केंद्रीय भूमि जल बोर्ड

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विभाग, जल शक्ति मंत्रालय

भारत सरकार

Central Ground Water Board

Department of Water Resources, River Development and Ganga Rejuvenation,

Ministry of Jal Shakti

Government of India

AQUIFER MAPPING AND MANAGEMENT OF GROUND WATER RESOURCES

KAVARATTI ISLAND, U.T.OF LAKHDWEEP

केरल क्षेत्र, तिरुवनंतपुरम

Kerala Region, Thiruvananthapuram

भारत सरकार / GOVERNMENT OF INDIA

जल शक्ति मंत्रालय / MINISTRY OF JAL SHAKTI

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DEPARTMENT OF WATER RESOURCES, RIVER DEVELOPMENT

AND GANGA REJUVENATION

केंद्रीय भूजल बोर्ड / **CENTRAL GROUND WATER BOARD**

केरल क्षेत्र / **KERALA REGION**

REPORT ON AQUIFER MAP AND MANAGEMENT PLAN OF KAVARATTI ISLAND, U.T. OF LAKSHADWEEP

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तिरुवनंतपुरम

Thiruvananthapuram

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AQUIFER MAPS AND MANAGEMENT PLAN OF KAVARATTI ISLAND

1.0 Salient information

1.1 About the area

The Kavaratti Island is one of the inhabited islands in the Union Territory of Lakshadweep located off the coast of Kerala State in the Arabian Sea. The UT of Lakshadweep has a geographical area of 32 sq. km, consisting of 36 tiny Islands, of which 10 are inhabited. The entire chain of islands exists in a scattered manner and having a distance of 220 to 440 kms between them. Kavaratti is the capital of the union territory of the Lakshadweep and obtain its name from the atoll upon which the town stands. Kavaratti Island is located between North latitude $10^0$32' and $10^0$35' and East longitude $72^0$35' to $72^0$40' with a total geographical area of 4.22 sq. kms. The shape of island resembles conical in nature with a pointed edge towards south and the narrow part of the island is called as "chicken neck". The average length and width of the island is around 5.8 and 1.6 km respectively with an average coastal perimeter of 11.45 km. In addition to the land area the island includes a lagoon area of 4.96 km on its western parts depicted in the physiographic map of Kavaratti Island, shown in Fig.1.

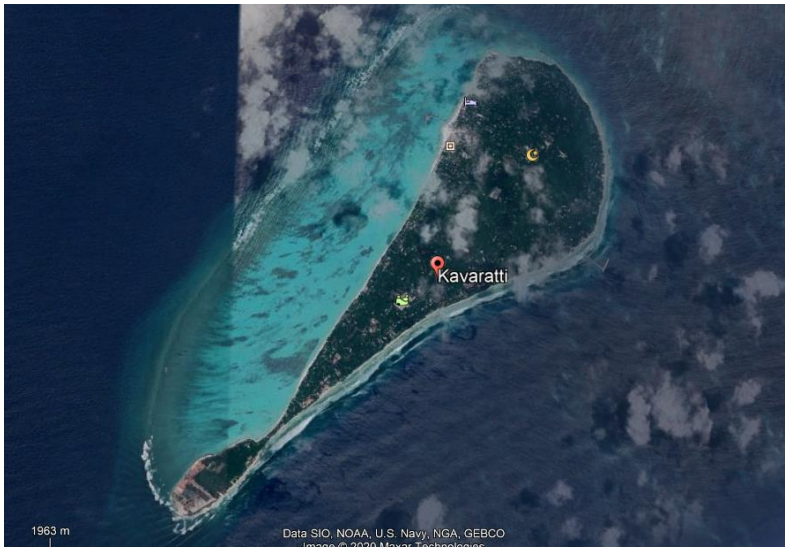

Fig. 1: Aerial View of Kavaratti Island from Space. (Google Map)

1.2 Population

Existing Population of Kavaratti island and its growth rate are important criteria in evaluating the current and future groundwater demand and its efficient management. As per the 2011 census data the total population of Kavaratti island is 11221 persons with 6182 males (55.09%) and 5039 females (44.90%). It is the densely populated island in Lakshadweep Sea with 2396 persons per sq.

km. The overall decadal growth rate in respect of Kavaratti island show an increase in population growth from 10119 to 11221 persons between 2001 to 2011 with a percentage growth of 10.89%. Literacy rate of Kavaratti is 88.29% with male 94.1% and female 81.66%.

1.3 Climate

The climate of Kavaratti is similar to the climatic conditions of Kerala. March to May is the hottest period of the year. The temperature ranges from 25^0C to 35^0C and humidity ranging from 70 -76 per cent for most of the year. The average rainfall received is 1600 mm a year. Monsoon prevails here from 15th May to 15th September. The monsoon period raises temperature to the mercury level between 27- 30 degrees. During the monsoon time, boats are not allowed outside the lagoon because of the violent sea. The presence of the reef maintains calm at the lagoon. Distribution of Normal rainfall in respect of Lakshadweep island is given in Table 1.

Table 1:Distribution of Normal Rain fall in Lakshadweep Islands

Island	No. of Years		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Minicoy	50	A	43.2	22.3	20.8	51.3	179.6	309	238	209	158.2	179	143	85.9	1640
		B	2.6	1.3	1.4	2.9	8.7	17.4	13.9	12.4	10.1	10.6	8.1	4.7	94.1
Amini	50	A	20.6	2.0	4.3	25.4	125.2	381	312	217	150	141	85.6	40.9	1504
		B	1.3	0.3	0.3	1.4	5.2	17.3	16.5	12.3	10.2	8.4	5.0	2.2	80.4

(A) Normal rainfall in mm (B) Average no. of rainy days (days with rain more than 2.5mm)

1.4 Soil

Soil layer developed with in the Kavaratti island is mainly derived from coral limestone, which include coral sands and lagoonal sands and mud. The existing soil have highly permeable in nature and allow the rainfall to infiltrate at a greater rate results in devoid of surface water runoff except in a very few local areas where compact soil get exposed. From a ground water resources perspective, the relevant soil characteristics are: the rate of infiltration, the thickness and the moisture contents at both field capacity and wilting point.

