



केंद्रीय भूमि जल बोर्ड

जल संसाधन, नदी विकास और गंगा संरक्षण विभाग
जल शक्ति मंत्रालय
भारत सरकार

Central Ground Water Board

Department of Water Resources, River Development & Ganga
Rejuvenation
Ministry of Jal Shakti
Government of India

Inception Report on NAQUIM 2.0

Parts of Port Blair Municipal Area, Andaman and Nicobar Islands

पूर्वी क्षेत्र, कोलकाता
Eastern Region, Kolkata

Inception Report on NAQUIM 2.0, Port Blair Municipal Area, (AAP: 2023-24)

Introduction:

The Aquifer Mapping and Management programme (NAQUIM) was launched by CGWB in the year 2012 as per the recommendations of the Report of the Steering Committee on Water Resources and Sanitation for Twelfth Five Year Plan (2012-2017), Planning Commission. NAQUIM was taken up with the objectives of delineating aquifers, characterizing aquifers and preparing aquifer management plans. National level mapping of Aquifers on 1:50,000 scales was considered sufficient for planning requirements up to block level.

Though the NAQUIM outputs have been useful for sustainable ground water management in numerous ways as enumerated above, large scale implementation of its recommendations at ground level by the user agencies is lacking. As per the feedback received from the agencies using the NAQUIM outputs, major limitations of the on-going studies include **i)** non availability of printed maps at usable scales and **ii)** lack of site specific recommendations for implementation at Panchayat or village level.

Keeping the above limitations in mind and considering the future requirements, broad objectives of NAQUIM 2.0 studies will be **i)** providing information in higher granularity with a focus on increasing density of dynamic data like ground water level, ground water quality etc. **ii)** providing issue based scientific inputs for ground water management up to Panchayat level, **iii)** providing printed maps to the users and **iv)** putting in place a strategy to ensure implementation of the recommended strategies. Involving state agencies in the studies for a sense of ownership.

The NAQUIM 2.0 studies are envisaged to be multidisciplinary. The study is designed to provide detailed information to support groundwater management decisions at ground level. Since the issues are different in different areas, the studies under NAQUIM 2.0 are proposed as issue specific and will be undertaken in prioritized focus areas. Broadly 11 Priority areas are identified based on ground water related issues one of the main identified issue is Urban Agglomerate.

The proposed urban study area of Port Blair under NAQUIM 2.0 covers an area of 42 Sq. km. The proposed area is to be mapped in 1:10,000 scales. Considering the urban agglomeration, constant growth of population and urbanization in Port Blair town, it is very difficult and challenging task to manage the fresh ground water resource in the island condition where there is a constant threat of saline sea water intrusion. Port Blair Town area has been selected under the pre-defined priority type of **“Urban Agglomerate”** out of 11 Priority areas as per Central Ground Water Board national mandate.

Port Blair is a town under South Andaman District of Union Territory of Andaman & Nicobar Islands. Port Blair is also the capital of Union Territory of Andaman & Nicobar Islands. The urban area of Port Blair falls under the Survey of India Toposheet Nos 87A/10 & 87A/14. Port Blair serves as the entry point for visiting the Andaman and Nicobar Islands. Port Blair is connected with mainland India by both air and sea

In 1789 the Government of Bengal established a penal colony on Chatham Island in the southeast bay of Great Andaman, named Port Blair in the honour of Archibald Blair of the East India Company. As the Indian independence movement continued to grow in the late 19th century, the enormous Cellular Jail was constructed between 1896 and 1906 to house Indian convicts, mostly political prisoners, in solitary confinement. The Cellular Jail is also known as Kala Pani (translated as "Black Waters"), a name given to it due to the torture and general ill-treatment towards its Indian convicts. From 1943 to 1944, Port Blair served as the headquarters of the Azad Hind government under Subhas Chandra Bose.

Although affected by the 2004 Indian Ocean earthquake and tsunami, Port Blair survived sufficiently to act as a base for relief efforts in the islands.

As per 2011 India census, Port Blair had a population of 100,608. Males constitute 52.92% (53,247) of the population and females 47.07% (47,361). 9.3% of the population is under the age of 6 years.

The Port Blair Municipal Council, abbreviated as PBMC is the ruling civic body administering the city of Port Blair, the capital and the largest city in the Indian union territory of Andaman and Nicobar Islands. The council came into existence on 2 October 1957 after the assent by the President of India to the Andaman & Nicobar Islands (Municipal Board's) Regulation, 1957 Act on 11 March 1957. The council comprises a total of 24 wards.

