Detailed Project Report

Development of Kovalam and Adjacent Beaches

KIIFB Consultancy Services Unit

JULY 2022

KIIFB Consultancy Service Unit (KCSU)		**DEVELOPMENT OF KOVALAM AND ADJACENT BEACHES**	
Issue date: 15/07/2022			Rev: 00

APPROVAL RECORD

Project: Development of Kovalam and Adjacent Beaches

Document Title: Detailed Project Report

Document No: KCSU/ KBD/P-02/DPR-000

Revision	Date	Prepared by	Reviewed by	Reviewed by	Approved by
00	15/07/2022	JS	DR	RP	SJV

DISCLAIMER

The report (including any enclosures and attachments) has been prepared by KIIFB Consultancy Services Unit for the exclusive use by and solely for the purpose for which it is provided. KIIFB Consultancy Services Unit does not accept any liability if this report is used for an alternative purpose from which it is intended, nor to any third party in respect of this report. KIIFB Consultancy Services Unit has used reasonable skill and care in checking the authenticity, accuracy and completeness of information obtained from the public domain or from external sources in the report. KIIFB Consultancy Services Unit assumes no responsibility for such information. KIIFB Consultancy Services Unit does not accept responsibility for any legal, commercial, or other consequences that may arise directly or indirectly as a result of the use of third-party information or information sourced from public domain in this report or used for an alternative purpose from which it is provided.

PREFACE

The project "Development of Kovalam and Adjacent Beaches" was proposed from the office of Honourable Chief Minister of Kerala. In line with the directives from CEO KIIFB, a team was formulated to work with an aim to augment the infrastructural facilities that focus to develop the beach of an international tourist destination with facilities having world class standards.

A brief concept note along with 2-D drawings and 3-D visualization were prepared incorporating the valuable suggestions received from the Principal Secretary, Tourism and Respected District Collector of Trivandrum on May 12th, 2022. The proposal was presented to a team in a meeting chaired by Honourable Minister for Public Works Department and Tourism on 16th May 2022. The District Collector was nominated as the nodal officer for further inter departmental coordination. KIIFB Consultancy Services Unit was advised to prepare DPR with preliminary design drawings along with tentative BOQ. The concept was presented to Tourism Director, Department of Tourism on May 25th and 27th and then to the Principal Secretary – Tourism and Fisheries, GOK on 28 th June 2022. Following which, the preparation of the Detailed Project Report for the 'Development of Kovalam and Adjacent Beaches' were initiated by the KIIFB Consultancy Services Unit (KCSU).

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Abbreviations	Full Form
KCSU	KIIFB Consultancy Services Unit
GOK	Government of Kerala
LAC	Legislative Constituency
PIS	Project Implementation Schedule
WBS	Work Breakdown Schedule
CBA	Cost Benefit Analysis
IB	Inspection Bungalow
DSR	Delhi Schedule of Rates
IT	Information Technology
KTDC	Kerala tourism development Corporation
SSUD	Sustainable Urban Development
ESD	Education for Sustainable development
DTPC	District Tourism Promotion Council
ITDC	Indian Tourism Development Corporation
KVDA	Kovalam Vizhinjam Development Authority
CZMP	Coastal Zone Management Plan
CRZ	Coastal Regulation Zone
CZMA	Coastal Zone Management Authority
SICOM	Society of integrated coastal management
MoEF/ MoEFCC	Ministry of Environment, Forest and Climate Change
IIT	Indian institute of Technology
LTL	Low Tide Line
HTL	High Tide Line
NDZ	No Development Zone
FEE	Foundation for Environment Education
NW	Northwest
SE	Southeast
UNESCO	United Nations Educational, Scientific and Cultural Organisation
BEAMS	Beach Environment and Aesthetics Management Serviced
ICZM	Integrated Coastal Zone Management

NIOT	National Institute of Ocean Technology
KCZMA	Kerala Coastal Zone Management Authority
VISL	Vizhijam International seaport limited
CCTV	Closed Circuit Television
NCCR	National Centre for Coastal Research
CSR	Cooperative Social Responsibility
RT	Responsible Tourism
OAT	Open Air Theatre
ETABS	Extended three-dimensional analysis of building system
IS	Indian Standard
RRC	Resource Recovery centre
MBBR	Moving red bio reactor
BOD	Biological oxygen demand
COD	Chemical oxygen demand
MOC	Material of construction
FRP	Fibre reinforced plastic
CI	Cast Iron
LT	Low tension
IEC	International electro technical commission
NBC	National building Code
MCCB	Moulded case circuit breaker
XLPC	Cross linked polyethylene
PVC	Poly vinyl chloride
LEO	Littorial Environmental Organisation
CSP	Cross section profile
ECC	Environmental carrying capacity
LV	Low Voltage
ELV	Extra Low Voltage
KSEB	Kerala State Electricity Board
KSEI	Kerala State Electrical Inspectorate
WDR	Wide dynamic range
LSF/LSOH	Low smoke and fume / Low smoke zero halogen
GIS	Geographic Information system

KSPCB	Kerala Sate Pollution control board
LSG	Local self-government
SWOT	Strength weakness opportunities and Threat
LPM	Litres per minutes

LIST OF ANNEXURES

SALIENT FEATURES

The Salient features of the Detailed Project Report (DPR) for the Development of Kovalam and adjacent beaches, Thiruvananthapuram, Kerala is provided below.

Table 0-1 Salient Features

Sl. No	Item	Description
1	Title of the Project	Development of Kovalam and adjacent beaches
2	District	Thiruvananthapuram
	Block	Athiyannoor
	Corporation/ Municipality/ Panchayath	Vizhinjam
	Assembly Constituency (LAC)	Belong to 2 LAC. Thiruvananthapuram and Kovalam
3	Implementing agency/ SPV	To be decided
4	DPR prepared by	KIIFB Consultancy Services Unit
5	Project Outlay Ph- 1	Rs 93 Crores (Including GST)
7	Nature of the project	New/ Upgradation
8	Need for the project	Details in Chapter 1 (Section 1.12)
9	Total estimated cost and item wise cost break up	Details in Chapter 12
	Whether detailed estimate attached?	Yes Enclosed in Annexure V
10	Details of investigations/ surveys conducted	Chapter 6 and Chapter 8
11	Details of Revenue streams, if any	Chapter 13
	Details of Cost Benefit Analysis (CBR Value)	Chapter 14 & Annexure VI
13	Details of project risks	Details in chapter 10
14	Details of project management organization strategy	Details in chapter 15
16	Details of Project Implementation Schedule (PIS) & Work Breakdown Schedule (WBS) – Proposed duration to complete the project	Details in chapter 16

17	List of statutory clearances	Details in chapter 17
19	Operations & Maintenance (O&M) arrangements of the project after Completion	Details in chapter 18
20	List of drawings	Enclosed in Annexure IV

Executive Summary

EXECUTIVE SUMMARY

Kerala is famous especially for its serene beauty and attractive tourism destinations. Kerala is also popular for its ecotourism activities. Kerala is a widely accepted and welcoming destination for domestic as well as foreign tourists. Thiruvananthapuram, the southern tip of God' s own country which is the administrative and cultural centre of the state, houses significant historic buildings, ancient temples, long stretches of palm fringed shorelines, windy backwaters, and other beautiful beaches. Kovalam is one such beach located in the Capital city of Kerala, which is famous for its beaches, among the most pristine in India. Kovalam is extremely popular among the tourists due to its shallow waters and low tidal waves. It is also one of the oldest tourist enclave in India which saw the transformation of a casual fishing village of Kerala into one of the most important tourist destinations.

Kovalam is an internationally renowned beach with three adjacent crescent-shaped beaches. The Northernmost crescent, Samudra Beach is a quiet place comparatively. Hawa Beach is more pristine, silent and is beautiful with one side covered with hillocks. A massive rocky promontory on the beach has created a beautiful bay of calm waters ideal for sea bathing. The southernmost, known as the Lighthouse Beach, is the most popular of the three. Many hotels, restaurants, lodges, and shops are located here, which is most frequented by domestic tourists. The leisure options at this beach are plenty and diverse. Sunbathing, swimming, herbal body toning massages, special cultural programmes and catamaran cruising are some of them.

Moreover, Kovalam includes other beautiful beaches adjacent to it, the IB beach and Adimalathura Beach. IB Beach is located just adjacent to the Light house beach. Adimalathura Beach on the coast of Arabian Sea is a fishing hamlet near to Kovalam international beach. Both the beaches are eminently beautiful and identified with a greater potential to be developed as a major tourist destination.

Need for the Project

Some of the beach tourism destinations in the district are in dilapidated condition which needs to be repaired and retrieved. Usually even if beaches gets washed away during rain, most of it would usually be retrieved. However, the process is not

happening in Trivandrum for the past few years. Severe sea erosion has made Shanghumukham out of bounds for the public. The tourists visiting Veli Beach are finding difficulties in accessing the beach. Also, there is a severe lack in tourism facilities or activities available at any of the beaches in Trivandrum.

