.co.in)
मृदा परीक्षण रिपोर्ट/SOIL TEST REPORT
 (Receipt No. 287528, dated 21-01-2019, Rs.4400/-)

नाम व पता/Name & Address: CAWTM, Manav Rachna, International Institute of Research & Studies, Delhi, Surajkund Road, Sector- 43, Faridabad (H.R.)- 121004.

क.स. S. No.	नमूना पहचान चिह्न Sample mark	प्रयोगशाला संख्या Lab. No.	अभिक्रिया pH (1:2)	विद्युत चालकता EC (dS/m) (1:2)	जैविक कार्बन Organic C (%)	उपलब्ध पोषक तत्व Available Nutrients		WHC	Texture			Class
						फास्फोरस P	पोटाश K		Sand	Silt	Clay	
						(kg/ha)						
1	Soil- 1	C-836/19	5.79	0.22	0.02 L	2.80 L	215 M	29.4	83	10	7	Loamy Sand
2	Soil- 2	C-837/19	5.68	0.17	0.26 L	4.48 L	419 H	34.9	79	10	11	Sandy Loam
3	Soil- 3	C-838/19	6.68	0.11	0.56 M	437 H	1275 H	35.4	61	28	11	Sandy Loam
4	Soil- 4	C-839/19	6.11	0.06	0.21 L	2.80 L	119 L	33.2	59	20	21	Sandy Loam

L=Low, M=Medium, H=High
 सिफारिशें : 1 मृदा क.स. 1, 2 व 4 अम्लीय है और क.स. 3 सामान्य है, कृषाकर कम शोमट बलुई, बलुई दोमट, बलुई दोमट व बलुई दोमट है। जैविक कार्बन का स्तर निम्न से मध्यम है तथा फास्फोरस एवं पोटाश का स्तर निम्न से उच्च है, जैसाकि दर्शाया गया है। मृदा क.स. 1, 2 व 4 में घुने की आवश्यक मात्रा की जांच करायें। अच्छी गुणवत्ता वाले खादों के साथ उर्वरकों की सतुलित मात्रा का उपयोग करें। 2. फल-पुष्पों, शाक-सब्जियों तथा फूलों की फसलों के बारे में अधिक जानकारी के लिए फल एवं उद्यान विज्ञान प्रौद्योगिकी संभाग/शाकीय फसल संभाग/पुष्प विज्ञान संभाग, भारतीय कृषि अनुसंधान संस्थान (पूरुसा), नई दिल्ली में संबंधित वैज्ञानिकों से सम्पर्क करें।

Recommendations: 1. Soil at S. No. 1, 2 and 4 are acidic and S. No. 3 is normal in nature, textures are loamy sand, sandy loam, sandy loam and sandy loam respectively. Soils have low to medium organic carbon and low to high available P and K content, as indicated above. Soils at S. No. 1, 2 and 4 should be test for lime requirement. Use balanced fertilizers along with good quality manures. 2. For fruit crops, vegetable and flower crops, the concerned specialists may be consulted for specific recommendations at Division of Fruits and Horticulture Technology/ Vegetables Crops / Floriculture, IARI, New Delhi.

नोट : यह रिपोर्ट वैधानिक उद्देश्यों के लिए प्रमाण-पत्र के रूप में प्रयोग नहीं की जा सकती।

Note : This report can not be used as a certificate for legal purpose.

for A.K. 21/1/19

प्रभारी वैज्ञानिक/Scientist Incharge

6.2 Type of Plantation

Habit wise distribution of plants

S. No.	Taxa	Habit	No. of Species
1.	Angiosperms	Herb	10
2.		Grass	4
3.		Climber	2
4.		Twiner	-
5.		Shrub	5
6.		Tree	5



Shami, Khejri Tree (*Prosopis cineraria*)

Taxonomic classification	
Kingdom	Plantae
(unranked)	Angiosperms
(unranked)	Eudicots
(unranked)	Rosids
Order	Fabales
Family	Fabaceae
Genus	<i>Prosopis</i>
Species	<i>P. cineraria</i>



Vilayati babool (*Prosopis juliflora*)

Taxonomic classification	
Kingdom	Plantae
(unranked)	Angiosperms
(unranked)	Eudicots
(unranked)	Rosids
Order	Fabales
Family	Fabaceae
Genus	<i>Prosopis</i>
Species	<i>P. juliflora</i>



Other invasive spp.-
Parthenium hysterophorus



7. CONCLUSION & RECOMMENDATION

1. Groundwater at present is the **only source** of all water in village Khoh.
2. Population of village increased tremendously after 2006 present population of village is 37041(provisional).
3. Due to sudden & abnormal increase in population of the village **land use pattern** has totally altered. This has reduced natural recharge substantially and increased flash food generated water logging of streets during monsoon.
4. All existing 5 dug wells and almost all tube wells (TW) of village in depth range from 250 to 270 feet have **gone dry**. The numbers of dry TWs in Khoh are few hundreds. Concentration of dry wells is more along foot hill zone where hard rock aquifer is being tapped. Discharge & sustainability of wells tapping water from 280 to 350 feet depth range is reducing fast.
5. The largest pond of village near Shani Temple is gone dry & other 3 has converted to **sewage tank**. The pond towards IMT is receiving both drain water and runoff water polluting potential source.
6. Apart from few individual attempts of artificial recharge of groundwater using RTRWH is made but no sincere community effort has been taken up so far in this direction in the village.