Geologically the area is underlain mainly by Coralline limestone which is unconformably resting on claystone. The Islands in the South Andaman district are composed mainly of thick Eocene sediments deposited on Pre-Tertiary sandstone, siltstone and shale with intrusions of basic and ultrabasic igneous rocks (Ophiolites). Marine inorganic sedimentary group of rocks comprising shale, sandstone, grit and conglomerate (Flysch and Mithakhari Groups) and organic sedimentary like Coralline atolls and limestone and extrusive and intrusive igneous rocks (volcanic and ultramafics) occupy the entire geographical area. Because of high permeability coralline limestone form good aquifer, while the basement does not contain much fresh water because of less permeability & Transmissivity and consequently brackish/ saline water is also found in the formation. The prepared base map is given in **Figure1.**

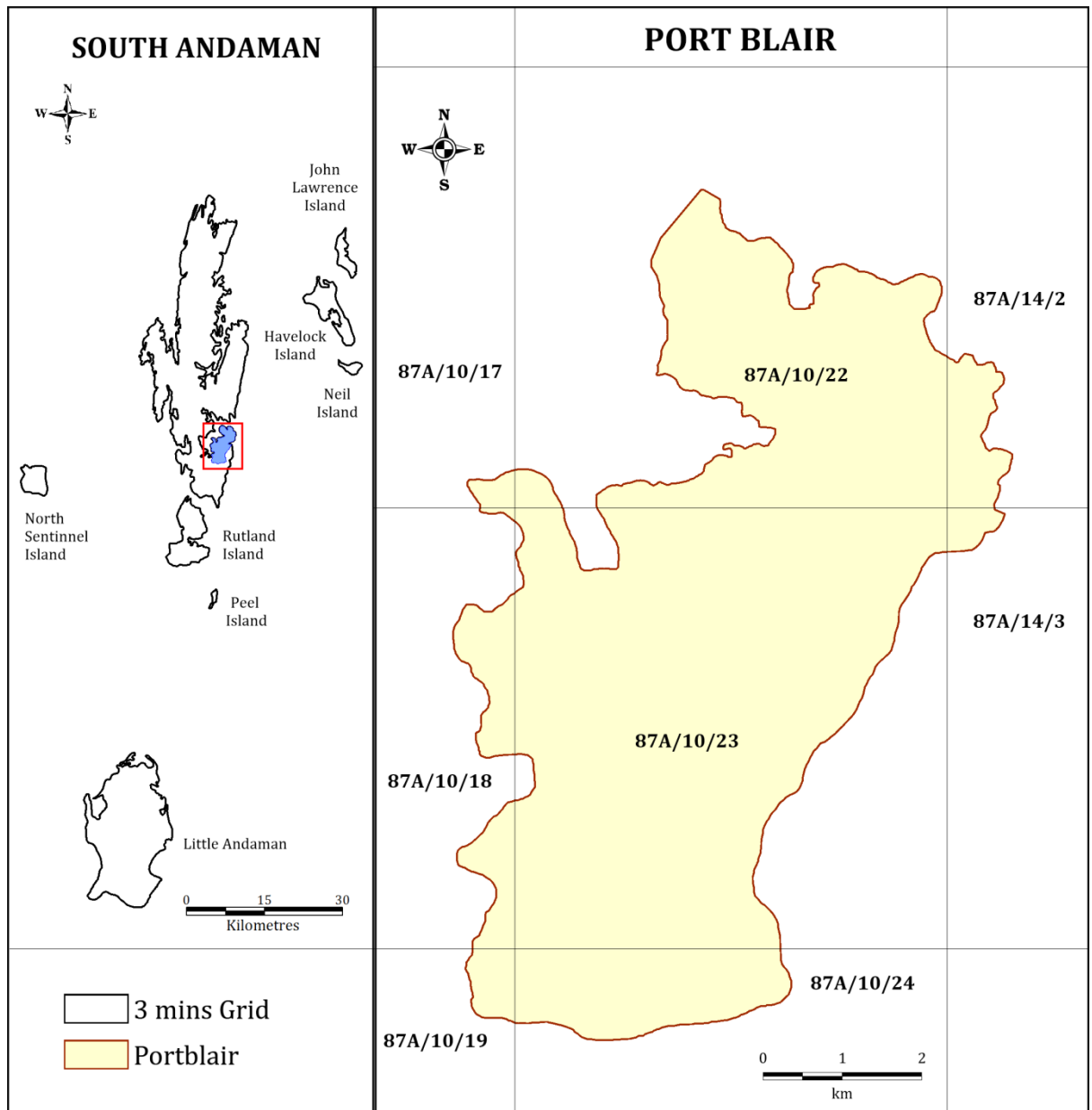


Figure 1 Base Map of Port Blair (Study Area) for NAQUIM 2.0

Priority types:

Port Blair Town area has been selected under the pre-defined priority type (Priority Area 2) of “Urban Agglomerate” out of 11 Priority areas as per Central Ground Water Board national mandate under NAQUIM 2.0.