Kovalam, one of the favourite tourist spots in Thiruvanathapuram is facing a declining rate of tourists over the past few years. The beach and its surrounding areas are found to be in a dilapidated condition. Due to littoral drift much of the beach area is slowly getting reduced. The present condition of beach lacks basic amenities, pedestrian pathway, and other required infrastructure. The Kovalam and adjacent beaches have vital potential to be developed as an international tourist destination. Therefore, it is required to augment the infrastructure facilities in Kovalam that will accelerate the tourism industry which will benefit the society as well as the economy.

Project Outline

The project envisages to develop Kovalam and beaches adjacent to Kovalam as the most sought- after place. The project is proposed to be completed in two phases. Phase 1 includes the Infrastructural development at Light House Beach and Hawa Beach; the renovation of the Silent Valley Sun Bath Park at Hawa Beach; Development of Corporation land; Developing the Connectivity to Corporation Land; Developing an access to IB Beach; Land demarcation at the adjacent beaches, i.e., IB Beach and Adimalathura beach; Land acquisition of Coconut Plantation Land and the Land acquisition for providing direct access to the Corporation Land.

Phase 2 involves the further development of IB Beach and Adimalathura beach, and the development of Coconut Plantation Land.

Shore protection measures at Kovalam beach shall be taken up in Phase I as a different project.

The major locations considered for development are:

1. Hawa Beach
2. Light House Beach
3. IB Beach

4. Adimalathura Beach

1. **Hawa Beach:** Hawa Beach is one of the most well-known tourist spots in Kovalam. It is declared as one of the most beautiful beaches in Kovalam. Hawa beach is more pristine and silent and is beautiful with one side covered with hillocks. The main attraction in Hawa Beach is the Silent Valley Sun Bath Park with historical significance that attract the tourists.

2. **Light House Beach:** The Light House Beach is a pristine beach on the coast of Arabian Sea in Kovalam. The most active beach in Kovalam is the Light House Beach. The beach is located at the southernmost end. The name came about from the old Vizhinjam Lighthouse located 35 m high on top of the Kurumkal hillock.

3. **IB Beach:** A small beach area lying between Lighthouse and IB of Harbour Engineering Department. It is proposed to be converted to a restricted access beach.

4. **Adimalathura Beach:** Adimalathura literally means "port with a hill beneath" . The location of this village is on the top of a vast undersea submarine mountain range in the Arabian Sea near Kovalam in Thiruvananthapuram district. It is bordered by the Karichal lake in the eastern side, the Chowara hills in the north, rocks vanishing into the Arabian sea in the south and west. It languishes under the green canopy formed by coconut palms.

Estimated Project Cost – Phase I

The estimate is prepared based on the Delhi Schedule of Rates (DSR), 2018. For the Development of Kovalam and Adjoining beaches, the total project cost is estimated to be Rs 93.00 Crore inclusive of Civil, Electrical, Fire Protection and Land Acquisition.

Project Schedule

A Total of 395 days is required for the completion of the project. Phase I of the project is scheduled for 305 days for construction activities. Pre- construction activities such as administrative sanction, tendering etc. is considered for a duration of 90 days.

01 Introduction

1 INTRODUCTION

The area of Thiruvananthapuram stretches over the low-lying coastal belt and undulating terrain of mid land sandwiched between the high land comprising green mountain forests of Western Ghats and Lakshadweep Sea. Rich in cultural heritage, Thiruvananthapuram has served as the capital to the area in pre- colonial period, colonial period, and post-colonial period, functioning as administrative capital, which had enhanced the character of the city as a service center, in the region. Located strategically nearer to the international sea route; it is acting as a leading tourist destination and as an administrative center for a long time. With added features like Technopark, Techno city, proposed International Deep- sea Container Transshipment Terminal, Monorail- along the arterial road of the city and studded with the richest temple in the world, Thiruvananthapuram is now striding ahead with firm steps to redefine its role in the global systems of cities.

1.1 Regional Setting

Figure 1-1 Map of India showing location of Kerala; Kerala map showing location of Trivandrum; District map of Trivandrum and Thiruvananthapuram Corporation map.

The district of Thiruvananthapuram is located at 8° 17′ N and 8° 51′ N latitude and 76 41′ E and 77 17' E longitude. The Corporation is located at 8° 30 N and 76°54 N on the west coast near the southern tip of mainland is bounded by Lakshadweep Sea to its west and the Western Ghats to its east.

Thiruvananthapuram district is bordered by Kollam district on the north, Thirunelveli and Kanyakumari districts of Tamil Nadu on the east and south respectively. Kollam renowned for its cashew industries and tourism potentials can act as catalyst to the socio- economic development of Thiruvananthapuram district. Thirunelveli, known for its education system and prowess through towns like Palayamkottai, also known as 'Oxford of South India' , because of the number of educational institutions it has, can add to the educational potential of Thiruvananthapuram district. Kanyakumari, a place with immense tourism vibrancy can also find itself connecting to the tourism network of Thiruvananthapuram district, as all three districts depends much on the Thiruvananthapuram Airport for their foreign inputs.

The Thiruvananthapuram Corporation is surrounded by Kadinakulam, Andoorkonam, Vembayam and Pothencode in the North; Karakulam, Aruvikkara, Vilappil and Vilavoorkkal in the East; Pallichal, Kalliyoor, Venganoor and Kottukal Grama Panchayats in the South; and the city situated on the west coast of India is bounded by Arabian Sea to its West.

The distance from Thiruvananthapuram to major urban centers of the State like Kochi and Kozhikode by road is 222 km and 446 km respectively and by rail are 221 km and 411 km respectively. Also, the distance from Thiruvananthapuram to Kanyakumari and Nagercoil by rail is 89 km and 71 km respectively. The major linkages to the corporation under different modes of transport are given below.

By Air: The International airport at Thiruvananthapuram is situated near Shanghumukham Beach within the city limits; about 3km west of the city.

By Rail: Thiruvananthapuram is well connected to every part of the country by train. There are trains from Mangalore, Kochi, Bengaluru, Chennai, Delhi, Goa, Mumbai, Kanyakumari and many other places. Thiruvananthapuram and Kochi cities, the two most important cities in Kerala are also well connected by commuter trains.

By Road: Long distance buses depart from the Central Bus Station (KSRTC Bus Terminal) at Thampanoor, opposite the Central Railway Station. Buses operate from Chennai, Madurai, Bangalore and Kanyakumari and Nagercoil to

Thiruvananthapuram. Similarly, Thiruvananthapuram is well connected to the northern parts of the State by buses.

By Sea: Thiruvananthapuram has one minor port at Vizhinjam (Vizhinjam International Seaport Limited). Also, seaport facilities are available at Valiathura and Anjengo.