Recommendations

7. Roof Top Rain Water Harvesting through
 1. Existing dry Dug Wells
 2. Existing dry / running Tube Wells
8. Trench cum Auger hole Recharge
9. Recharge through percolation tank
 1. De-siltation of existing tanks and renovation
 2. Transfer of useable water
10. afforestation along hill slope & water bodies

Glimpses of Filed Investigations











EMTRC CONSULTANTS PRIVATE LIMITED*EMTRC Lab: Recognized by Ministry of Environment & Forests, Govt. of India*

NABL Accredited Laboratory ISO/IEC 17025:2005 (TC-7376)

Regd Office (For Correspondence) Tower 5 / 102 (FF), CWG village, NH24, Near Akshardham Temple, Delhi 110092

Phone: 9810032481, 011 21211228, email: emtrcjk@gmail.com , website: www.emtrc.com**TEST REPORT**

Date: 24-01-2019

Report No. : EMTRC/677/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Ground Water
 Sampling Location/No. : Sample No.7
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Standard IS:10500:2012
1	pH	-	APHA-4500	7.77	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	Colourless	5
3	Turbidity	NTU	APHA-2030B	<1	5
4	Total Dissolved Solids	mg/l	APHA-2540B	620	2000
5	Conductivity	µmhos/cm	APHA-2510	830	-
6	Bicarbonate	mg/l	APHA-2320B	240	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	150	600
8	Calcium as Ca	mg/l	APHA-4500B	52	75
9	Magnesium as Mg	mg/l	APHA-4500B	4.8	30
10	Chlorides as Cl	mg/l	APHA-4500B	45	1000
11	Nitrates as NO ₃	mg/l	APHA-4500	2.8	45
12	Fluoride as F	mg/l	APHA-4500D	0.62	1.5
13	Sulphate as SO ₄	mg/l	APHA-4500E	11.7	400
14	Sodium as Na	mg/l	APHA-3500B	128	-
15	Potassium as K	mg/l	APHA-3500B	5.2	-
16	Dissolved Oxygen	mg/l	APHA-4500C	Nil	-
17	COD	mg/l	APHA-5220C	12	-

MUKESH KUMAR
 Authorized Signatory

ENVIRONMENT MONITORING TRAINING & RESEARCH CENTRE

EMTRC Lab: F-66, Road-2, UPSIDC Industrial Area, Masuri Gulawthi Road, Ghaziabad (UP) 201009

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Regd Office (For Correspondence) Tower 5 / 102 (FF), CWG village, NH24, Near Akshardham Temple, Delhi 110092

Phone: 9810032481, 011 21211228, email: emtrckm@gmail.com, website: www.emtrc.com**TEST REPORT**

Date: 24-01-2019

Report No. : EMTRC/676/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Water
 Sampling Location/No. : Sample No.6
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Limit IS:10500:2012
1	pH	-	APHA-4500	7.82	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	Colourless	5
3	Turbidity	NTU	APHA-2030B	<1	5
4	Total Dissolved Solids	mg/l	APHA-2540B	790	2000
5	Conductivity	µmhos/cm	APHA-2510	1090	-
6	Bicarbonate	mg/l	APHA-2320B	280	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	260	600
8	Calcium as Ca	mg/l	APHA-4500B	80	75
9	Magnesium as Mg	mg/l	APHA-4500B	14.6	30
10	Chlorides as Cl	mg/l	APHA-4500B	75	1000
11	Nitrates as NO ₃	mg/l	APHA-4500	3.8	45
12	Fluoride as F	mg/l	APHA-4500D	0.62	1.5
13	Sulphate as SO ₄	mg/l	APHA-4500E	16	400
14	Sodium as Na	mg/l	APHA-3500B	134	-
15	Potassium as K	mg/l	APHA-3500B	5.8	-
16	Dissolved Oxygen	mg/l	APHA-4500C	Nil	-
17	COD	mg/l	APHA-5220C	16	-

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NABL Accredited Laboratory ISO/IEC 17025:2005 (TC-7376)

Regd Office (For Correspondence) Tower 5 / 102 (FF), CWG village, NH24, Near Akshardham Temple, Delhi 110092

Phone: 9810032481, 011 21211228, email: emtrcjkm@gmail.com , website: www.emtrc.com**TEST REPORT**