1.5 Agriculture and irrigation

Due to lack of space and surface water irrigational activities within the island are restricted to very minimum scale. In general, house hold farming of coconut and other plants utilizing the available land area in a small-scale manner is widely practised in island. In order to carry out cultivation practise in the island, ground water play a major role and in addition to that

evapotranspiration loss from the available plantation on ground water resource put considerable stress. In order to understand the exiting agriculture practise with in the island it has been broadly categorized in to two major classes based on water balance view point. The first one mainly includes the Grass, Crops and Shrubs which extract the water exclusively from soil moisture zone exist at a shallow depth are coined as Shallow rooted plants. Coconut trees and other varieties having deep roots can have the capacity to penetrate below soil moisture zone upto the existing water table are classified under Deep rooted plants. The deep-rooted plants were generally grown in the area where water table is around 5m bgl. Coconut harvesting is the major agricultural activities carried out in kavaratti and its production has been increased from 51 lac to 106 lac nuts between 2004-05 to 2010-11. Statistical details of coconut harvested in kavaratti island is given in Table 2.

Table 2: Coconut Harvested from 2004 to 2011 in Kavaratti Island (in lack nuts)

Island	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Kavaratti	51.0	55.00	54.00	60.00	60.30	104.79	106.00

1.6 Ground water resources availability and extraction

Ground water resource available in the Kavaratti Island is restricted to top few meters within the phreatic aquifer in the form of fresh water lens, considered as the only available direct sources for drinking, domestic and little irrigation purpose. The coral sand act as aquifer in the island is of highly porous in nature, and because of that rainfall gets maximum infiltrated in to it and further displace the saline water to further deep for maintain the density difference. Hence chance for rejected recharge from rainfall is totally devoid in island scenario, in a nut shell around 18 to 51 percentage of the annual rainfall got recharged into the ground water depends on Intensity, Frequency and Distribution of lens.

In small island conditions, the estimation of recharge based on ground water fluctuation method is not practicable unlike in the case of continental coastal aquifers as the head build up due to rainfall recharge dissipates within 2-3 days and diurnal fluctuation is nearly the same as seasonal fluctuation. Therefore, water table fluctuation method cannot be adopted for assessing the dynamic ground water potential of Lakshadweep islands. Instead resource computation is by finding the ratio between recharge and draft calculation. As per the dynamic ground water resource calculation for the year 2017, Total Resource water surplus has been computed as 147.6 ham. Evapotranspiration loss of 38.3 ham and water loss due to outflow to sea in the order 29.5 ha.m needs to be considered while accessing the total resource. After deduction the various outflow component the available resource in respect of Kavaratti island, as worked out as 50.3 ha.m with gross annual ground water

extraction of 41.8 ha.m. Based on the above stage of development is computed as 83.1% and categorized as semi critical. Details of ground water resource calculation is given in Table 3.

Table 3 : Dynamic Ground Water Resources of Kavaratti Islands (As in March 2017)

#	Annual components of Water Balance	Ha.m
1	Population (Projected as on 2017)	11954
2	Area (Ha)	363.0
3	Normal Monsoon Rainfall (m)	1.355
4	Rainfall Infiltration Factor (%)	30
5	Total Resource (Water Surplus) (Ha.m)) [2*3*4]	147.6
6	ET loss from Trees for 6 non-monsoon months (Ha.m)	38.3
7	Water loss due to outflow to sea [20% of (3) (Ha.m)]	29.5
8	Buffer zone for reserve during delayed or lesser monsoon period [20% of (3)] (Ha.m)	29.5
9	Balance available resource (Ha.m)	50.3
10	Domestic Extraction @100 lpcd [1*100*365] (Ha.m)	41.8
11	Gross Annual GW Extraction (Ha.m)	41.8
12	Groundwater balance available [9-11](Ha.m)	8.5
13	Stage of ground water extraction [11*100/9]	83.1
14	Category	Semi-Critical

1.7 Water level behaviour

The depth of the dug wells range from 1.20 to 4.66 m. and the depth to water level ranges from 0.52 to 4.11 m bgl . At a glance of the water level map of the island exhibits that DTW in the north central part of the island ranges from 1.5. to 2.50 m bgl and gradually increases towards south. The available fresh water lens in kavaratti island exhibit maximum thickness in the north central part than the rest. In south of Pandarath Palli – Secretariat section, the ground water is generally saline during the summer months. However, in the extreme south, south of chicken neck area, it is fresh. The contact between the fresh / brackish water moves further north during severe summer and towards south during monsoon. Thus, the wells located in this peripheral area exhibit maximum fluctuation in ground water quality, whereas those located in the north central part show almost constant quality over time. The area south of the road and up to chicken neck shows wide variation in quality. Ground water Hydrograph as generated from the observation wells OWC3 & 4 monitored by LPWD during morning and evening on weekly interval for the year 2014 reflects meagre fluctuation in the water level from 0.65 m to 0.86 m thought out the year. Which implies that the effect of rainfall recharge cannot be visualized directly on it in island case. The fresh water lens expand vertically and laterally to accommodate additional rainwater in flow in to the system. Moreover, the tidal effects have strong influence on the water levels. The maps showing locations of the key wells, depth to water table (pre-monsoon 2016) and hydrographs of Kavaratti island is given in Figures 2,3 ,4 & 4a respectively.