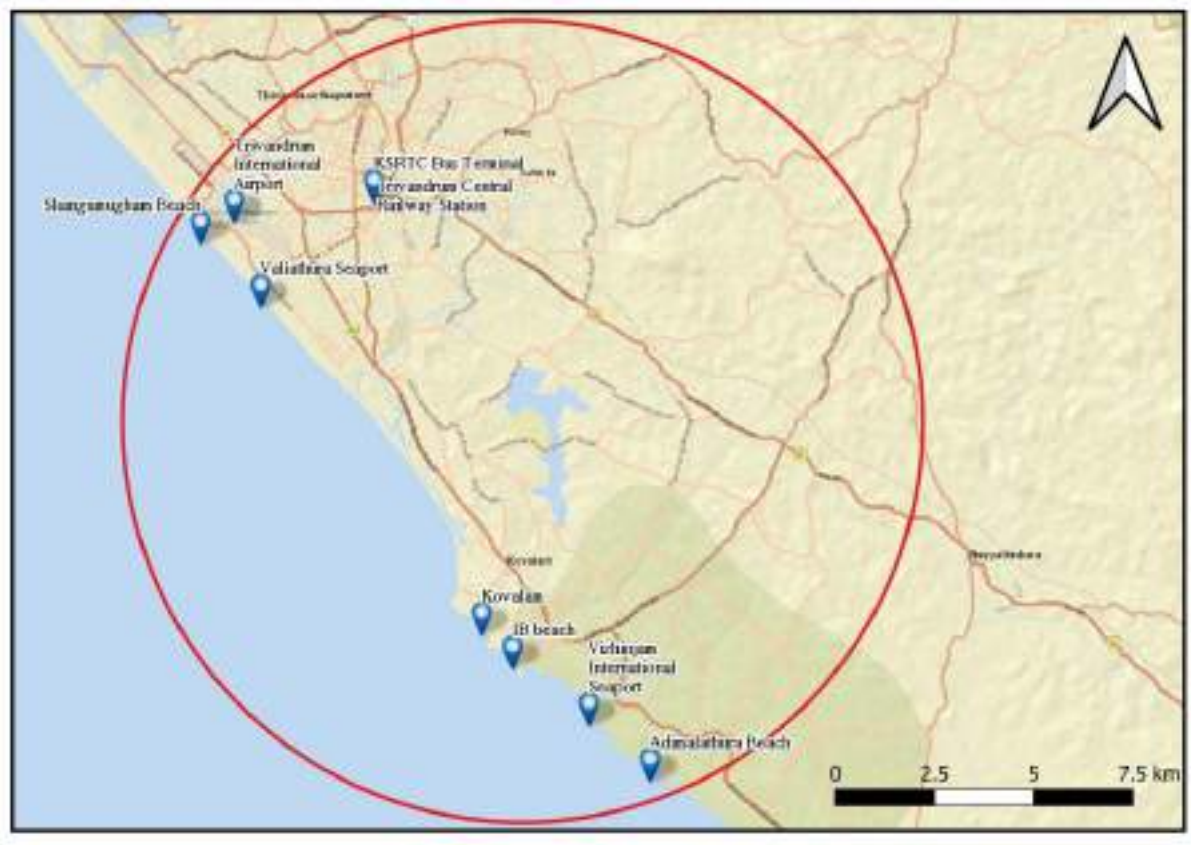


Figure 1-2 Regional Transport Facilities available around the Project Location

1.2 Demographics

Census 2011 place Kerala's population at 3,33,87,677 persons which includes 15,84,200 males and 17,23,084 females. Although Kerala accounts for only about one per cent of the total area of India; it contains about 2.76% of the country's population.

The population of Thiruvananthapuram district as per Census 2011 is 33,07,284. Though Thiruvananthapuram accounts for only 5.64% of State's area (2,192 Sq. km against 38,863 Sq. km) it comprises 9.9% of the state population. There is a linear

increase in the population of the district, and it has grown from 21,98,606 to 3307284 in a period of 1971 to 2011.

Thiruvananthapuram city has a total population of 9,86, 578; of which male and female are 4, 89, 991 and 4, 96, 587 respectively. The Thiruvananthapuram Corporation spreads over an area of 214. 86 Sq. Km.

It is seen that the population size is more in coastal wards towards south of airport, and the size is less in wards located towards city core. Among Wards within Corporation, total population is more in Ward 65 (Thiruvallom – 25185 persons) and is least in Ward 78 (Muttathara – 1143 persons).

The average population density of the State is 859 persons per square kilometers, 2.25 times the national average. The average population density of Thiruvananthapuram district is 1509 which is 1.75 times higher than the State average.

Comparing the districts, during both 2001 and 2011, Thiruvananthapuram is one of the high-density districts. Compared to the neighbouring districts, the population density of Thiruvananthapuram is much above Alappuzha, Kollam and Pathanamthitta districts.

Within the district, coastal LSGs are having greater population density which lowers on going towards mid land to high land. The city has an average density of 4444 persons/Unit area.

1.3 Kovalam

Kovalam is a small fishing village on the south-western segment of the complex coastline of western India and is situated in the Thiruvananthapuram district of the state of Kerala. The late Maharaja of Travancore Sree Thirunal Balarama first brought Kovalam to public eyes as his summer retreat. The European guests of the Travancore kingdom discovered the potentiality of Kovalam as a tourist destination in the late 1930' s. But the real fame as a beach resort was won later for Kovalam in the early 1980' s with the arrivals of Hippies or Bohemian tourists of Anglo-American origin. Afterwards, development initiatives under 'Club Mediterranean Project' , several

projects of Indian Tourism Development Corporation (ITDC) and Kerala Tourism Development Corporation (KTDC) like 'Chartered Tourism Initiative' starting in 1995 and setting up of Kovalam Vizhinjam Development Authority (KVDA) had strengthened infrastructural development and transformed Kovalam to a world class sea-resort from a mere fishing village.

Kovalam is famous for its beaches, among the most pristine in India. Kovalam is extremely popular among the tourists due to its shallow waters and low tidal waves. A wide variety of resorts, restaurants, handicrafts, jewellery shops and ayurvedic centers are available at the beach side. Kovalam is a crescent-shaped beach comprising 3 major beaches. The southernmost, known as the Lighthouse Beach, is the most popular of the three. Many hotels, restaurants, lodges and shops are located here. It is frequented by outsiders who stay and enjoy Kovalam. The northernmost crescent, (with the different names Main Beach/Leela Beach/Samudra Beach) is a quiet place comparatively. Hawa Beach is more pristine and silent and is beautiful with one side covered with hillocks.

Figure 1-3 Kovalam Beach

Adimalathura Beach on the coast of Arabian Sea is a fishing hamlet near to Kovalam international beach. This village has traditional resorts which highly function as ayurveda resorts and heritage sites. Somatheeram Ayurveda Resort (the world' s first Ayurveda Beach resort), Manaltheeram Ayurveda Resort, Travancore Heritage and Abad Harmonia Ayurveda Resort can be found here.

Figure 1-4 Adimalathura Beach

1.4 Tourism

Tourism is now an integral part of global financial market, and its values now encroach upon all human interactions. It has become an effective instrument for generating employment, earning revenue and foreign exchange, enhancing environment, preserving culture and tradition, and thereby facilitating overall development. Kerala Tourism is having a global presence and with its clear strategy for growth sheer marketing activities, it has gained a lot of tourists from all over the world. An equable climate, a long shoreline with serene beaches, tranquil stretches of emerald backwaters, lush hill stations and exotic wildlife, waterfalls, sprawling plantations and paddy fields, enchanting art forms, magical festivals, historic and cultural monuments, exotic cuisine, all of which makes Kerala a unique experience. The Kerala Tourism Development Corporation (KTDC) is a public sector undertaking that conducts and regulates the tourism activities in the state of Kerala. The KTDC is headquartered at Thiruvananthapuram and has offices across all the districts of Kerala. The District Tourism Promotion Councils have undertaken the responsibility of creating and marketing local tourism products and opportunities.

Coastal tourism is based on a unique resource combination at the interface of land and sea offering amenities such as water, beaches, scenic beauty, rich terrestrial and marine biodiversity, diversified cultural and historic heritage, healthy food and good

infrastructure. Coastal recreation activities, which have been increasing during the last few decades, occupy a unique place in coastal tourism. In India, Kerala and Karnataka were emerged as a coastal tourism destination within the 1960s, because of the distinctive commercialism points being its natural coastal beauty. The rapid growth of coastal tourism is one of the major reasons for Urban infrastructural development in the coastal areas. Moreover, equal importance should be given in preserving and conserving the natural ecosystem while executing the developmental activities to eliminate any consequent coastal environmental problems. Therefore, In Coastal tourism, it is extremely important to balance Urban infrastructural development needed for tourism' s economic advantages along with maintaining environmental sustainability.

Table 1-1 and Fig 1-5 shows the financial year wise tourist arrival in Kerala. It was observed that a high percentage increase in the arrival of foreign as well as domestic tourists were observed during the period 2016- 18. A major decline in foreign tourists were observed since the Covid pandemic outbreak which seriously affected the tourism sector in Kerala that hit the economy of the state.

Table 1-1 Financial year-wise tourist arrivals to Kerala

Financial Year	Foreign Tourists	% Increase	Domestic Tourists	% Increase
2005-2006	3,82,986	12.77	60,45,363	1.85
2006-2007	4,68,658	22.37	63,87,724	5.66
2007-2008	5,54,921	18.41	68,79,885	7.7
2008-2009	5,70,945	2.89	77,12,249	12.1
2009-2010	5,86,638	2.75	80,03,915	3.78
2010-2011	6,79,636	15.85	87,11,344	8.84
2011-2012	7,62,058	12.13	95,12,537	9.2
2012-2013	8,23,601	8.08	1,02,69,805	7.96
2013-2014	8,83,353	7.25	1,10,78,690	7.88
2014-2015	9,46,665	7.17	1,18,89,260	7.32

2015-2016	9,98,706	5.5	1,26,30,483	6.23
2016-2017	10,46,738	4.81	1,33,99,240	6.09
2017-2018	11,39,526	8.86	1,52,80,718	14.04
2018-2019	10,78,182	-5.38	1,59,17,417	4.17

Figure 1-5 Foreign and domestic tourist arrival financial year wise

The maximum number of foreign tourists arrived during the 1st quarter of the year 2019, constituting 35.51 % with 4,22,469 tourists followed by 4th quarter constituting 31.08 % with 3,69,796 tourists, the 3rd quarter constituting 18.09% with 215186 tourists and the 2nd quarter constituting 15.32% with 1,82,320 tourists (Table 1-2 and Fig 1-6).