Date: 24-01-2019

Report No. : EMTRC/675/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Ground Water
 Sampling Location/No. : Sample No.5
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Limit IS:10500:2012
1	pH	-	APHA-4500	7.38	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	Colourless	5
3	Turbidity	NTU	APHA-2030B	<1	5
4	Total Dissolved Solids	mg/l	APHA-2540B	1210	2000
5	Conductivity	µmhos/cm	APHA-2510	1680	-
6	Bicarbonate	mg/l	APHA-2320B	310	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	310	600
8	Calcium as Ca	mg/l	APHA-4500B	112	75
9	Magnesium as Mg	mg/l	APHA-4500B	9.7	30
10	Chlorides as Cl	mg/l	APHA-4500B	170	1000
11	Nitrates as NO ₃	mg/l	APHA-4500	5.2	45
12	Fluoride as F	mg/l	APHA-4500D	0.68	1.5
13	Sulphate as SO ₄	mg/l	APHA-4500E	48	400
14	Sodium as Na	mg/l	APHA-3500B	186	-
15	Potassium as K	mg/l	APHA-3500B	8	-
16	Dissolved Oxygen	mg/l	APHA-4500C	Nil	-
17	COD	mg/l	APHA-5220C	20	-

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Annexure -4

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Regd Office (For Correspondence) Tower 5 / 102 (FF), CWG village, NH24, Near Akshardham Temple, Delhi 110092

Phone: 9810032481, 011 21211228, email: emtrcjk@gmail.com, website: www.emtrc.com**TEST REPORT**

Date: 24-01-2019

Report No. : EMTRC/674/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Water
 Sampling Location/No. : Sample No.4
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Standard IS:10500:2012
1	pH	-	APHA-4500	7.29	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	Colourless	5
3	Turbidity	NTU	APHA-2030B	<1	5
4	Total Dissolved Solids	mg/l	APHA-2540B	1410	2000
5	Conductivity	µmhos/cm	APHA-2510	1980	-
6	Bicarbonate	mg/l	APHA-2320B	300	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	450	600
8	Calcium as Ca	mg/l	APHA-4500B	160	75
9	Magnesium as Mg	mg/l	APHA-4500B	12.2	30
10	Chlorides as Cl	mg/l	APHA-4500B	250	1000
11	Nitrates as NO ₃	mg/l	APHA-4500	7.2	45
12	Sulphate as SO ₄	mg/l	APHA-4500E	69	400
13	Fluoride as F	mg/l	APHA-4500D	0.45	1.5
14	Sodium as Na	mg/l	APHA-3500B	218	-
15	Potassium as K	mg/l	APHA-3500B	11.5	-
16	Dissolved Oxygen	mg/l	APHA-4500C	Nil	-
17	COD	mg/l	APHA-5220C	18	-

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Date: 24-01-2019

Report No. : EMTRC/673/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Water
 Sampling Location/No. : Sample No.3
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Standard IS:10500:2012
1	pH	-	APHA-4500	7.17	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	7	5
3	Turbidity	NTU	APHA-2030B	3	5
4	Total Dissolved Solids	mg/l	APHA-2540B	1390	2000
5	Conductivity	µmhos/cm	APHA-2510	1920	-
6	Bicarbonate	mg/l	APHA-2320B	360	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	320	600
8	Chlorides as Cl	mg/l	APHA-4500B	240	1000
9	Nitrates as NO ₃	mg/l	APHA-4500	7.8	45
10	Sulphate as SO ₄	mg/l	APHA-4500E	100	400
11	Fluoride as F	mg/l	APHA-4500D	0.46	1.5
12	Dissolved Oxygen	mg/l	APHA-4500C	0.3	-
13	BOD, 3 days 27°C	mg/l	APHA-5210B	12	-
14	COD	mg/l	APHA-5220C	60	-
15	Sodium as Na	mg/l	APHA-3500B	308	-
16	Potassium as K	mg/l	APHA-3500B	24	-
17	Calcium as Ca	mg/l	APHA-4500B	112	75
18	Magnesium as Mg	mg/l	APHA-4500B	9.7	30
19	Iron as Fe	mg/l	APHA-3111B	1.2	0.3
20	Copper as Cu	mg/l	APHA-3111B	0.32	1.5
21	Lead as Pb	mg/l	APHA-3111B	0.15	0.01
22	Total Chromium as Cr	mg/l	APHA-3500B	0.11	-
23	Zinc as Zn	mg/l	APHA-3111B	4.21	15
24	Mercury as Hg	mg/l	APHA-3111B	<0.001	0.001
25	Arsenic as As	mg/l	APHA-3111B	<0.001	0.05
26	Selenium as Se	mg/l	APHA-3111B	0.02	0.01
27	Total coliform	MPN/100ml	APHA-9230B	14110	Nil
28	Fecal Coliform	MPN/100ml	APHA-9230B	1280	Nil