Previous Studies:

Various studies were carried out previously in South Andaman & Port Blair Town. The details are as follows:

- Systemic Hydrogeological Survey was 1st carried out by Dr. P.G. Adyalkar & Shri. K. Md. Najeeb of CGWB, ER, 1981 in South Andaman. (Unpublished Report). However

reconnaissance's Hydrogeological Survey in selected areas were carried out by Shri. G.C. Chatterjee, Shri. B.N. Niyogi & Shri. D.P. Ghosh, Geological Survey of India (GSI).

- Geo-electrical spot resistivity survey were conducted by CGWB,ER in locations selected for exploratory drilling in 2 phases, once in 1984 by Dr. A.N. Bhowmik & Dr. A. Srisailnath and again in more number of locations by Dr. P. C. Chandra & Shri. C.R. Das.
- Hydrogeology and Ground water Resources evaluation in parts of South Andaman and Campbell Bay, Great Nicobar Islands was carried out by Shri. I. Banerjee, (1988) (Unpublished Report of CGWB).
- Report on Environment of the Oceanic pelasediments associated with the Ophiolite assemblage, South Andaman Islands by Shri. T. C. Lahiri and Shri M. K Sen, (1988), Indian Minerals, 42, No.1
- Report on Systematic Hydrogeological surveys in Parts of Middle and South Andaman by Shri. T. L. Chakraborty, (1990) (Unpublished Report of CGWB).
- Report on Hydrogeological investigation for sites for ground water structure in the civil airport area Port Blair, South Andaman was done by Shri. S.Bhattacharya, (1997) (Unpublished Report of CGWB).
- Report on Hydrogeology of Andaman and Nicobar Islands by Shri. A Kar, (2001) (Unpublished Report of CGWB).
- Report on Water supply to rural and urban areas of Andaman and Nicobar Islands with special reference to application of article recharge and conservation technique by Shri. A Kar, Shri. S. Sarkar and Shri. K. K. Srivastava (2002a), National Seminar of Ind. Desalination association, Kolkata. Abs. Vol.
- Report on Artificial recharge of ground water for augmentation of water supply and landscape development in Port Blair town and A & N Islands by Shri. A Kar, (2002b), Nat. Seminar, LAWMI, Kolkata, Abs. Vol.
- Report on Preliminary report on investigation of springs at Rutland Island as a possible water supply source to Portblair town by Shri. A. Kar, (2002c) (Unpublished Report of CGWB).
- Report on Augmentation of water supply situation through development of (Pre-existing and new) dug well and pond sources in Port Municipal area by Shri. A. Kar, (2003) (Unpublished Report of CGWB).
- Groundwater information booklet of South Andaman District, A & N ISLANDS, by Shri. J. S. Sharma & Shri Amlanjyoti Kar, 2013(Published Brochure of CGWB)
- Report on Groundwater Hydrogeology of Andaman and Nicobar Islands by Dr. Indranil Roy, Shri. S. Chakraborty, Shri. A. Kar and Shri. G. C. Pati, 2014 (Proceedings of the Workshop on Conservation of Water Resources in Andaman & Nicobar Islands: Issues and

Challenges; Organised by Central Ground Water Board at Port Blair, A & N Islands, March 27, 2014)

- NAQUIM Studies in parts of South Andaman (Annual Action Plan 2018-2019)
- Ground Water Resources of Andaman & Nicobar Islands 2022, District Brochure of Andaman & Nicobar Islands, etc.

Objectives of the present study:

Groundwater has been used everywhere in the world for a long time because of its easy accessibility and good quality. In urban areas, groundwater as a source of domestic, commercial and industrial water has greatly contributed to the development of cities. Groundwater in urban areas can suffer from many kinds of contamination from both natural and anthropogenic sources. Among contaminants from natural sources, arsenic and fluoride are the most serious. Originally, these elements are contained in rocks, and then released into groundwater by the weathering of these rocks. As for anthropogenic contamination, industrial wastewater, domestic waste water and leakage of fuels, leaky sewage, septic tanks are sources of nitrogen, heavy metals, volatile organic compounds, pathogenic microorganisms and pharmaceuticals. These contaminants are either discharged to the ground by factories, warehouses and households, and then migrate to the subsurface together with rainwater infiltration, or they can be directly discharged into subsurface soil layers through leaking sewer pipes. These sources of nitrate can also become sources of other hazardous substances or health-related microorganisms. Other than nitrogen, there are many contaminants in urban groundwater including heavy metals, volatile organic carbons and pharmaceutical.