Table 1-2 Quarterly Comparison – Foreign Tourists

Year	2015	2016	2017	2018	2019
I- Quarter	3,63,492	3,84,719	3,93,038	4,40,694	4,22,469
II- Quarter	1,51,774	1,53,461	1,75,746	1,67,666	1,82,320
III- Quarter	1,84,005	2,00,335	2,00,988	1,73,758	2,15,186
IV-Quarter	2,78,208	2,99,904	3,22,098	3,14,289	3,69,796
Total	9,77,479	10,38,419	10,91,870	10,96,407	11,89,771

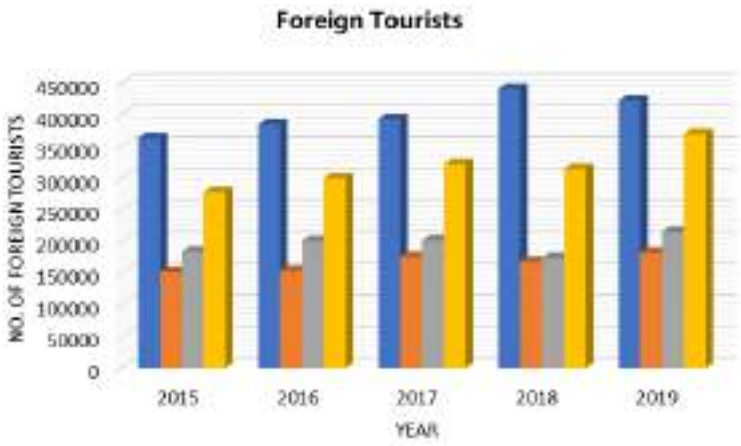


Figure 1-6 Foreign tourist arrival from the year 2015- 2019

During 2019, the maximum number of domestic tourists arrived during the 4th quarter constituting 28.29% with 52,00,006 tourists followed by 2nd quarter constituting 25.97 % with 47,73,739 tourists, the 3rd quarter constituting 22.95% with 42,20,020 tourists and the 1st quarter constituting 22.79 % with 4190468 tourists.

Table 1-3 Quarterly Comparison – Domestic Tourists

Year	2015	2016	2017	2018	2019
I- Quarter	28,78,897	30,43,809	32,70,514	38,77,712	41,90,468
II- Quarter	29,76,682	31,10,808	35,78,943	41,49,122	47,73,739
III- Quarter	28,61,813	30,86,508	34,10,654	32,92,016	42,20,020
IV-Quarter	37,48,179	39,31,410	44,13,409	42,85,811	52,00,006
Total	**1,24,65,571**	**1,31,72,535**	**1,46,73,520**	**1,56,04,661**	**1,83,84,233**

Figure 1-7 Domestic tourist arrival from the year 2015- 2019

During 2019 the maximum number of foreign tourists arrived was in January followed by December. The month wise details of foreign and domestic during the year 2019 is listed in the table below. From this data it can be observed that October to February is the peak time for tourist arrivals (Table 1-4 and Fig 1-8).

Table 1-4 Month wise details of foreign and domestic tourists 2019

Month	No. of Tourist		Proportion to Total	
	Foreign	Domestic	Foreign	Domestic
January	1,60,588	15,15,551	13.5	8.24
February	1,48,024	13,35,665	12.44	7.27
March	1,13,857	13,39,252	9.57	7.28
April	86,693	16,13,257	7.28	8.78
May	49,952	18,18,986	4.2	9.89
June	45,675	13,41,496	3.84	7.3
July	78,034	14,30,508	6.56	7.78
August	74,210	13,21,175	6.24	7.19
September	62,942	14,68,337	5.29	7.99
October	94,205	15,94,093	7.92	8.67
November	1,20,848	16,52,890	10.15	8.99
December	1,54,743	19,53,023	13.01	10.62
Total	11,89,771	1,83,84,233	100	100

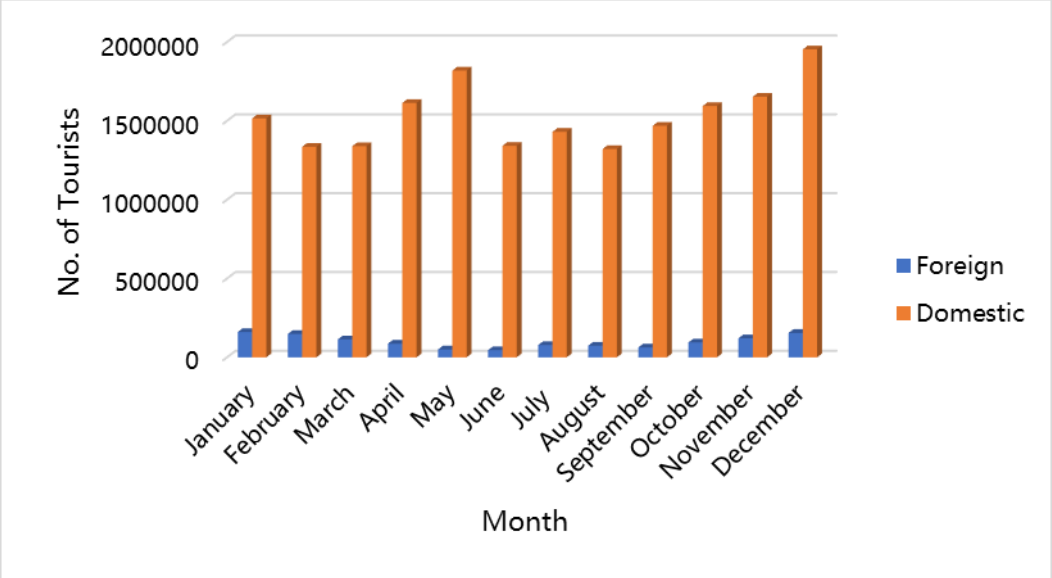


Figure 1-8 Foreign and domestic tourist arrival in the year 2019

1.4.1 History and Tourism in Kovalam

In 1966, the department of tourism took over the beach area with an old beach house. Later, the coast was given to ITDC (India Tourism Development Corporation), which built the Ashok Beach Resort, a five-star hotel, in 1973, excluding the Department of Tourism's current Guest House Complex. KTDC (Kerala Tourism Development Corporation) opened Hotel Samudra around the same time. Later, ITDC expanded its hotel resort by 72 rooms. At the same time, the private sector arrived at the destination, causing overall changes, particularly around Vellar Lake and the Vizhinjam Lighthouse. The Kovalam-Vizhinjam Development Authority was founded in 1975. In 1972, ITDC opened a beach resort in Kovalam, and in 1995, the Rajiv Gandhi Conference Centre.

Kovalam was gradually becoming a renowned tourist resort in India. While the first tourism-related businesses opened in the 1970s, and early visitors were forced to sleep on the beach, lodges began to spring up to accommodate them. Kovalam acquired fame in India and beyond throughout time. Most visitors came from the United Kingdom, followed by Germany, France, the United States, Italy, and Japan. In 1995, when chartered tourism was announced in Kovalam, it created a boom of interest in the local sector. The potential of chartered visitors prompted an anticipation of greater demand for hotels and restaurants, resulting in an inflow of foreigners along the beach.

As Kovalam beach is a public place with multiple entry points, there is no authentic data available on the number of visitors to the beach every year. However, the following data derived from the booking data available with the accommodation facilities in the region highlights the tourism potential of the place and the growth it has seen in a five-year span from 2014-2019. During the pre-pandemic times, a 52% growth in the number of tourists have been noted during the year 2014-2019 (Table 1-5).

Table 1-5 Tourist visiting data in Thiruvanathapuram and Kovalam from 2014- 2020

Sl No	Destination	2020	2019	2018	2017	2016	2015	2014
1	Thiruvananthapuram City	412256	1489770	1392314	1217446	1026272	1008083	1148647
2	**Kovalam**	**259093**	**917288**	**862513**	**815645**	**671256**	**502597**	**601073**

3	Varkala	77887	253626	229365	207518	183482	186147	236441
4	Poovar	37945	118352	101649	87489	69222	65682	76326
5	Ponmudi	23910	82947	68476	59637	45860	43916	30573
	Total	**811091**	**2861983**	**2654317**	**2387735**	**1996092**	**1806425**	**2093060**

1.5 Coastal Protection and Management

Coastline is defined, as boundary between land and water and the coast is the strip of land that extends from the coastline inland to the first major change in terrain features. The coastline is influenced by various environmental parameters such as wind, waves and currents. Coastal erosion is the wearing a way of land by action of waves, currents and wind. Coastal erosion is accompanied with landward recession of the shoreline and loss of land area. It is a common problem faced in almost all coastal areas. Only the magnitude and nature of erosion changes from place to place.

The causes of coastal erosion are broadly classified as natural and human causes. The various developmental activities taking place along the coast of Kerala has resulted in significant coastline changes and has affected its stability. When the waves approach at an angle to the coast in the vicinity of near- shore region, waves stir-up the bed material due to breaking action and keep the same in suspension. Movement of the bed material / sediment along the coastline is termed as 'littoral transport' or 'littoral drift'. Along most of the parts of Indian coast, the erosion observed is seasonal in nature, that is, beach gets eroded during monsoon and regains its original profile during fair weather season. However, at some places, erosion is of permanent nature.