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Date: 24-01-2019

Report No. : EMTRC/672/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Water
 Sampling Location/No. : Sample No.2
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Standard IS:10500:2012
1	pH	-	APHA-4500	7.08	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	Colourless	5
3	Turbidity	NTU	APHA-2030B	<1	5
4	Total Dissolved Solids	mg/l	APHA-2540B	1030	2000
5	Conductivity	µmhos/cm	APHA-2510	1390	-
6	Bicarbonate	mg/l	APHA-2320B	290	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	280	600
8	Chlorides as Cl	mg/l	APHA-4500B	130	1000
9	Nitrates as NO ₃	mg/l	APHA-4500	6.2	45
10	Sulphate as SO ₄	mg/l	APHA-4500E	48	400
11	Fluoride as F	mg/l	APHA-4500D	0.48	1.5
12	Dissolved Oxygen	mg/l	APHA-4500C	Nil	-
13	BOD, 3 days 27°C	mg/l	APHA-5210B	<0.1	-
14	COD	mg/l	APHA-5220C	20	-
15	Sodium as Na	mg/l	APHA-3500B	206	-
16	Potassium as K	mg/l	APHA-3500B	11.8	-
17	Calcium as Ca	mg/l	APHA-4500B	96	75
18	Magnesium as Mg	mg/l	APHA-4500B	9.7	30
19	Iron as Fe	mg/l	APHA-3111B	0.26	0.3
20	Copper as Cu	mg/l	APHA-3111B	0.21	1.5
21	Lead as Pb	mg/l	APHA-3111B	0.07	0.01
22	Total Chromium as Cr	mg/l	APHA-3500B	0.07	0.5
23	Zinc as Zn	mg/l	APHA-3111B	1.01	15
24	Mercury as Hg	mg/l	APHA-3111B	<0.001	0.001
25	Arsenic as As	mg/l	APHA-3111B	<0.001	0.05
26	Selenium as Se	mg/l	APHA-3111B	<0.01	0.01
27	Total coliform	MPN/100ml	APHA-9230B	Nil	Nil
28	Fecal coliform	MPN/100ml	APHA-9230B	Nil	Nil

MUKESH KUMAR
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Phone: 9810032481, 011 21211228, email: emtrcjk@gmail.com , website: www.emtrc.com**TEST REPORT**

Date: 24-01-2019

Report No. : EMTRC/671/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Water
 Sampling Location/No. : Sample No.1
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Standard IS:10500:2012
1	pH	-	APHA-4500	7.12	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	Colourless	5
3	Turbidity	NTU	APHA-2030B	<1	5
4	Total Dissolved Solids	mg/l	APHA-2540B	1680	2000
5	Conductivity	µmhos/cm	APHA-2510	2250	-
6	Bicarbonate	mg/l	APHA-2320B	380	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	540	600
8	Chlorides as Cl	mg/l	APHA-4500B	340	1000
9	Nitrates as NO ₃	mg/l	APHA-4500	4.2	45
10	Sulphate as SO ₄	mg/l	APHA-4500E	134	400
11	Fluoride as F	mg/l	APHA-4500D	0.52	1.5
12	Dissolved Oxygen	mg/l	APHA-4500C	Nil	-
13	BOD, 3 days 27°C	mg/l	APHA-5210B	<0.1	-
14	COD	mg/l	APHA-5220C	22	-
15	Sodium as Na	mg/l	APHA-3500B	235	-
16	Potassium as K	mg/l	APHA-3500B	19	-
17	Calcium as Ca	mg/l	APHA-4500B	180	75
18	Magnesium as Mg	mg/l	APHA-4500B	21.9	30
19	Iron as Fe	mg/l	APHA-3111B	0.22	0.3
20	Copper as Cu	mg/l	APHA-3111B	0.2	1.5
21	Lead as Pb	mg/l	APHA-3111B	0.06	0.01
22	Total Chromium as Cr	mg/l	APHA-3500B	0.06	0.5
23	Zinc as Zn	mg/l	APHA-3111B	0.81	15
24	Mercury as Hg	mg/l	APHA-3111B	<0.001	0.001
25	Arsenic as As	mg/l	APHA-3111B	<0.001	0.05
26	Selenium as Se	mg/l	APHA-3111B	<0.01	0.01
27	Total coliform	MPN/100ml	APHA-9230B	Nil	Nil
28	Fecal coliform	MPN/100ml	APHA-9230B	Nil	Nil

MUKESH KUMAR
 Authorized Signatory

ENVIRONMENT MONITORING TRAINING & RESEARCH CENTRE
 EMTRC Lab: F-66, Road-2, UPSIDC Industrial Area, Masuri Gulawthi Road, Ghaziabad (UP) 201009

EMTRC CONSULTANTS PRIVATE LIMITED*EMTRC Lab: Recognized by Ministry of Environment & Forests, Govt. of India*

NABL Accredited Laboratory ISO/IEC 17025:2005 (TC-7376)

Regd Office (For Correspondence) Tower 5 / 102 (FF), CWG village, NH24, Near Akshardham Temple, Delhi 110092

Phone: 9810032481, 011 21211228, email: emtrcjk@gmail.com, website: www.emtrc.com**TEST REPORT**

Date: 24-01-2019

Report No. : EMTRC/678/2018
 Issued To : Arunnanshu Mukherji
 No. of Pages : 1 of 1
 WO / PO No : By E.mail
 Type of Sample : Water
 Sampling Location/No. : Sample No.8
 Date of Sample Received by Lab : 15-01-2019
 Sampling Procedure : Grab Sampling
 Sample Collected & Brought to Lab by : Collected by Client