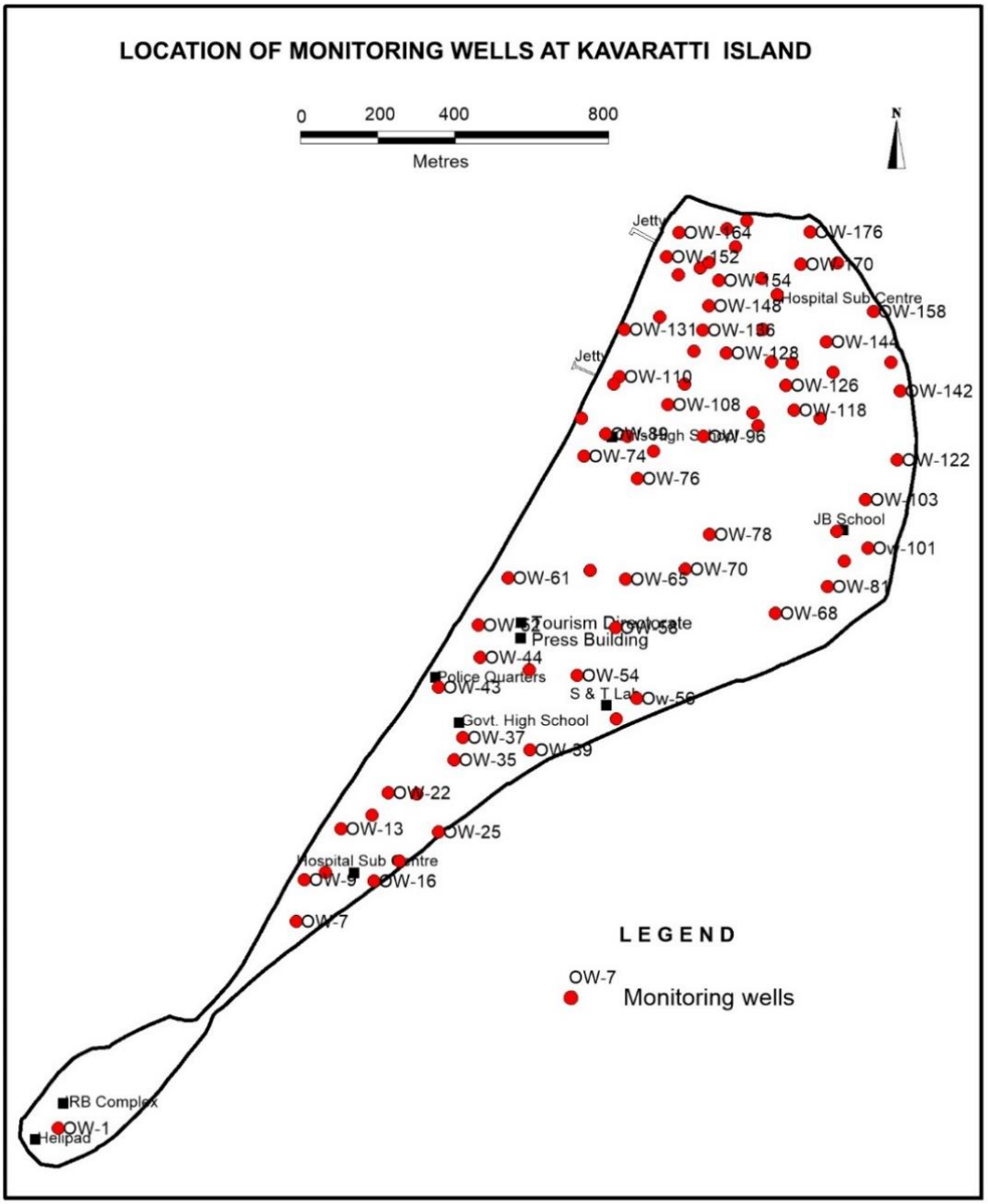

Fig. 2: Location map of Key wells exist in Kavaratti island

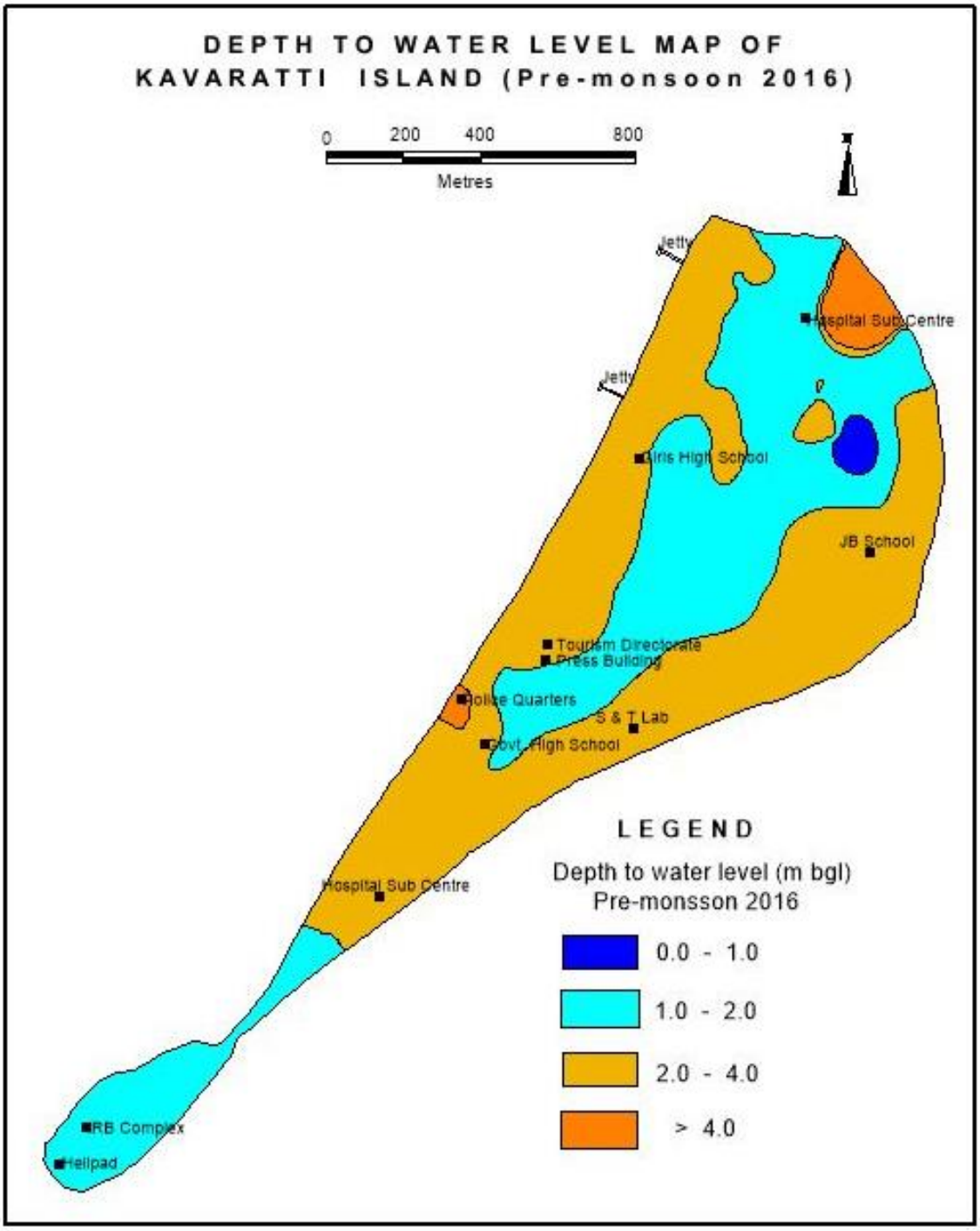

Fig. 3:

Fig.3: Depth to water level map of Kavaratti island

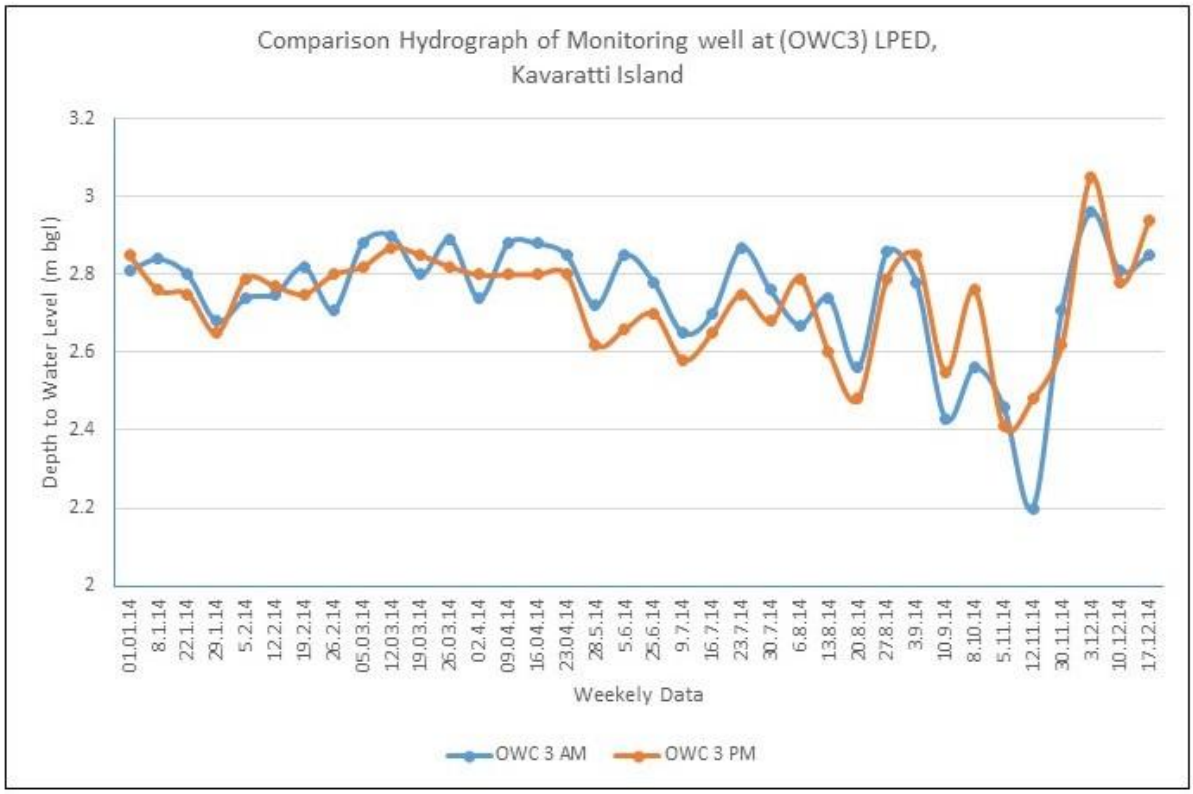

Fig. 4: Hydrograph of Depth to water level at OWC3 Kavaratti Island.

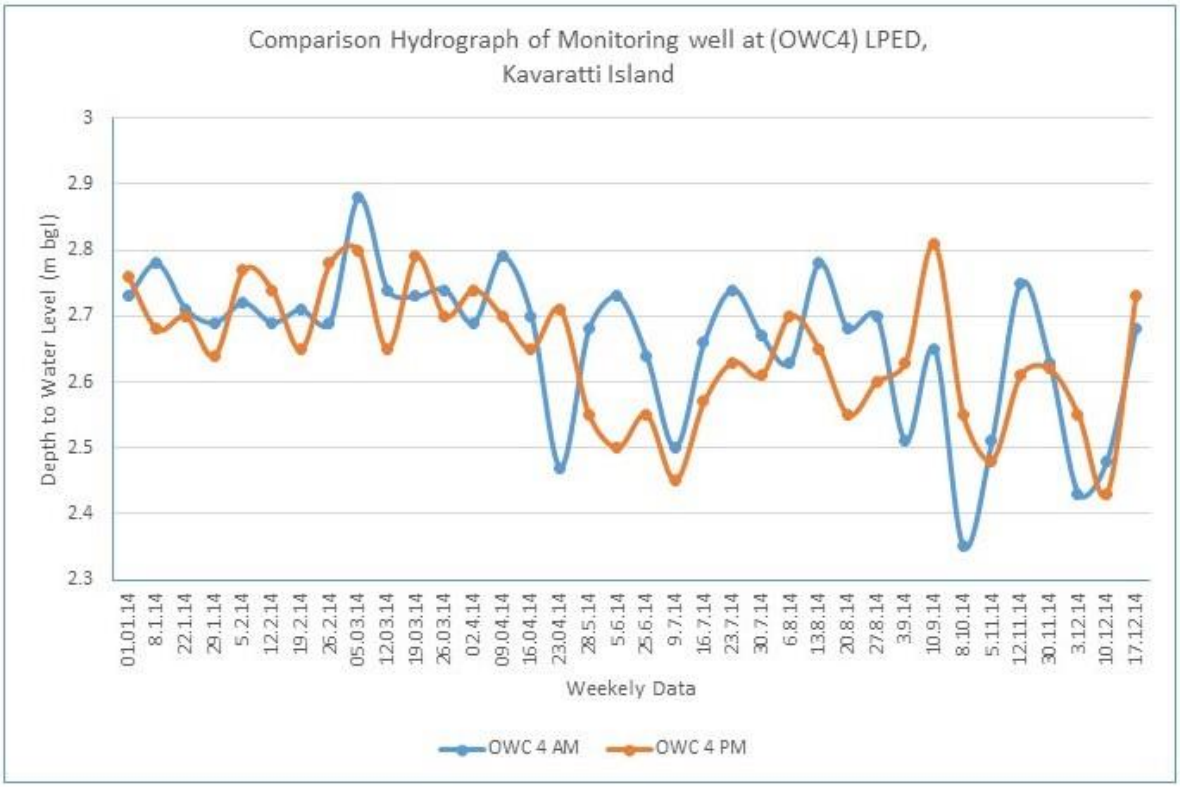

Fig. 4a: Hydrograph of Depth to water level at OWC4 Kavaratti Island

1.8 Existing & Future Water demands

Based on Ground water resource estimation carried out during April 2017, total Ground water resource available and its corresponding extraction from various sector in respect of Kavaratti island is as follows. The gross annual ground water resource available is 147.6 Ha.m Ground water Draft by Domestic sector is 41.8 Ha.m, further loss due to Evapotranspiration and buffer zones accounted around 38.3 Ha.m and 59.3 Ha.m respectively. The stage of ground water development as computed from ratio of total surplus resource and gross annual extraction has brought out around 83.1% with semi critical category. The future ground water demand can approximately be calculated by considering population growth rate for the draft figure.