The present objective is to prepare detail map of the study area of Port Blair in 1:10,000 scale. To assess the Ground Water Management & Development of the study area along with Aquifer disposition, aquifer delineation, etc. as per NAQUIM 2.0 guideline. The study is defined with following objectives in **Table 1:**

Table 1: Objectives of NAQUIM 2.0 study

S. No	Objectives
1	Demand Supply Study
2	Aquifer Dispositions
3	Aquifer-wise ground Water Levels
4	Delineation of Recharge Areas
5	Estimation/Refinement of parameters used for resource assessment
6	Assessment of ground water resources
7	Ground Water Quality
8	Areas showing signs of subsidence
9	Ground Water Quality Management Interventions including demarcation of safer aquifers
10	Artificial Recharge Plan
11	Other measures
12	Identification of potential aquifers for drinking water supply
13	A plan for drinking water source sustainability
14	Recommendations for tackling water logging

Existing data:

Presently there are existing 15 Nos of NHNS Monitoring Stations present in the study area of Port Blair. Long Term Pre-monsoon & Post-Monsoon water level data Ground Water Quality Data are available of these monitoring stations. Presently 1 No of EW/BW is present in the study area (Calicut). 15 Nos of VES has been already conducted in Port Blair.

The pumping test conducted in the study area total 02 Nos of pumping summarized in **Table 4**.

Table: 2 Existing NHNS Monitoring stations and Ground water sampling stations for quality analysis in Portblair Town.

SL no	Well No	Town	Village	Well Type	M. P.	Lat.	Long.
1	AN001	Portblair	Portblair	Dug Well	0.67	11.67057	92.74398
2	AN002	Portblair	South Point (port Blair)	Dug Well	0.49	11.66408	92.75384
3	AN003	Portblair	Corbyn's Cove (port Blair)	Dug Well	0.68	11.64253	92.74598
4	AN005	Portblair	Austinabad(port Blair)	Dug Well	0.67	11.63509	92.73469
5	AN008	Portblair	Shadipur(port Blair)	Dug Well	0.6	11.65651	92.74348
6	AN011	Portblair	Garacharma	Dug Well	0.92	11.61367	92.70953

SL no	Well No	Town	Village	Well Type	M. P.	Lat.	Long.
7	AN013	Portblair	Brookshabad (Port Blair)	Dug Well	0.4	11.63799	92.74037
8	AN017	Portblair	Calicut	Dug Well	0.58	11.60738	92.72644
9	AN020	Portblair	Jungalighat(V I P Road)	Dug Well	0.88	11.6576	92.73523
10	AN045	Portblair	Marina Park	Dug Well	0.56	11.67113	92.74633
11	AN046	Portblair	Calicut Bore well	Bore Well	0.36	11.60009	92.71949
12	AN059	Portblair	Light House	Dug Well	0.25	11.66814	92.73775
13	AN066	Portblair	Telerabad	Dug well	0.81	11.60728	92.70087
14	AN091	Portblair	Dollyganj Chowk (Old Pahargaon)	Dug well	0.52	11.63425	92.72282
15	AN092	Portblair	Lamba Line	Dug well	0.74	11.65928	92.7495

Table: 3: Existing VES Locations in Portblair Town

SL NO	Location	VES no	Latitude	Longitude	Elevation
1	Airport	VES1	11.648448	92.732173	38
2	Airport	VES2	11.648761	92.732469	37
3	Airport	VES3	11.65018	92.734375	34
4	DBRAIT	VES4	11.636151	92.716461	44
5	DBRAIT	VES5	11.635999	92.716471	46
6	DBRAIT	VES6	11.635763	92.716519	47
7	DBRAIT	VES7	11.636103	92.71666	47
8	Calicut	VES8	11.597979	92.709147	70
9	Calicut	VES9	11.594936	92.714181	105
10	Calicut	VES10	11.603103	92.699767	23
11	Calicut	VES11	11.592721	92.719961	91
12	Calicut	VES12	11.606101	92.719239	79
13	Calicut	VES13	11.612393	92.724944	62
14	Calicut	VES14	11.609886	92.720696	74
15	Calicut	VES15	11.59921	92.719927	81

Table: 4: Existing Pumping test Details in Portblair Town

SL NO	Location	Type of well	Transmissivity (m ² /Day)	Discharge (LPH)	Storativity (S)	Specific discharge lpm/m	Latitude (°)	Longitude (°)
1	Calicut	EW	163.79	44670	9.65x10 ⁻⁴	n/a	11.6°	92.725°
2	Bednabad	EW	127.06	44761	6.19x10 ⁻⁴	n/a	11.5833°	92.733°

Data gap analysis:**Location:**

The study area comprises of 24 wards of Port Blair Urban area, South Andaman district, Union Territory of Andaman & Nicobar Islands covering a total geographical area of 42 sq. km. It is bounded by the North latitudes of 11.589631° and 11.686109° and East longitudes of 92.692813° & 92.757582°. The study area can be located in part of Survey of India Toposheet Nos 87A/10 & 87A/14.