In order to mitigate the coastal erosion, the coastal protections are broadly classified as soft and hard solutions and also combination of both. Soft solutions are vegetation, beach nourishment, sand bypassing, flood proofing, sand dune formation, zoning, retreat etc. Hard solutions are seawall / revetment, groynes, offshore reefs, detached seawalls etc. Innovative methods comprise sand filled geotextile tubes/containers/bags/mats, stone filled gabions, artificial reef balls etc.

For the preservation of beach at Kattoor, Alappuzha, construction of 34 number of groyne field was proposed by IIT Madras. The beach area was found to be reducing

due to littoral drift. Also, the IIT authorities recommended that all the groynes may be constructed simultaneously to avoid probable local erosion and that might be caused for groynes constructed in isolation. The coastal stretch along the Chellanam fishing harbour was identified by NCCR as a sand deficit zone as the sediment is blocked in the south of the sea walls and groynes are the major management strategies adopted for coastal protection along Kerala coast.

Kovalam has magnificent sandy beaches which are surrounded on the land side by ridges and lateritic slopes as well as clay covered small flood plains used as paddy fields. There are large rocky promontories of granitic rocks along the shoreline protruding into the seas. Some marine organisms of anemones genus and some varieties of sponges can be observed along the sandy shore. But during the last decade, Kovalam and its surrounding areas were overwhelmingly affected by marine erosion. The spatial pattern of distribution of the erosion magnitude is uneven and irrespective of the forested or deforested (reclaimed for agriculture primarily) stretches of the coast. All these have devastating influences on the tourism of Kovalam.

1.6 Blue Flag Certification

The Blue Flag is a world-renowned award for beaches, marinas, and boats. In India, the Blue Flag programme is implemented by the Society for Sustainable Urban Development (SSUD), as the National Operator. It is operated under the auspices of Foundation for Environmental Education (FEE), an international not for profit organization, headquartered in Copenhagen, Denmark.

The programme initiated in France in 1985, is recognized by the United Nations Education for Scientific and Cultural Organization (UNESCO) as an innovative Education for Sustainable Development (ESD) programme that creates opportunities for local communities, businesses, and administration to empower themselves to sustainably manage beach spaces, encourage responsible tourism and contribute towards the conservation of natural resources.

1.6.1 Certification Criteria

Blue Flag Award is based on compliance to four main categories – Environmental Education and Information; Water Quality; Environmental Management; Safety and Services. A beach shall be awarded as an International Blue Flag beach based on its achievement of 33 imperative criteria.

I. Environmental Education and Information

- Information about the Blue Flag Programme and other FEE awards must be displayed.
- Environmental education activities must be offered and promoted to beach users.
- Information about bathing water quality must be displayed.
- Information relating to local eco-systems, environmental elements and cultural sites must be displayed.
- A map of the beach indicating different facilities must be displayed.
- A code of conduct that reflects appropriate laws and/or regulations governing the use of the beach and surrounding areas must be displayed.

II. Water Quality

- The beach must fully comply with the water quality sampling and frequency requirements.
- The beach must fully comply with the standards and requirements for water quality analysis.
- Industrial, wastewater or sewage-related discharges must not affect the beach area.
- The beach must comply with the Blue Flag requirements for the microbiological parameter Escherichia coli (faecal coli bacteria) and intestinal enterococci (streptococci).
- The beach must comply with the Blue Flag requirements for physical parameters.

III. Environmental Management

- The local authority/beach operator should establish a beach management committee.
- The local authority/beach operator must comply with all laws and/or regulations affecting the location and operation of the beach.

- Sensitive areas must be managed.
- The beach must be clean.
- Algal vegetation or natural debris must be left on the beach.
- Waste disposal bins/containers must be available at the beach in adequate numbers, and they must be regularly maintained.
- Facilities for the separation of recyclable waste materials must be available at the beach.
- An adequate number of toilet or restroom facilities must be provided.
- The toilet or restroom facilities must be kept clean.
- The toilet or restroom facilities must have controlled sewage disposal.
- There must be no unauthorized camping or driving and no dumping on the beach.
- Access to the beach by dogs and other domestic animals must be strictly controlled.
- All buildings and beach equipment must be properly maintained.
- Marine and freshwater sensitive habitats (such as coral reefs or sea grass beds) in the vicinity of the beach must be monitored.
- A sustainable means of transportation should be promoted in the beach area.

IV. Safety and Services

- Appropriate public safety control measures must be implemented.
- First aid equipment must be available on the beach.
- Emergency plans to cope with pollution risks must be in place.
- There must be management of different users and uses of the beach so as to prevent conflicts and accidents.
- There must be safety measures in place to protect users of the beach and free access must be granted to the public.
- A supply of drinking water should be available at the beach.
- At least one Blue Flag beach in each municipality must have access and facilities provided for the physically disabled.

1.6.2 Blue Flag Beaches in India

India is aimed at expanding the network of Blue Flag certification to 100 such beaches in the country in the next five years. In pursuance of this goal, India started its journey of sustainable development of coastal regions on World Environment Day in June, 2018 by launching its beach cleaning campaign 'I AM SAVING MY BEACH'

simultaneously at 13 coastal states and thereafter launching India's own eco-label Beach Environment and Aesthetics Management Services (BEAMS) under its Integrated Coastal Zone Management (ICZM) project which has a prime objective of protecting and conserving the pristine coastal and marine ecosystems through holistic management of resources. With "I AM SAVING MY BEACH" (Intensive Beach Cleaning & Environment Education) campaign, MoEFCC has kickstarted the journey towards certifying these beaches for Eco-label at par with Blue Flag beaches in the world. This campaign was undertaken by team of SICOM-MoEFCC at these beaches concurrently for an extensive cleaning & environment education drive, coinciding with the World Environment Day celebrations.

Table 1-6 Blue Flag certified beaches in India

Sl. No	List of Blue flag beaches in India	Location
1	Eden Beach	Puducherry
2	Kovalam Beach	Tamil Nadu
3	Golden Beach	Odisha
4	Shivrajpur Beach	Gujarat
5	Kappad Beach	Kerala
6	Ghoghla Beach	Diu
7	Kasarkod Beach	Karnataka
8	Radhanagar Beach	Andaman & Nicobar Islands
9	Rushikonda Beach	Andhra Pradesh
10	Padubidri Beach	Karnataka

Chandrabhaga beach on the Konark coast of Odisha became not only India' s but also Asia' s first beach to get the Blue Flag certification. There are currently 10 beaches in India holding the blue flag certification which is shown in the table 1-6.

02 Project Overview

2 PROJECT OVERVIEW

2.1 Aim

To Transform Kovalam and its adjacent beaches to a State of art facilities by recommending new infrastructural development in conjunction with improving the existing infrastructural facilities, thereby enhancing the activities and welcoming more visitors which will make the beach vibrant; and also with the further goal of achieving Kerala' s second blue flag certified beach.

2.2 Objective

- To Develop the Infrastructural facilities at Hawa Beach, Light House Beach, IB Beach and Adimalathura Beach.
- To Renovate the Silent Valley Sun Bath Park.
- Boundary demarcation of IB Beach and Adimalathura Beach.
- Land acquisition of Corporation Land and Coconut Plantation Land at the Light House beach for its development.
- Further development of IB Beach and Adimalathura Beach in Phase II.
- Obtaining Blue flag certification in Phase II.

2.3 Scope

- To Develop the public infrastructure available at Kovalam beach and thereby enhancing the built environment as well as the local standards of living.
- Transforming the beach in such a way to provide world class experiences to the tourists without affecting the society and environment, which will in turn strengthen the economy.
- Providing beach accessibility for all people inclusive of differently abled so that everyone will get an opportunity for engaging themselves in all activities and can freely use all resources available in the beach.

2.4 Limitations

- Many of the data are collected from published reports and journals.
- The enhancement of infrastructural facilities beyond beach premises is not studied.
- Comprehensive waste disposal system is not studied.

2.5 Need for the Project

Kovalam, one of the favourite tourist spots in Thiruvanathapuram is facing a declining rate of tourists over the past few years. The beach and its surrounding areas are found to be in a dilapidated condition. Due to littoral drift, much of the beach area is slowly getting reduced. The beach is in a bad condition which also lacks basic amenities, pedestrian pathway, and other required infrastructure. The Kovalam and adjacent beaches have vital potential to be developed as an international tourist destination. Therefore, it is required to augment the infrastructure facilities in Kovalam that will accelerate the tourism industry which will benefit the society as well as the economy. Thus, the development of Kovalam and adjacent beaches will attract more crowd and bring back Kovalam as most favourite tourist spot.

2.6 Overview of the Project

The Project area stretches over a total length of 3. 65 km, out of which the 1.75 km constitute the Kovalam Beach that begin from Silent valley to IB beach, and the rest 1.90 km constitute the Adimalathura Beach that begin from Somatheeram to towards south of Adimalathura Beach.