	Parameters	Unit	Test Methods	RESULTS	Standard IS:10500:2012
1	pH	-	APHA-4500	7.50	6.5 – 8.5
2	Colour	Hazen Unit	APHA-2120B	Colourless	5
3	Turbidity	NTU	APHA-2030B	2	5
4	Total Dissolved Solids	mg/l	APHA-2540B	520	2000
5	Conductivity	µmhos/cm	APHA-2510	660	-
6	Bicarbonate	mg/l	APHA-2320B	190	600
7	Total Hardness as CaCO ₃	mg/l	APHA-2340C	90	600
8	Calcium as Ca	mg/l	APHA-4500B	32	75
9	Magnesium as Mg	mg/l	APHA-4500B	2.4	30
10	Chlorides as Cl	mg/l	APHA-4500B	18	1000
11	Nitrates as NO ₃	mg/l	APHA-4500	3.8	45
12	Fluoride as F	mg/l	APHA-4500D	0.42	1.5
13	Sulphate as SO ₄	mg/l	APHA-4500E	28	400
14	Sodium as Na	mg/l	APHA-3500B	180	-
15	Potassium as K	mg/l	APHA-3500B	21	-
16	Dissolved Oxygen	mg/l	APHA-4500C	Nil	-
17	COD	mg/l	APHA-5220C	12	-

MUKESH KUMAR
 Authorized Signatory

ENVIRONMENT MONITORING TRAINING & RESEARCH CENTRE
 EMTRC Lab: F-66, Road-2, UPSIDC Industrial Area, Masuri Gulawthi Road, Ghaziabad (UP) 201009

GRADIENT PROFILING RESISTIVITY DATA COLLECTION FORMAT (GRP)								
Location:- KHOH (SHANI TEMPLE)								
Geology:-								
Coordinate in degree decimal:			Easting:-76.92337			Northing:- 28.35346		
RL:- 258 m amsl								
Direction of GRP line:- N352				Current Electrode Separation: AB= 300M			Water Table:-	
Potential Electrode separation: MN=20M				Station Interval: 5M			GRP No.:- 1	
Name of observer:- SAURABH						Date:- 25/01/2019		
Station No.	AB=300 AB/2=150M	Distance X in M	N(P1)	M(P2)	K (Geometrical Factor)	R (Resistance) Ω	Apparent Resistivity Ωm	CURRENT (mA)
1	150	-50.0	-40.0	-60.0	2514.3	0.0849	213.46	157
2	150	-45.0	-35.0	-55.0	2686.2	0.0763	204.95	
3	150	-40.0	-30.0	-50.0	2848.2	0.0734	209.06	
4	150	-35.0	-25.0	-45.0	2998.0	0.0653	195.77	
5	150	-30.0	-20.0	-40.0	3133.2	0.0602	188.62	
6	150	-25.0	-15.0	-35.0	3251.7	0.0499	162.26	
7	150	-20.0	-10.0	-30.0	3351.5	0.0466	156.18	
8	150	-15.0	-5.0	-25.0	3431.0	0.0467	160.23	
9	150	-10.0	0.0	-20.0	3488.8	0.0418	145.83	
10	150	-5.0	5.0	-15.0	3523.9	0.0396	139.55	
11	150	0.0	10.0	-10.0	3535.7	0.034	120.21	
12	150	5.0	15.0	-5.0	3523.9	0.0308	108.54	
13	150	10.0	20.0	0.0	3488.8	0.0353	123.16	
14	150	15.0	25.0	5.0	3431.0	0.0286	98.13	VES POINT
15	150	20.0	30.0	10.0	3351.5	0.0296	99.21	
16	150	25.0	35.0	15.0	3251.7	0.0307	99.83	
17	150	30.0	40.0	20.0	3133.2	0.0327	102.46	
18	150	35.0	45.0	25.0	2998.0	0.0323	96.83	
19	150	40.0	50.0	30.0	2848.2	0.0336	95.70	
20	150	45.0	55.0	35.0	2686.2	0.0343	92.14	
21	150	50.0	60.0	40.0	2514.3	0.0333	83.73	