Data Availability:

The available CGWB in-house Exploration data and existing NHS wells for monitoring water level in different wards along with the Toposheet Nos within the study area is compiled, tabulated and plotted. The data insufficiency within the study area is thereby identified and given for recommendations.

Data gap analysis for Exploratory Wells:

Presently the NAQUIM 2.0 study area of Portblair is divided in to 3' X 3' grid to construct EW (if feasible) to study the deeper aquifer parameters. In the study area 2 Exploratory Wells are present. Hence more exploratory wells are to be constructed to get deeper aquifer data for establishing aquifer geometry and determining aquifer parameters.

The map of existing NHS wells and their details is furnished in **Figure 2 and Table 4**.

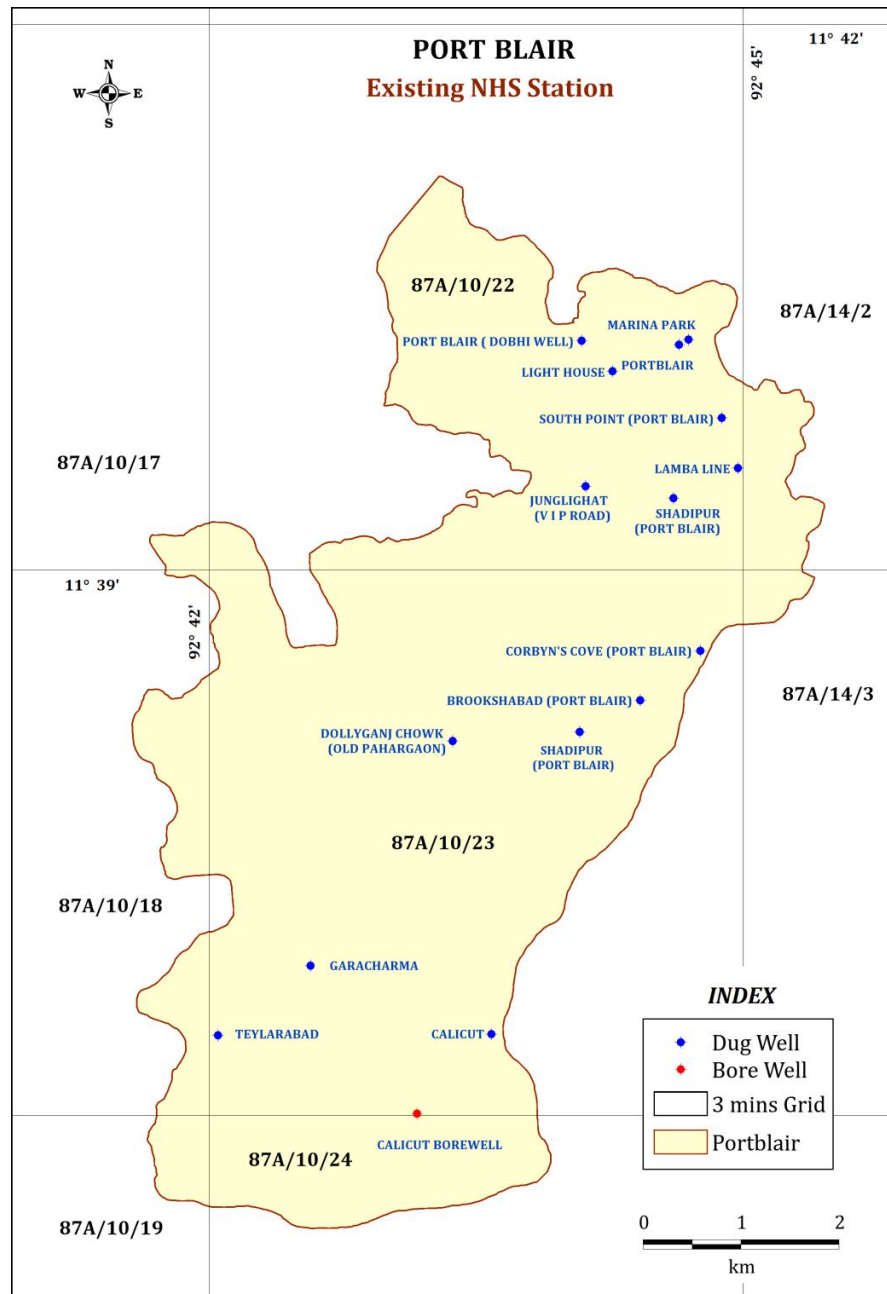


Figure 2: Location map of Existing NHS wells in Port Blair

Ground Water Monitoring Data:

For 1st aquifer (un-confined/Phreatic), one open/dug well is recommended for each quadrant of a Base Map. For 2nd aquifer (fractured zone) the EW/OW constructed may be used as piezometers for GW monitoring. Base map at spatial scale of 3' X 3' grids have been considered for plotting and analysis of the gap in the study area.