2.0 Aquifer disposition

2.1 Number of aquifers

The islands is composed mainly of coral reefs and material derived from it, Coralline sandstone constitute the major aquifer material in the island condition and mainly consist of calcareous sand of beach facies, strand line facies, dune facies and anthropogenically modified varieties on the basis of base morphometric units. The grain size and other physical characteristics Coralline grit and gritty conglomerates, coralline limestones and shingles resembles submerged reef facies. The calcareous sand and other materials deposited over the island has risen approximately up to 5 m above mean sea level. In general aquifer act as phreatic nature with depth to water level observed within the range of 2 to 3 m bgl. The fresh water exist as a thin lens floating over the saline water with definite hydraulic continuity. Large diameter wells are the most common and traditional ground water abstraction structures in kavaratti. In almost all the wells, hard coral limestone is exposed near the bottom. The sand below this hard layer has caved in most of the wells.

The disposition of the aquifer material on both lateral and vertical directions were defined from the data collected from exploratory drilling carried out with in the island. A sum of around 15 nos of exploratory boreholes were drilled by central ground water board at 5 locations within kavaratti with a depth ranges of 5.5 to 38 m bgl. The details of boreholes drilled are given in Table no.4. The data generated during exploration indicated that there is no spatial continuity of the aquifers and the fresh/saline water interface in the island (Fig.5). The aquifer map as generated from the available depth to water level data and electrical conductivity is given in figure no 6.

Table 4: Salient features of exploratory boreholes drilled by CGWB in Kavaratti Island.

Sl. No.	Location	Depth (m.bgl)	Zones screened (m.bgl)	DTW (m.bgl)	Sp. Elec. Conductance(EC) (µS/cm at 25°C)
Kavaratti South					
1	Near Govt. High school	12.0	6-12	1.9	5100
2	Near Govt. High school	38.0	26-38	1.75	>200000
3	Near Govt. High school	7.5	4.5-7.5	1.98	790
4	Water testing Lab	10.0	7-10	2.45	17300
5	Water testing Lab	15.0	11-15	2.06	11400
Kavaratti North					
6	Chekkikulam	22.5	10.5-22.5	1.26	12600
7	Chekkikulam	11.5	8.5-11.5	1.52	800
8	Chekkikulam	8.5	5.5-8.5	1.47	970
9	Ujrapalli	25.0	13-25	0.45	12400
10	Ujrapalli	15.0	9-15	0.95	6400
11	Ujrapalli	11.5	8.5-11.5	0.53	1010
12	Ujrapalli	8.5	5.5-8.5	0.73	810
13	Pallikunnu	29.0	23-29	0.45	>20000
14	Pallikunnu	8.5	5.5-8.5	0.63	1120
15	Pallikunnu	5.5	2.5-5.5	0.58	610