The project focuses on the development of Kovalam and adjacent beaches. The project is proposed to be completed in two phases. Phase 1 includes the infrastructure development at Light house beach and Hawa Beach; The Renovation of the Silent Valley Sun Bath Park at Hawa beach; Development of Corporation land; Developing the Connectivity to Corporation Land; Developing an access to IB Beach; Land demarcation at the adjacent beaches, i.e., IB Beach and Adimalathura beach; Land acquisition of Coconut Plantation Land and Land acquisition to be executed for providing direct access to the Corporation Land.

Phase 2 involves the further development of IB Beach and Adimalathura beach, and the development of Coconut Plantation Land.

Shore protection measures at Kovalam beach shall be taken up in Phase I as a different project.

Figure 2-1 Project Location

The major locations considered for development are:

1. Hawa Beach
2. Light House Beach
3. IB House Beach
4. Adimalathura Beach

1. Hawa Beach

The beach lying North of Light House beach is Hawa beach. This beach is also known as Eve' s beach, encircled with palm groves. The beach is popular for its unique elegance and scenic beauty. Hawa Beach is one of the most well-known tourist spots in Kovalam. Hawa beach is more pristine and silent and is beautiful with one side covered with hillocks. The beach is comparatively less crowded, so it is ideal for those who look for peace and relaxation. In the morning, the beach is occupied by native fishermen. The beach provides a dazzling experience especially at sun rise and sun

set. The beach is not ideal for swimming, because the water current is very strong here.

The renovation of Silent Valley Sun Bath Park at the Hawa Beach is to preserve the heritage value it holds. A New Walkway is also proposed from the Silent Valley which is connecting to the proposed Gateway entrance of the Beach. At mid rock on Hawa & Eve's beach, a bridge connecting the Edakkal/ Mid- rock is to be built for sightseeing and enjoying the magnificent view of the dusk and dawn; and to facilitate water sports activities along the side of Edakkal/ Mid-rock. Other infrastructural development is also proposed at the Hawa Beach which is discussed in detail in the Section 8.

2. Light House Beach

The Light House Beach is a pristine beach on the coast of Arabian Sea in Kovalam. Among the three beaches, this is the largest, most popular and active beach in Kovalam. The beach is located at the southernmost end. At the southern end of the beach there exists a 35 m tall light house painted in red and white mounted on top of palm covered Kurumkal hill. The Light house is officially called Vizhinjam Light house.

The renovation of the existing infrastructure like walkways, toilets, etc; Development of access point to the southern part of beach, development of the corporation land, Land acquisition and development of 7-acre coconut plantation land and an access bridge to IB beach are to be proposed at the Light house beach area. The mentioned proposals are discussed in detail in Section 5.

3. IB Beach

A small beach area lying between Lighthouse and IB of Harbour Engineering Department. It is proposed to be converted to a private beach exclusively for foreign tourists.

4. Adimalathura Beach

Adimalathura literally means “port with a hill beneath” . The location of the Adimalathura village is on the top of a vast undersea submarine mountain range in

the Arabian Sea near Kovalam in Thiruvananthapuram district. It is bordered by the Karichal lake in the eastern side, the Chowara hills in the north, rocks vanishing into the Arabian sea in the south and west. It languishes under the green canopy formed by coconut palms. The Infrastructural development in Adimalathura Beach is also part of the project.

03

Site and Surroundings

3 SITE AND SURROUNDINGS

Figure 3-1 Kovalam Beach

Kovalam, a small coastal tourist village, lies 12 kilometres south of Thiruvananthapuram, Kerala (Fig. 3-1). People come from all over the country and the world to visit this location because of its four crescent-shaped beaches, ambience, appealing natural atmosphere. The main attractions are small sandy beaches, promontories, and cultural heritage. The 0.054 km^2 project area that extending from 76˚58'26" E 8˚23'26" N to 76˚58'59" E 8˚22'53" N encompasses 3 small beaches- Hawah, Lighthouse and IB beaches. The middle beach, the Lighthouse beach is the most popular among domestic and foreign tourists. The features of Kovalam beaches are shown in fig 3-2.

HAWA	LIGHTHOUSE	IB
LENGTH 510M	LENGTH 570M	LENGTH 110M
WATER DEPTH 2.5 M	WATER DEPTH 2.5 M	WATER DEPTH 2.5 M
SANDY STRETCH	PROMONTORY	GRANITE PROMONTORY
PROMONTORY	SANDY BEACH	SANDY BEACH
NATURAL INTENSIVE USE	AVG. WIDTH 38m	AVG. WIDTH 38m
AVG. WIDTH 35m	NATURAL INTENSIVE USE	NATURAL INTENSIVE USE
BERM HEIGHT		

Figure 3-2 Details and features of Kovalam Beach

Beaches of Kovalam have been internationally renowned since the 1930s' soon after the late Maharaja of Travancore, Sree Chithira Thirunal Balarama Varma, chose this lovely beach resort as his summer vacation destination. The location became a popular hangout for international travellers who came to see the Salvation Army headquarters in Thiruvananthapuram. "Club Mediterranean" was the first to take steps to develop this as a coastal resort. The Indian government and the Department of Tourism backed this plan because of the location's natural beauty and its clean swimming waters. Kovalam's actual fame as an ethnic tourist halt came in the early 1980s' , with the advent of hippies or Bohemian visitors and their unstructured nightlife. The tourism department's early initiatives, such as the Ashoka Beach Resort (a hotel owned by ITDC), a string of cottages, the Halcyon Castle (now turned into a luxury hotel), and Hotel Samudra run by KTDC, had greatly aided in the establishment of foreign tourism in Kovalam.

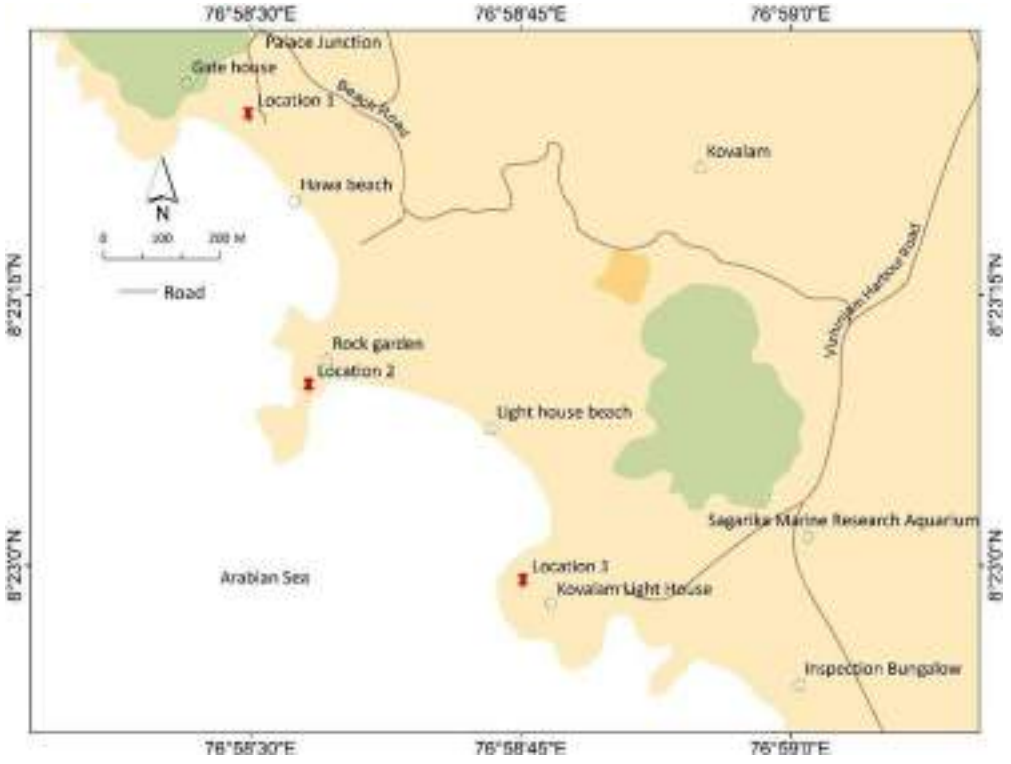


Figure 3-3 Stretch of Project area considered for developement

Vizhinjam, primary fishing centre, located near Kovalam Beach, has now gained new prominence as one of India's major ports. Now, it has become a popular landing centre for foreign marine tourists.

In Kovalam, a peer group of about 60 fishermen families has been undertaking biodiversity conservation such as mussel collection because their livelihood is heavily reliant on it. They have worshipped the shoreline while inflicting no harm to the habitat and contributing significantly to small-scale fisheries. Popular fishing activities in Kovalam include reef fishing, trap fishing, and harpoon fishing.