RESISTIVITY DATA ACQUISITION SHEET (VES)						
Location:- KHOH (SHANI TEMPLE)						
Geology:-						
Coordinate in degree decimal:		Easting:- 76.92331		Northing:-28.35324		
RL:-258 m amsl					Water Table:-	
Direction of Schlumberger Array:- N352					VES No.:- 1	
Name of Observer: SAURABH					Date:- 25/01/2019	
Station No.	AB/2 Distance of half of the current electrode	MN/2 Distance of half of the potential electrode	K (Geometrical factor)	R (Resistance) in ohm	Apparent Resistivity in ohm-m	CURRENT (mA)
1	1	0.4	3.30	61.39	202.40	33
2	2	0.4	15.07	16.79	253.06	46
3	3	0.4	34.70	7.33	254.33	44
4	4	0.4	62.17	3.78	235.01	43
5	5	0.4	97.50	2.12	206.69	46
6	5	1	37.68	5.32	200.46	46
7	6	1	54.95	2.94	161.55	49
8	8	1	98.91	1.1	108.80	69
9	10	1	155.43	0.614	95.43	91
10	15	1	351.68	0.223	78.42	46
11	20	1	626.43	0.111	69.53	43
12	25	1	979.68	0.062	60.74	114
13	25	5	188.40	0.315	59.35	114
14	30	5	274.75	0.184	50.55	110
15	35	5	376.80	0.118	44.46	115
16	40	5	494.55	0.092	45.50	105
17	50	5	777.15	0.058	45.07	107
18	50	10	376.80	0.124	46.72	108
19	60	10	549.50	0.102	56.05	133
20	70	10	753.60	0.076	57.27	98
21	80	10	989.10	0.061	60.34	163
22	90	10	1256.00	0.051	64.06	133
23	100	10	1554.30	0.044	68.39	127
24	100	20	753.60	0.097	73.10	126
25	110	20	918.45	0.086	78.99	179
26	120	20	1099.00	0.078	85.72	175
27	130	20	1295.25	0.073	94.55	188
28	140	20	1507.20	0.067	100.98	118
29	150	20	1734.85	0.063	109.30	153

GRADIENT PROFILING RESISTIVITY DATA COLLECTION FORMAT (GRP)								
Location:- KHOH (DABLI TEMPLE)								
Geology:-								
Coordinate in degree decimal:			Easting: 76.92604			Northing:-28.35131		
RL:- 260 m amsl								
Direction of GRP line:- N275				Current Electrode Separation: AB= 300M			Water Table:-	
Potential Electrode separation: MN=20M				Station Interval: 5M			GRP No.:-2	
Name of observer:- SAURABH						Date:- 25/01/2018		
Station No.	AB=300 AB/2=150M	Distance X in M	N(P1)	M(P2)	K (Geometrical Factor)	R (Resistance) Ω	Apparent Resistivity Ωm	CURRENT (mA)
1	150	-50.0	-40.0	-60.0	2514.3	0.0572	143.82	179
2	150	-45.0	-35.0	-55.0	2686.2	0.048	128.94	
3	150	-40.0	-30.0	-50.0	2848.2	0.0433	123.33	
4	150	-35.0	-25.0	-45.0	2998.0	0.0354	106.13	
5	150	-30.0	-20.0	-40.0	3133.2	0.028	87.73	
6	150	-25.0	-15.0	-35.0	3251.7	0.0295	95.92	
7	150	-20.0	-10.0	-30.0	3351.5	0.0269	90.16	
8	150	-15.0	-5.0	-25.0	3431.0	0.0271	92.98	
9	150	-10.0	0.0	-20.0	3488.8	0.0272	94.90	
10	150	-5.0	5.0	-15.0	3523.9	0.0255	89.86	
11	150	0.0	10.0	-10.0	3535.7	0.0222	78.49	VES POINT
12	150	5.0	15.0	-5.0	3523.9	0.0241	84.93	
13	150	10.0	20.0	0.0	3488.8	0.024	83.73	
14	150	15.0	25.0	5.0	3431.0	0.024	82.35	
15	150	20.0	30.0	10.0	3351.5	0.0267	89.49	
16	150	25.0	35.0	15.0	3251.7	0.0285	92.67	
17	150	30.0	40.0	20.0	3133.2	0.0283	88.67	
18	150	35.0	45.0	25.0	2998.0	0.0267	80.05	
19	150	40.0	50.0	30.0	2848.2	0.0287	81.74	
20	150	45.0	55.0	35.0	2686.2	0.0296	79.51	
21	150	50.0	60.0	40.0	2514.3	0.0297	74.67	

RESISTIVITY DATA ACQUISITION SHEET (VES)						
Location:- KHOH (DABLI TEMPLE)						
Geology:-						
Coordinate in degree decimal:		Easting:- 76.92604		Northing:- 28.35137		
RL:- 260 m amsl					Water Table:-	
Direction of Schlumberger Array:- N 275					VES No.:- 2	
Name of Observer: SAURABH					Date:- 25/01/2019	
Station No.	AB/2 Distance of half of the current electrode	MN/2 Distance of half of the potential electrode	K (Geometrical factor)	R (Resistance) in ohm	Apparent Resistivity in ohm-m	CURRENT (mA)
1	1	0.4	3.30	13.08	43.12	229
2	2	0.4	15.07	3.94	59.38	318
3	3	0.4	34.70	1.93	66.97	298
4	4	0.4	62.17	1.22	75.85	210
5	5	0.4	97.50	0.81	78.97	182
6	5	1	37.68	2.12	79.88	182
7	6	1	54.95	1.51	82.97	208
8	8	1	98.91	0.861	85.16	213
9	10	1	155.43	0.514	79.89	179
10	15	1	351.68	0.205	72.09	130
11	20	1	626.43	0.103	64.52	270
12	25	1	979.68	0.064	62.70	265
13	25	5	188.40	0.334	62.93	265
14	30	5	274.75	0.228	62.64	271
15	35	5	376.80	0.168	63.30	366
16	40	5	494.55	0.127	62.81	358
17	50	5	777.15	0.086	66.83	285
18	50	10	376.80	0.175	65.94	284
19	60	10	549.50	0.12	65.94	199
20	70	10	753.60	0.091	68.58	215
21	80	10	989.10	0.07	69.24	279
22	90	10	1256.00	0.056	70.34	258
23	100	10	1554.30	0.047	73.05	150
24	100	20	753.60	0.098	73.85	150
25	110	20	918.45	0.077	70.72	179
26	120	20	1099.00	0.067	73.63	501
27	130	20	1295.25	0.06	77.72	168
28	140	20	1507.20	0.052	78.37	160
29	150	20	1734.85	0.049	85.01	149