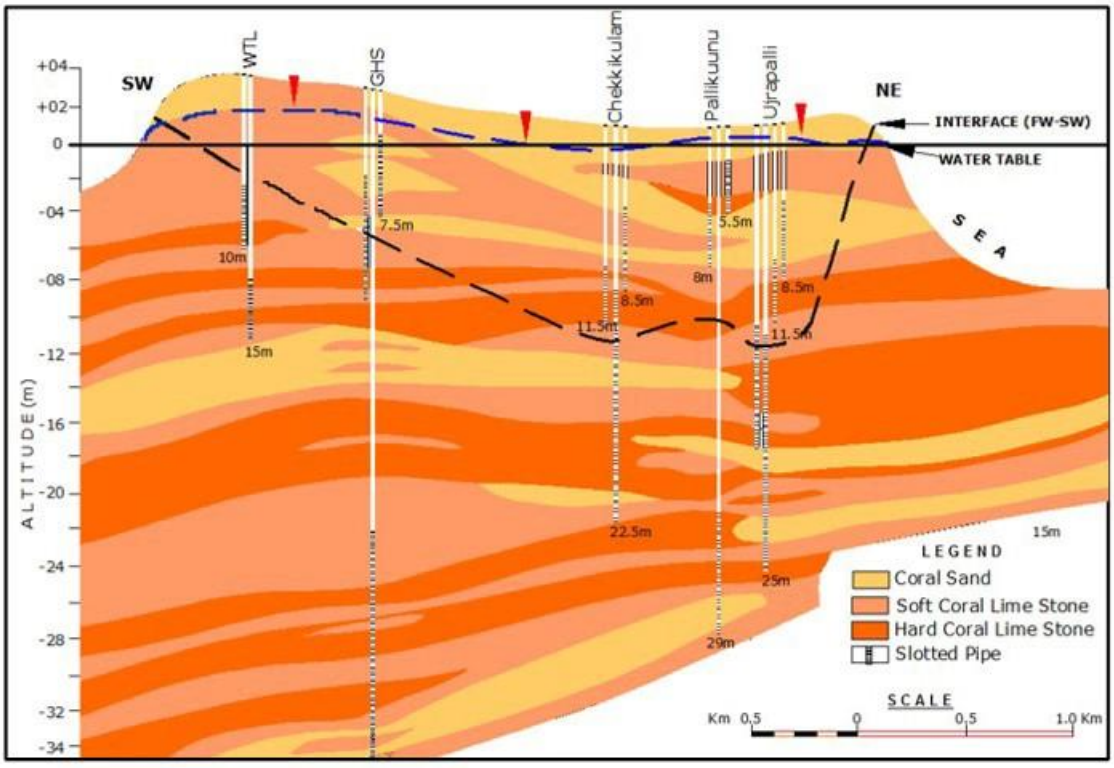

Fig. 5: Hydrogeological cross section of Kavaratti Island

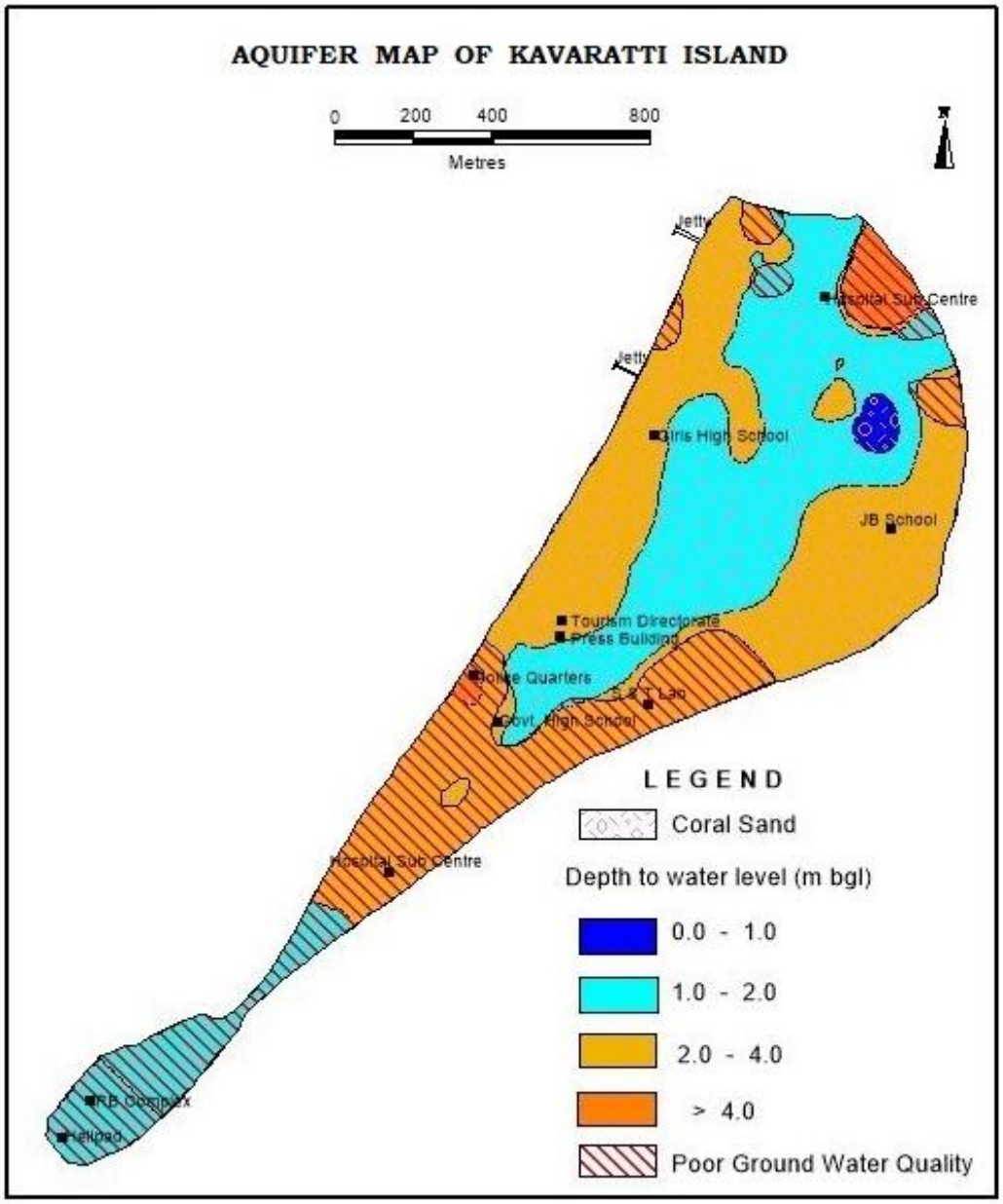

Fig.6:Aquifer map of Kavaratti Island

3. Ground water quality

Quality of ground water in the island is good and potable for domestic purpose. It is mainly Mg- Ca- Bicarbonate type and is suitable for domestic and irrigation purposes. The pH value ranges from 7.02 to 8.66 and the EC values are generally within the range of 306- 11400 µS / cm at 25 °C. The chloride content shows a wide variation of 30- 4350 mg/l. About 70% of the water samples

shown the EC range <3000 µS / cm at 25^0 C and 83 % of samples shown the chloride range<1000 mg/l .Ground water in the western tip of the island is brackish, and are fresh and potable in the north central part of the island. Lakshadweep Public Works Department is maintaining chemical lab for monitoring the ground water samples in periodic manner from selected observation wells. The details of chemical analysis is given in the Table 5. The spatial variations in EC are depicted in Fig. 7.

Table 5: Hydrochemistry of select ground water samples collected from open wells in U.T of Lakshadweep

#	Name of Island	No of Samples	pH	EC (µS/cm)	TDS (mg/l)	Total Hardness(mg/l)	Ca (mg/l)	Mg (mg/l)	Cl (mg/l)
1	Kavaratti	78	7.02-8.66	306-11400	171-6384	60-1670	40-640	20-1120	30-4350

It has been generally observed that ground water quality in the islands show variation due to effects like Tidal, Rainfall recharge, Groundwater drafts from wells etc. as the horizontal flow of groundwater is relatively insignificant the freashwater occurs in the form of lens contracts and expands in response to above factors. During the diurnal Tital fluctuations of the sea freashwater lens shows variation in water quality, and bacame brackish during low tides, freash during high tides in the area where lens thickness is low. Heavy withdrawal of ground water from a point source can induce upconing of saline water and make the quality deterioration. Rainfall recharge has improved the quaity of lens that exist beneth by reshaping the lens shape. In addtion to the above marine aerosols can influnce the ground water quality.

It has been observed from the studies carried out by Central Ground Water Board, that temporal variation in ground water quality have more signigicants and is depend on recharge and draft relations, with in 20 to 100 m area there exist a considerable changes in quality. It was observed from the analysis that after heavy monsoon rainfall the water quality in the entire island north of Chicken neck was having freshwater with the EC of less than 3000 µS/cm, except in a small patch along the northeast influenced by the saline water lake in the area. A water surplus of more than 800 mm during the monsoon was found to result in the fresh water lens spreading in the entire island.

The important minor components of seawater viz. Fluoride, Iodide, Boron, and Strontium were analysed from the ground water samples of Kavaratti Island. Fluoride is present in low concentrations (normally less than 1.5mg/l) as it forms strong solute complexes with many cations. The spatial distribution of fluoride in the island varies in the range of 0.2 to 2.1 mg/l. The major sources of fluoride in coral islands are the fluoride associated with calcium in the form of Calcium Fluoride (CaF) in the skeletal remains of marine organisms. The Strontium content of the ground

water is in the range of 1.7 to 5.7 mg/l. Chemical quality of ground water analysed from dug wells in kavaratti island is given in the Table 6.