Figure 3-4 Project Location

The beach complex includes a string of budget cottages, Ayurvedic health resorts, convention facilities, shopping zones, swimming pools, Yoga and Ayurvedic massage centres. Accommodation facilities for tourists at Kovalam range from five-star hotels to budget hotels and the choice of food available at restaurants and cafeterias range from Continental varieties to South Indian delicacies.

3.1 Demographics of Kovalam

The Kovalam, outgrowth of Thiruvananthapuram corporation, an urban territory of 3.33 sq. km area carries a population density of 8632.43. Total number of households are 4970 with a total population of 28, 746. Kovalam had registered a higher male population of 14, 737 to female population, which is 14, 009, a material contradiction to state scenario. SC population is 1291 (male=647; female= 644) and has no ST population according to previous census data.

3.2 Literacy

Total number of literates are 18, 293 (male=9677; female= 8616). Total count of illiterates is 10, 453 (male=5060; female= 5393).

3.3 Livelihood

Total number of workers are 8308 (male=7413; female= 895). The rest are marginal workers. Majority of the main workers is concentrated in non-industrial sector, in which they constitute a total of 6213 (male= 5652; female= 561). Total count of non-worker is 20,438 (male=7324; female= 13, 114), i.e., 71% of the total urban outgrowth population.

3.4 Climate

Kovalam has high temperatures all year round ranging between 30°C (86°F) and 34°C (92°F). The wet season / rainy season takes place in the following months: May, June, July, September, October, and November. This is the time of year where the majority of Kovalam's annual precipitation occurs. March has an average maximum temperature of 34°C (92°F) and is the warmest month of the year. The coldest month is January with an average maximum temperature of 30°C (86°F). June tops the wettest month list with 306mm (12.0in) of rainfall. January is the driest month with 20mm (0.8in) of precipitation. January is the sunniest month with an average of 263 hours of sunshine.

The weather in Adimalathura is also affected by the large Coastal belt of Kerala and Tamil Nadu. The presence of this landmass causes differential heating of land and water. These factors set off a rush of moisture-rich air from the Arabian Sea over the Southern coastal region, resulting in tropical monsoons. Two seasons dominate this village: the dry season associated with the winter and the rainy season from the end of June to the end of August bringing strong winds. However, the weather patterns of this village do not always conform to the monsoon patterns of South Kerala. The temperature of this village ranges between 24 °C (75.2 °F) and 36 °C (96.8 °F) throughout the year. Although the humidity is relatively high, the constant cool sea breezes mitigate the heat.

3.5 Physical Setting of Kovalam

Figure 3-5 Physical Setting of Kovalam

Kovalam is situated at a distance of 16 km from the city of Trivandrum. The Kovalam Junction is accessed through NH Bypass from Chakai- Kazhakoottam which runs parallel to the coastal line of the city and there is good network of road connectivity to and within the region of Kovalam.

The nearest railway station from Kovalam is the Thiruvananthapuram Central railway station, about 16 km away. The nearest airport is the Trivandrum International Airport, about 10 km away. Vizhinjam sea port is located approximately 3 km away from the beach.

The coastal highway is one of the biggest infrastructure projects by Kerala Government which surround the study area and that connects with the NH and other roads. The coastal highway spans about 600 kms between Southern and Northern

ends of Kerala with a beautiful corridor. Coastal highway will begin at Poovar in Thiruvananthapuram district and end at Kunjathoor in Kasargode district by passing through 9 districts. Thus, the Coastal highway and parallelly developing the Kovalam and its adjacent beaches which are major coastal areas in the district of Thiruvananthapuram can improve the tourism attraction along the highway. The Coastal highway can make the access to Kovalam and adjacent beaches easier.

By Air: Kovalam is at a distance of 14 kilometers from the Trivandrum International Airport.

By Rail: The nearest railway station to Kovalam is the Thiruvananthapuram Central Railway Station located at a distance of about 15 kilometers from the main town of Kovalam.

By Road: Kovalam is connected by road with several tourist destinations within Kerala and India. It is located at a distance of 19 km from the state capital of Thiruvananthapuram and at a distance of 212 km from Kochi. Visitors can reach Kovalam either in a KSRTC Bus, Private Bus or in your Private Vehicle. The KSRTC Bus stop is located nearby the entrance gate leading to the tourist information center at Kovalam enroute The Hotel Raviz, Kovalam.

Figure 3-6 Location of KSRTC Bus stop in Kovalam

3.6 Major Attractions around Kovalam

Kovalam is the most visited beach in Kerala and is the coastal town which is situated in Thiruvananthapuram. The Padmanabhaswamy temple is one of the major attractions surrounding Kovalam located 11.8 km away from Kovalam. Some of the other tourist spots from Kovalam are mentioned in Table 3-1.

Table 3-1 Distance to other tourist spots from Kovalam

Tourist Destinations	Distance (in kms)	Tourist Destinations	Distance (In kms)
Trivandrum	16	Ponmudi	77
Kanyakumari	87	Cochin	238
Munnar	317	Kumarakam	172
Trichur	315	Kottayam	170
Varkala	69	Thekkady	270
Kollam	87	Sucheendram Temple	74
Alappuzha	172	Padmanabhapuram Palace	53

Shanghumukham Beach located 13.4 km from Kovalam is the Beach near airport. *Akkulam Boat club* located to the North of Kovalam which is 19.4 km far is a Picnic spot surrounding the Kovalam Beach. Veli located 18.8 km from Kovalam is another Picnic spot. Veli lagoon meets Arabian sea and Veli covers activities like boating in backwater lagoon, 18-acre waterfront garden with modern sculptures, floating bridge.

Another major attraction is the *Vizhinjam Lighthouse*, this lighthouse is located on a hillock named Kurumkal which is very close to the sea. The lighthouse came into function in the year 1972 as Vizhinjam was then a busy seaport. This was later modified in the year 2003. The southern end of the Kovalam beach is named after this hill house. The lighthouse is 35-meter-tall structure that is painted with red and white colour that is easily visible from a long distance. It is open to visitors and offers spectacular views of the lighthouse beach, Eve' s Beach, and its surroundings.

Figure 3-7 Major attractions around Kovalam

Edakkal is the popular sunset viewing point that lies between the Lighthouse Beach and Eve's Beach. It offers enchanting view of the red and orange sun setting in the horizon with amazing new patterns in the sky. It is one of the best places to view the sunset in Kovalam and the best place to capture the photos of different patterns of the beautiful sky.

Figure 3-8 Vizhinjam Light House

Other major tourist attractions

Vizhinjam fishing harbour

Another significant spot is fishing harbour. The place is famous because the establishment of a plant which converts energy from sea waves to electricity. For boosting tourism in this harbour, some grand projects are under the anvil monitored by ministry of tourism. It is a perfect place for tourism thanks to its unique marine ecology and rich biodiversity. A diving school, marine museum, research centre, mari-culture system development unit have been planned to promote tourism and most of them are in the stages of execution.

Thiruvallam backwaters

It is the prime backwater destination of Thiruvananthapuram and is located very near to Kovalam. It is important destination and it is famous for water-based activities like Canoe ride, kayaking, etc.

The Kovalam Art Gallery

The art gallery is located on Hawah beach. Works of various artists from the world is exhibited here. Ancient paintings are the main highlight of the gallery. It is a perfect place for art loving persons.

Vizhinjam marine aquarium

A marine aquarium is another attraction here, which houses many fishes like clown fish, moon wrasse, squirrel fish, butterfly etc. There are also displayed pearl images of Christ, Virgin Mary and many Hindu gods and goddesses.

Pilgrim Centres

Aazhimala Siva Temple

As the name suggests, the temple is devoted to Lord Siva. The temple is located near Aazhimala beach, on the way to Kovalam - Poovar road. Azhimala in Vizhinjam, Thiruvananthapuram, picturesque with the tranquil yet erratic sea, mellow fisherfolk, a handful of tourists and the revered Shiva Temple, is now host to a congregation of tourists. In majestic glory, a 58-ft-tall statue of Lord Shiva as Gangadhareswara, with his windswept, tumultuous dreadlocks enclosing a triumphant Goddess Ganga, has been intricately sculpted on the premises of the Azhimala temple, adjacent to the sea.

Figure 3-9 Aazhimala Shiva temple (left); Lord Shiva Statue in front of temple (Right)

Thiruvallom Parashurama Temple

This 2000-year-old temple, located on the banks of Karamana river. It is less than 10 km away from Kovalam. The temple is dedicated to Lord Parasurama believed to be creator of Kerala, as per myths. It is a famous centre of ancestor worship. Devotees make offering to the departed souls as part of balitherpen. The temple is situated where Killi River, Karamana river and Parvathi Puthanar merge. This makes it a holy site for balitherpanam.

Vizhinjam rock cut cave temple

The temple, constructed in the18th century is a marvellous sculpture which shows the skill of workers behind it. The deity here is Vinadhera Dakshinamurthi. Outside the cave are semi carved statues of Lord Shiva and goddess Parvathi. The temple will remain closed on Mondays.