GRADIENT PROFILING RESISTIVITY DATA COLLECTION FORMAT (GRP)								
Location:- KHOH (NEAR SARPANCH HOUSE)								
Geology:-								
Coordinate in degree decimal:			Easting: -76.92298			Northing:- 28.35842		
RL:- 245 m amsl								
Direction of GRP line:- N85				Current Electrode Separation: AB= 300M			Water Table:-	
Potential Electrode separation: MN=20M				Station Interval: 5M			GRP No.:- 3	
Name of observer:- SAURABH						Date:- 26/01/2019		
Station No.	AB=300 AB/2=150M	Distance X in M	N(P1)	M(P2)	K (Geometrical Factor)	R (Resistance) Ω	Apparent Resistivity Ωm	CURRENT (mA)
1	150	-50.0	-40.0	-60.0	2514.3	0.00748	18.81	256
2	150	-45.0	-35.0	-55.0	2686.2	0.00739	19.85	
3	150	-40.0	-30.0	-50.0	2848.2	0.00599	17.06	
4	150	-35.0	-25.0	-45.0	2998.0	0.00594	17.81	
5	150	-30.0	-20.0	-40.0	3133.2	0.00555	17.39	
6	150	-25.0	-15.0	-35.0	3251.7	0.00608	19.77	
7	150	-20.0	-10.0	-30.0	3351.5	0.00672	22.52	
8	150	-15.0	-5.0	-25.0	3431.0	0.00633	21.72	
9	150	-10.0	0.0	-20.0	3488.8	0.00537	18.74	
10	150	-5.0	5.0	-15.0	3523.9	0.00515	18.15	
11	150	0.0	10.0	-10.0	3535.7	0.00506	17.89	
12	150	5.0	15.0	-5.0	3523.9	0.00488	17.20	
13	150	10.0	20.0	0.0	3488.8	0.00477	16.64	VES POINT
14	150	15.0	25.0	5.0	3431.0	0.00497	17.05	
15	150	20.0	30.0	10.0	3351.5	0.00563	18.87	
16	150	25.0	35.0	15.0	3251.7	0.00576	18.73	
17	150	30.0	40.0	20.0	3133.2	0.00562	17.61	
18	150	35.0	45.0	25.0	2998.0	0.00561	16.82	
19	150	40.0	50.0	30.0	2848.2	0.00686	19.54	
20	150	45.0	55.0	35.0	2686.2	0.00594	15.96	
21	150	50.0	60.0	40.0	2514.3	0.00591	14.86	

Annexure 14

RESISTIVITY DATA ACQUISITION SHEET (VES)						
Location:- KHOH (NEAR SARPANCH HOUSE)						
Geology:-						
Coordinate in degree decimal:		Easting:- 76.92274		Northing:- 28.3854		
RL:- 245 m amsl					Water Table:-	
Direction of Schlumberger Array:- N85					VES No.:- 3	
Name of Observer: SAURABH					Date:- 26/01/2019	
Station No.	AB/2 Distance of half of the current electrode	MN/2 Distance of half of the potential electrode	K (Geometrical factor)	R (Resistance) in ohm	Apparent Resistivity in ohm-m	CURRENT (mA)
1	1	0.4	3.30	8.78	28.95	350
2	2	0.4	15.07	1.99	29.99	328
3	3	0.4	34.70	0.857	29.74	313
4	4	0.4	62.17	0.459	28.54	319
5	5	0.4	97.50	0.297	28.96	238
6	5	1	37.68	0.749	28.22	240
7	6	1	54.95	0.481	26.43	218
8	8	1	98.91	0.236	23.34	250
9	10	1	155.43	0.155	24.09	318
10	15	1	351.68	0.068	23.91	338
11	20	1	626.43	0.034	21.30	363
12	25	1	979.68	0.019	18.61	310
13	25	5	188.40	0.096	18.09	310
14	30	5	274.75	0.067	18.41	459
15	35	5	376.80	0.051	19.22	468
16	40	5	494.55	0.037	18.30	446
17	50	5	777.15	0.025	19.43	223
18	50	10	376.80	0.053	19.97	223
19	60	10	549.50	0.032	17.58	412
20	70	10	753.60	0.021	15.83	303
21	80	10	989.10	0.014	13.85	315
22	90	10	1256.00	0.011	13.82	408
23	100	10	1554.30	0.0097	15.08	305
24	100	20	753.60	0.02	15.07	305
25	110	20	918.45	0.013	11.94	202
26	120	20	1099.00	0.011	12.09	155
27	130	20	1295.25	0.0097	12.56	127
28	140	20	1507.20	0.01	15.07	144
29	150	20	1734.85	0.0098	17.00	445