Table 6: Chemical quality of water samples from open wells in Kavaratti Island

well No	pH	EC in µ s/ cm at 25 °C.	Concentration in mg/l													
			TDS	Ca	Mg	Na	K	HCO_3	SO_4	Cl	F	I x10^{-3}	B	NO_3	PO_4	Sr
1	7.65	1960	330	86	28	232	9.8	165	72	469	0.2	55	nd	28	0.09	1.7
2	7.69	8260	1090	144	177	1340	65	268	300	2591	0.9	21	0.63	29	nd	nd
3	7.76	5460	870	116	141	800	70	415	210	1455	1.2	12	0.27	50	nd	3.3
4	7.78	1970	440	80	58	212	4.9	342	77	398	0.9	10	0.12	32	0.59	nd
5	7.52	3110	675	78	117	380	4.5	549	96	717	1.4	18	0.21	8	0.17	4.4
6	7.66	3220	680	102	103	380	8.9	561	100	731	1.3	9	0.33	10	0.03	nd
7	7.52	3040	800	82	145	330	7.7	659	155	582	1.9	31	0.24	15	0.21	nd
8	7.46	2580	695	128	91	232	14	561	80	511	1.5	12	0.46	15	0.04	5.7
9	7.58	2180	605	78	100	200	37	781	80	291	1.9	67	0.37	9	0.14	nd
10	7.65	1250	460	62	74	81	1.5	439	44	156	1.4	22	0.26	5.7	0.11	2.7
11	7.74	1490	455	94	53	100	23	317	60	167	0.9	9.5	nd	212	0.05	nd
12	7.75	1430	425	96	45	118	2.5	439	53	213	1.0	17	nd	8	0.13	nd
13	7.74	1150	415	104	38	86	2.7	439	28	135	0.8	12	nd	4.5	0.17	2.8
14	7.54	2130	585	84	91	250	17	610	52	334	1.6	76	nd	tr	0.11	nd
15	7.87	1040	400	72	53	59	7.5	378	32	114	1.2	14	nd	14	0.18	nd
16	7.92	650	290	62	33	20	2.3	305	16	46	0.6	3.5	0.26	13	0.11	nd
17	7.66	1240	410	80	51	97	7.5	439	44	142	1.1	11	nd	19	0.09	2.6
18	8.22	601	190	28	29	44	0.9	220	24	60	0.7	13	nd	tr	0.05	nd
19	7.81	1020	395	68	55	55	0.4	390	90	99	1.1	11	nd	4.3	0.27	2.9
20	7.8	1250	415	72	57	94	8.5	390	36	170	0.9	45	nd	27	0.05	nd
21	7.91	1200	335	72	38	100	28	329	32	156	1.5	16	nd	60	0.02	nd
22	7.4	2660	615	120	77	296	2	464	70	589	1.3	22	nd	tr	0.05	nd
23	7.61	2010	540	92	75	190	13	464	52	362	1.3	36	nd	20	0.16	2.7
24	7.55	1240	390	76	49	116	4.9	354	37	206	1.6	nd	nd	2.5	nd	2.6
25	7.84	1110	420	64	63	90	9.1	342	49	128	1.7	nd	nd	30	nd	2.7
26	7.47	1530	370	56	56	172	6.8	281	54	312	1.9	34	nd	10	nd	nd
27	7.31	2910	590	80	95	400	16	397	103	724	1.7	19	0.06	5.3	0.01	nd
28	7.36	1080	360	76	42	80	6.5	415	34	110	0.7	8	0.04	28	0.03	nd
29	7.38	1120	520	68	85	67	2.1	500	32	110	2.1	nd	nd	tr	0.1	4.4
30	7.16	1310	550	84	83	220	4.1	512	30	383	2.0	nd	nd	11	nd	nd
31	7.3	3160	920	96	166	280	12	854	135	504	1.2	nd	nd	3	nd	nd
32	6.98	6740	1110	144	183	1060	46	549	204	1889	1.12	39	0.44	32	0.15	5.7
33	7.2	8300	1150	172	176	1240	70	537	335	2130	0.9	nd	nd	75	nd	nd
34	7.18	2890	640	164	56	252	56	415	70	426	0.5	nd	nd	420	0.11	nd
35	7.29	5560	1050	136	173	700	40	671	222	1310	1.6	44	0.42	12	0.23	nd