Presently in Port Blair there are 15 existing NHS wells (14 Dug wells & 1 bore well) which are monitored two times a year. **Figure3** and **Table 2** show the distribution of NHS wells in the study area. A total of 40 wells tapping Aquifer-I are thereby recommended for bridging the data gap. For deeper Aquifer, the exploratory wells/Observation wells (EW/OW) recommended along with the exploratory wells may be used as piezometers for GW monitoring. A monthly monitoring of key wells is proposed during this study.

Groundwater quality data:

The norms for data required for groundwater quality is similar to that of Ground Water Monitoring. Water samples collected from every existing NHS stations as well as from the recommended KOWs could be utilized for quality analysis.

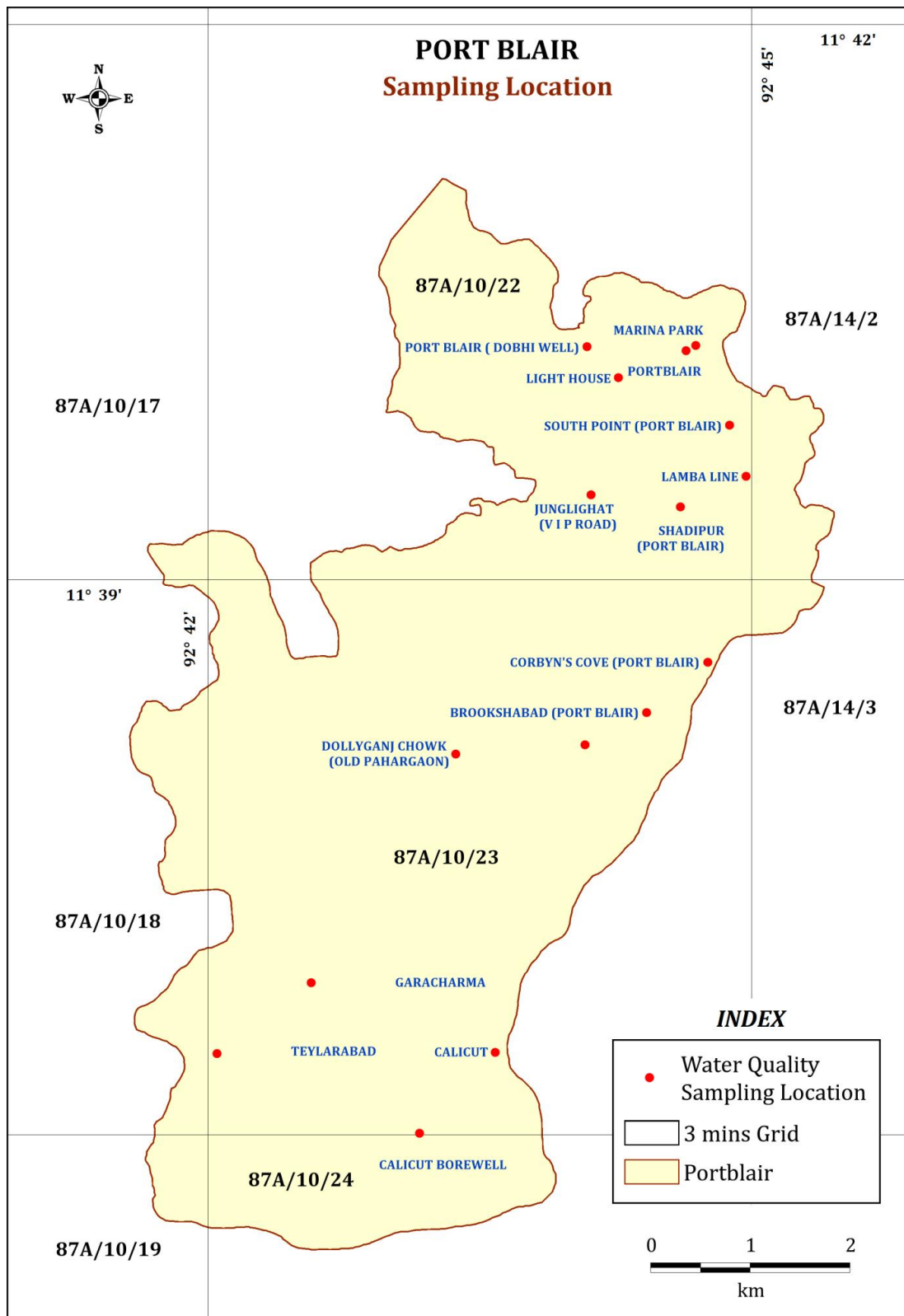


Figure 3: Existing Ground Water Sampling Locations in Port Blair

Geophysical data:

It is recommended that 2 to 3 Profiling/VES soundings up to 100 meter interpretation depth may be carried out in each of the grids of the Base Map to decipher aquifer geometry. A total of 25 VES (Tentative) is recommended to carry out in the study area. The existing VES is presented in **Figure 4 & Table 3.**

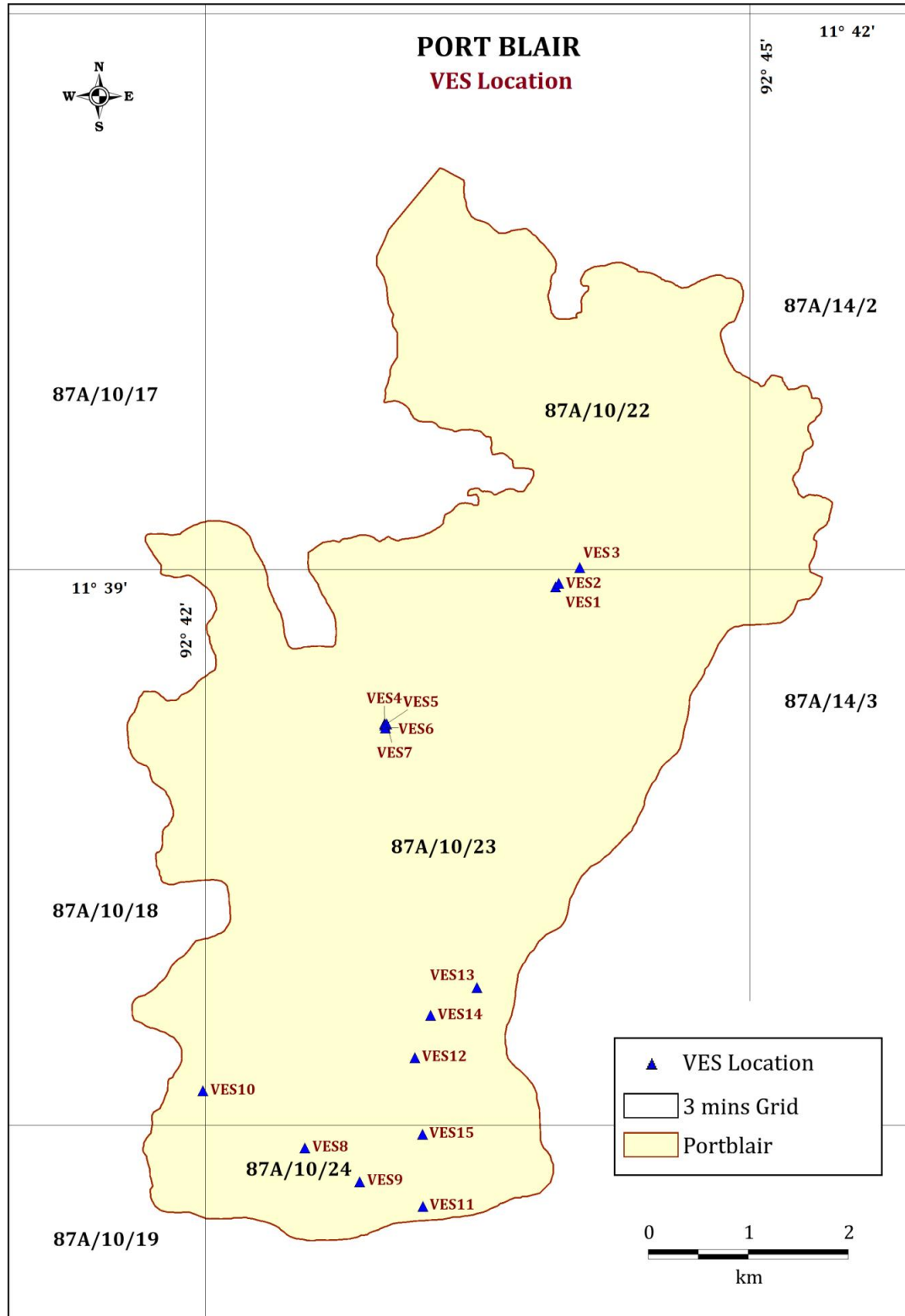


Figure 4: Location map of Existing VES surveys carried out in Port Blair

New Data generation plan:

Presently the NAQUIM 2.0 study area of Portblair is divided in to 3' X 3' grid to establish new Key Observation Wells (KOWs), ground water sampling points, construction of EW (if feasible) to study the deeper aquifer parameters and also VES/ TEM Survey is required. The new data generation summarized as below in **Table no 5**

Table 5: New data Generation Plan in Portblair Town

Key wells	Ward wise	40
Ward wise Data collection	Water Demand Data	
	Population Data	
	Sewerage disposal system Data	
	No of structures GW abstraction structure	
	Well inventory Data	
Hydrogeology	Pumping test	20
	VES Survey	25
	OW/EW construction	02 If possible through outsourcing
GW Quality study	Outsourcing BOD, SOD and other biological parameters.	40
	In-house Analysis	40 Basic/ 40 HM
Soil Infiltration test	15 NOS	15
GW user feedback	Interaction with GW users	

The work will be conducted with assistance of APWD (Andaman Public Works Department) and other line departments working in Ground Water to get the details of check dam, Dug Well, Bore Well, water supply schemes, etc. Activity wise monthly targets for new data generation is to be set.