GRADIENT PROFILING RESISTIVITY DATA COLLECTION FORMAT (GRP)								
Location:- KHOH (NEAR ANGANBADI CENTER)								
Geology:-								
Coordinate in degree decimal:			Easting: 76.92531			Northing:-28.35286		
RL:- 258 m amsl								
Direction of GRP line:- N351				Current Electrode Separation: AB= 300M			Water Table:-	
Potential Electrode separation: MN=20M				Station Interval: 5M			GRP No.:-4	
Name of observer:- SAURABH						Date:- 26/01/2018		
Station No.	AB=300 AB/2=150M	Distance X in M	N(P1)	M(P2)	K (Geometrical Factor)	R (Resistance) Ω	Apparent Resistivity Ωm	CURRENT (mA)
1	150	-50.0	-40.0	-60.0	2514.3	0.0395	99.31	161
2	150	-45.0	-35.0	-55.0	2686.2	0.0227	60.98	
3	150	-40.0	-30.0	-50.0	2848.2	0.0122	34.75	
4	150	-35.0	-25.0	-45.0	2998.0	0.0138	41.37	
5	150	-30.0	-20.0	-40.0	3133.2	0.0143	44.80	
6	150	-25.0	-15.0	-35.0	3251.7	0.0137	44.55	
7	150	-20.0	-10.0	-30.0	3351.5	0.0135	45.25	
8	150	-15.0	-5.0	-25.0	3431.0	0.0122	41.86	
9	150	-10.0	0.0	-20.0	3488.8	0.0117	40.82	
10	150	-5.0	5.0	-15.0	3523.9	0.0127	44.75	
11	150	0.0	10.0	-10.0	3535.7	0.0111	39.25	
12	150	5.0	15.0	-5.0	3523.9	0.0173	60.96	
13	150	10.0	20.0	0.0	3488.8	0.00848	29.59	
14	150	15.0	25.0	5.0	3431.0	0.00759	26.04	VES POINT
15	150	20.0	30.0	10.0	3351.5	0.00877	29.39	
16	150	25.0	35.0	15.0	3251.7	0.00887	28.84	
17	150	30.0	40.0	20.0	3133.2	0.00832	26.07	
18	150	35.0	45.0	25.0	2998.0	0.00909	27.25	
19	150	40.0	50.0	30.0	2848.2	0.0109	31.05	
20	150	45.0	55.0	35.0	2686.2	0.0139	37.34	
21	150	50.0	60.0	40.0	2514.3	0.0177	44.50	

RESISTIVITY DATA ACQUISITION SHEET (VES)						
Location:- KHOH (NEAR ANGANBADI CENTER)						
Geology:-						
Coordinate in degree decimal:		Easting:- 76.92541		Northing:- 28.35280		
RL:- 258 m amsl					Water Table:-	
Direction of Schlumberger Array:- N 351					VES No.:- 4	
Name of Observer: SAURABH					Date:- 26/01/2019	
Station No.	AB/2 Distance of half of the current electrode	MN/2 Distance of half of the potential electrode	K (Geometrical factor)	R (Resistance) in ohm	Apparent Resistivity in ohm-m	CURRENT (mA)
1	1	0.4	3.30	6.442	21.24	261
2	2	0.4	15.07	2.01	30.29	337
3	3	0.4	34.70	1.146	39.76	540
4	4	0.4	62.17	0.697	43.33	467
5	5	0.4	97.50	0.496	48.36	355
6	5	1	37.68	1.29	48.61	352
7	6	1	54.95	0.962	52.86	256
8	8	1	98.91	0.626	61.92	219
9	10	1	155.43	0.378	58.75	186
10	15	1	351.68	0.172	60.49	302
11	20	1	626.43	0.122	76.42	103
12	25	1	979.68	0.08	78.37	176
13	25	5	188.40	0.415	78.19	176
14	30	5	274.75	0.271	74.46	134
15	35	5	376.80	0.168	63.30	137
16	40	5	494.55	0.09	44.51	270
17	50	5	777.15	0.036	27.98	273
18	50	10	376.80	0.073	27.51	272
19	60	10	549.50	0.049	26.93	287
20	70	10	753.60	0.035	26.38	345
21	80	10	989.10	0.026	25.72	237
22	90	10	1256.00	0.021	26.38	240
23	100	10	1554.30	0.018	27.98	200
24	100	20	753.60	0.036	27.13	200
25	110	20	918.45	0.024	22.04	215
26	120	20	1099.00	0.021	23.08	192
27	130	20	1295.25	0.026	33.68	110
28	140	20	1507.20	0.024	36.17	163
29	150	20	1734.85	0.023	39.90	147