nd- not determined, tr- present in traces

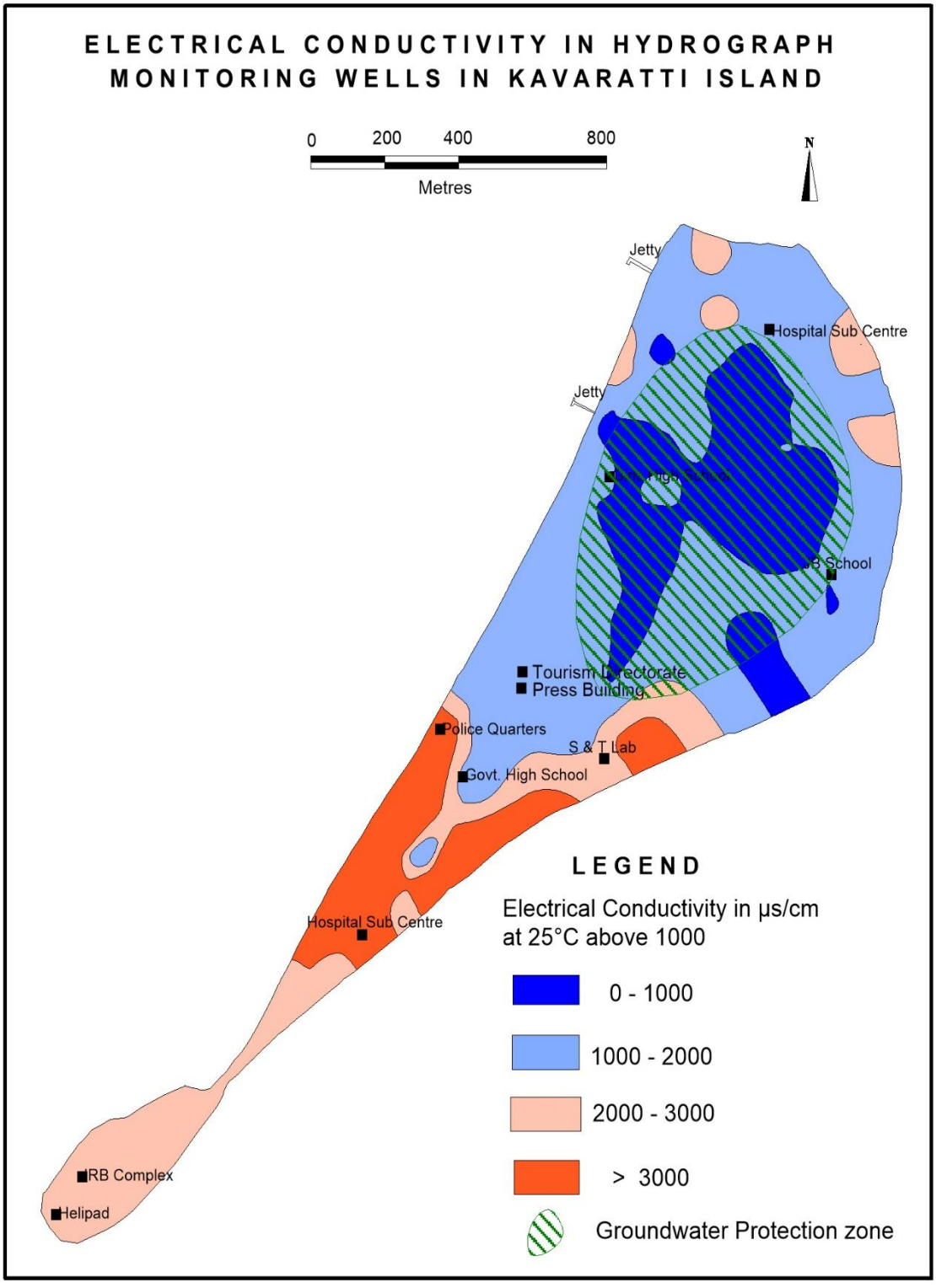

Fig. 7: Spatial variations in EC in Kavaratti Island.

4.0 Ground water resources, extraction, contamination & other issues

4.1 Ground water resources and extraction

The major component of ground water draft in Kavaratti islands is from domestic consumption. Almost all households have their own dug well and more than 75% of the wells are fitted with small capacity (normally 0.5 HP) electric pumps. About 1500 dug wells/ filter points is being currently used for domestic purpose in the island. An estimate of around 100 lpd was considered as per capita consumption for domestic draft, the final domestic draft figure as derived is 41.8 ha.m against the available resource of 50.3 ha.m, after the allocated resources for ET loss, Water loss due to outflow to sea etc. Thus, the stage of ground water development has attained 83.1% which is in semi critical category. Kavaratti Island has a higher stage of ground water development hence, proper management practices should be adopted for bringing it under safe category.

4.2 Ground Water Quality issues

In addition to excess ground water extraction in the island, contamination of ground water through Human waste, sewerage, biological wastes and fertilizers are major threat. The traditional burial grounds also contribute to ground water contamination to some extent.

5.0 Ground water resource enhancement

5.1 Ground water management issues

Some of the management issues identified in sustainable development of ground water resources in the Kavaratti Island are summarized below:

- Absence of surface water resources in the islands naturally putting stress on limited available ground water resources.
- Deterioration of ground water quality especially during summer months.
- Existing supplies unable to cope with the rapidly increasing demands for drinking and domestic uses.
- Ground water extraction through pumping at places, resulted in up-coning of saline water and consequent quality deterioration.
- Considering the available ground water resource and quality issues as referred it has been recommended to promote Roof-top rainwater harvesting in the Island.

- Very Low Temperature Desalination plant implemented in the island supplement the drinking water requirement at present and has the potential to address future demand. However, the step-wells normally used for domestic and washing purposes are abandoned at many locations and gathering waste in such ponds may form potential pollution sources. Awareness on water management practices should be imparted to the people in the Island

5.2 Ground water resource and quality enhancement

Rainwater Harvesting Systems

Rainwater collection has long been recognized as the most suitable and adoptable method to make up the short falls in ground water availability in Kavaratti Islands. Rainwater is being collected from the roof tops of the buildings in storage tanks of various capacities ranging from 5000 to 10,000 thousand litres and in some cases, up to 50,000 liters. Such tanks are normally attached Government quarters, non-residential buildings and some private houses. The water collected from the roof tops is made to flow to the collection through a filter, designed to remove suspended particles. The water is then chlorinated and distributed to the public. Operation related to the pumping and distribution of water is entrusted with the local administration. Community rainwater harvesting systems using public buildings such as hospitals and schools have also been implemented in Kavaratti, from which the harvested water, after filtration and chlorination in a centralized unit, is pumped into overhead tanks for distribution along with water collected from other sources such as ground water, desalination plants etc. In additional to this Rehabilitation, Restoration, Renovation and Protection of available ponds and wells need to be taken up.

Ground water Quality monitoring

Ground Water Quality Testing Laboratories already installed in the island by the administration. A stringent ground water monitoring schedule needs to be worked out for quality monitoring from select wells. The local Public Health authorities are kept informed of any change in the quality of ground water, especially salinity.

Ground water regulation

The Lakshadweep Ground Water (Development and Control) Regulation, 2001 was promulgated on August 6, 2001. As per the regulation, a Ground Water Authority will have the

powers to control and regulate the extraction and use of water in any form in any of the islands in Lakshadweep. The Authority was constituted in 2019 and is functional.

Others Methods

- Encourage use of water efficient domestic fixtures like taps/ flush tanks to improve water use efficiency and reduce wastage.
- Decentralized garbage / waste treatment systems to prevent further contamination of available fresh water resources.
- Sensitization and capacity building of stakeholders at all levels on the importance of water conservation and ways and means for its judicious management for ensuring long-term sustainability of water resources.

6.0 Demand side interventions

Demand side management is important when the resources are limited. Community education to reduce waste, conserve rainwater and proper maintaining of groundwater extraction structures will improve the efficiency in water management in the Island. High porosity of coral sands, close interval of domestic septic tanks and shallow groundwater are the major reasons for anthropogenic contamination in the island. The U.T Administration has taken steps to ensure installation of scientifically designed septic tank in all newly constructed houses and other buildings so as to arrest contamination from these sources. Integrated use of groundwater, rainwater and desalinized water is essential for sustainable management of water resources in the Island.

6.1 Training

Mass awareness creation on water and waste management among the islanders is required for successful management of water resources in the Island. Necessary Training to technical, professional and managerial level is required to improve the skills of local personnel in the assessment, development and management of their own water resources.