Month-wise activity plan:

Field visits and visits to local offices for data collection in the study area are required, Conducting Public Awareness training programmes. Data compilation report writing. Sharing of data with the concerned departments and entering data in WIMS. Subsequent Progress Reporting in MIS, uploading of reports and media in publications warehouse.

Composition of the team:

Team Leader Dr Indranil Roy, Scientist-D, Hydrogeologist-1: Sandip Bhowal, AHG, Hydrogeologist-2: Awadhesh Kumar, STA, Geophysicist: Sujit Sarkar, Scientist -D, Chemist: Prasanth Yentapalli, ACH, Hydrometereologist: DR Nilamoni Barman, Scientist-B.

Team-member-wise responsibilities and monthly targets for entering in the MIS:

Table6: NAQUIM 2.0 Work Distribution Table (Month-Wise) for Port Blair

NAQUIM 2.0 Work Distribution Table (Month-Wise) for Port Blair														
Team members:		Dr. Indranil Roy (Scientist-D & Team Leader), Sandip Bhowal (AHG), Awadhesh Kumar (STA-HG), Sujit Sarkar (Scientist-D, Geophysist), Prasanth Yentapalli (ACH, Chemist), Dr Nilamoni Barman (Scientist-B, Hydrometereologist), Rajyashree Nandi & Mahasweta Mukherjee (Young Professionals)												
Sl.	WORK ITEMS	Assignments to be carried out by officers	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1	Base map Preparation													
2	Preparation of the Inception Report:	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar												
3	Pre-Monsoon Field Data Collection	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar, Prasanth Yentapalli												
4	Pre-Monsoon Sample Surveys and User Feedback	Sandip Bhowal, Awadhesh Kumar, Prasanth Yentapalli												
5	Pre-Monsoon Other on-going field activities, geophysical studies etc. data entry in WIMS	Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar												
6	IInd Review –Premonsson fieldwork													
7	Data Analysis and Interpretation	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar, Prasanth Yentapalli, Dr Nilamoni Barman, Young Professionals												
8	Workshops and mid-term review by NLEC	Dr. Indranil Roy												
9	Post-monsoon Field Data Collection	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar, Prasanth Yentapalli												
10	Post-monsoon Sample Surveys and User Feedback	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar, Prasanth Yentapalli												
10	Post-Monsoon Other on-going field activities Exploratory drilling, geophysical studies, data entry in WIMS	Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar												
	IVth Review –Post-monsson fieldwork													

NAQUIM 2.0 Work Distribution Table (Month-Wise) for Port Blair														
Team members:		Dr. Indranil Roy (Scientist-D & Team Leader), Sandip Bhowal (AHG), Awadhesh Kumar (STA-HG), Sujit Sarkar (Scientist-D, Geophysist), Prasanth Yentapalli (ACH, Chemist), Dr Nilamoni Barman (Scientist-B, Hydrometeorologist), Rajyashree Nandi & Mahasweta Mukherjee (Young Professionals)												
Sl.	WORK ITEMS	Assignments to be carried out by officers	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
11	Data Analysis and Draft Report Preparation	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar, Prasanth Yentapalli, Dr Nilamoni Barman, Young Professionals												
12	Other ongoing field activities - Exploratory drilling, geophysical studies, data entry in WIMS	Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar												
13	Ground Water Management Plan; Field truthing of Management plan & RWH & AR Plan	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar, Prasanth Yentapalli												
14	Other ongoing field activities - Exploratory drilling, geophysical studies, data entry in WIMS	Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar												
	Vth Review –GW Management Plan													
15	Modification of draft report with additional information collected by the above mentioned field checks - Scrutiny and Finalisation of the Report	Dr. Indranil Roy, Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar, Prasanth Yentapalli, Dr Nilamoni Barman, Young Professionals												
	VI Review –Report													
16	Other ongoing field activities - Exploratory drilling, geophysical studies, data entry in WIMS	Sandip Bhowal, Awadhesh Kumar, Sujit Sarkar												
17	Sharing of the reports with CHQ, SGWCC and DM/DC - Brochure to be prepared by 31st March.	Dr. Indranil Roy												