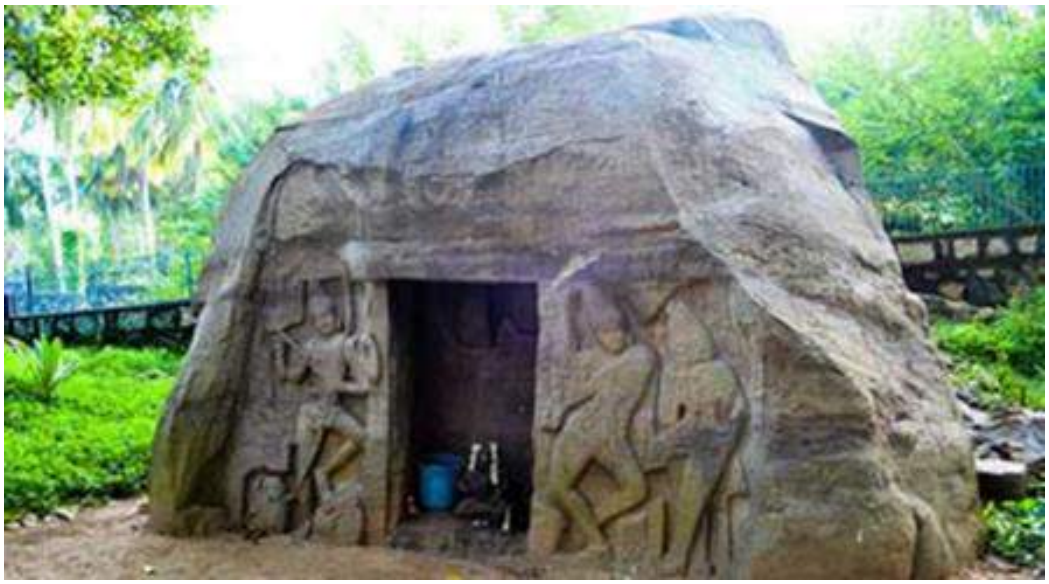


Figure 3-10 Vizhinjam Rock Cut Cave Temple

Kovalam Juma Masjid

It is situated near Asoka beach in Kovalam. Opposite to it, there is located Lord Ganesha temple, which shows religious harmony of the destination. An architectural wonder, the mosque highlights the traditional architecture of Kerala.

3.7 Land Use

Fig 3-11 shows the Land use of Kovalam in which majority of the land constitutes Beaches and Coastal sandy region along the coast. Moving towards the land, Kovalam is enriched with healthy Plantains and coconut trees. As the region is dominant with such crop since 1997, the main occupation of majority of the local population were Coconut farming, toddy taping, extraction of coconut oil, coir making, and fishing.

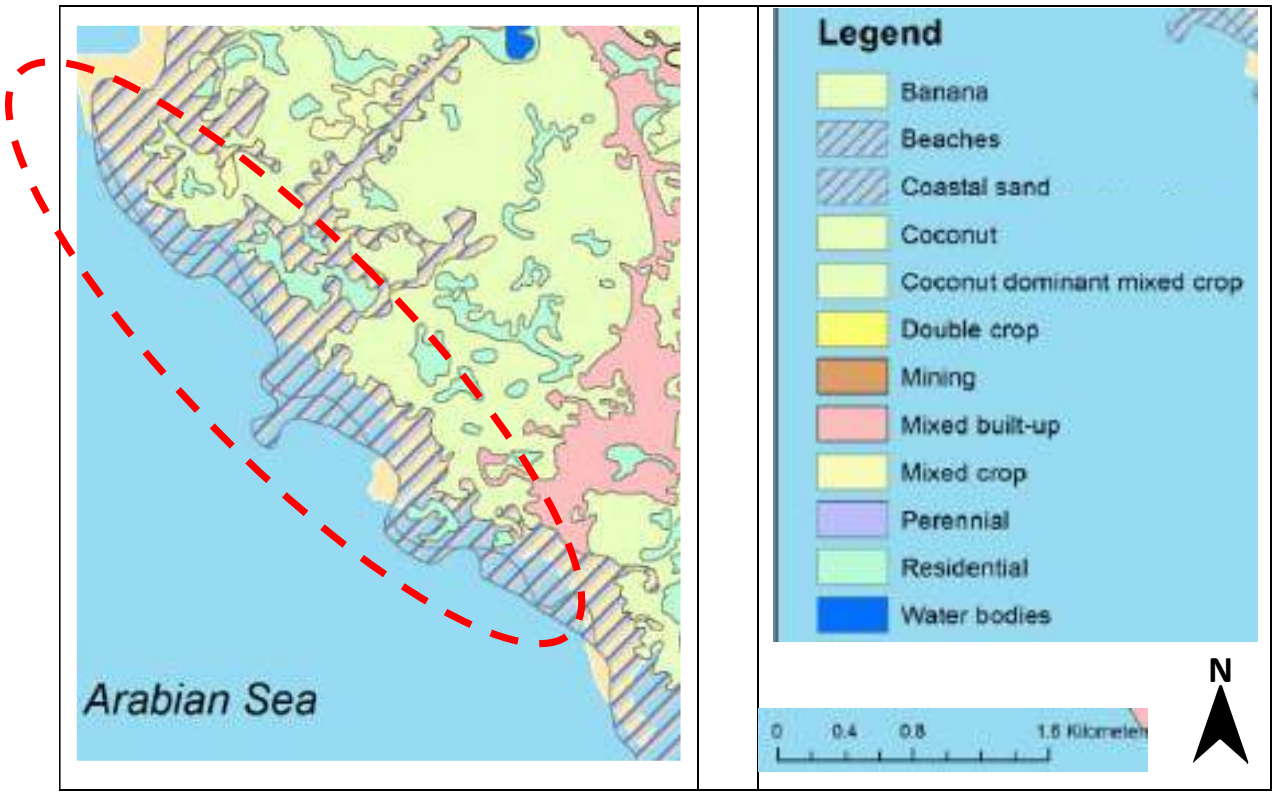


Figure 3-11 Land-use map of Kovalam beach

Behind the Light House Beach on the plains, extensive paddy and vegetable cultivation were done. Coconut plantations were also abundant in this region. Today, this place has no paddy or cultivation to boast of. Coconut is still grown on the hills, valleys and on the land adjacent to the beaches.

Fishing, predictably has been the other chief activity of the people of this region. Mechanized boats, catamarans, and other country boats are used to this day for fishing. But the expansion of building footprints in the past years, in which encroachments towards the beach along with the unfavourable climatic conditions that causes the sea to displace the land has significantly altered the land use pattern in Kovalam. At the same time, Beaches are forming to other parts of the region even though it is getting displaced on one side. Thus, there exist a potential to develop such identified areas by not dismissing in mind the significance of conserving such newly formed beach.

3.8 Shore Protection Measures

Since the beaches in the Kovalam region have been continuously eroding over the past few years, appropriate rehabilitation and rejuvenation are needed to preserve the sandy ecosystem. A combination of offshore breakwaters, headland extensions, and sand replenishment of the beach are currently being assessed. The formation of beaches are seasonal and depends on the littoral drift pattern in the North-South direction as well as the onshore to offshore movements. The Kovalam region's North-South littoral drift has been historically recorded to be minimal. However, mostly because of recent cyclones, the onshore-offshore movement of sand appears to be disturbing the equilibrium, which in turn is assumed to be contributing to the erosion. Hence the scenarios is being thoroughly assessed through studies conducted by NCCR.

A Team from NCCR visited the Kovalam beach conducted a detailed investigation of the Costal erosion at Kovalam. The rejuvenation of the beach is proposed for the Kovalam beach and Hawa beach. NCCR has requested to conduct a bathymetry study till 8m water depth during the pre-monsoon season along with the soil profiling at select locations.

Figure 3-12 Kovalam beach during Monsoon season

Figure 3-13 Kovalam beach during accretion season.

3.9 Coastal Regulation Zoning in Kovalam

The Zones within which the project area falls is shown in the map below (Fig 3-14; 3-15 and 3-16). As per the data obtained from KCZMA, the stretch of Kovalam fall under CRZ- II; Adimalathura under CRZ- III and Vizhinjham Lighthouse under CRZ- I B.

Figure 3-16 shows the CRZ map superimposed over the Survey number. The renovation of the existing Silent Valley Sun Bath park fall under the survey no. 18; The walkway from Silent valley to Hawa beach is proposed in Survey plot no. 19 and 29; Renovation of existing walkway in Light house beach belong to Survey land 30, 31 and 42; Development of Corporation land falls in Survey land 31; Development of Coconut Plantation belong to Survey land 31, 32 and 35; The Access bridge towards IB beach is included between the survey land 56 or 57; and the IB Beach fall under the survey land no. 61.

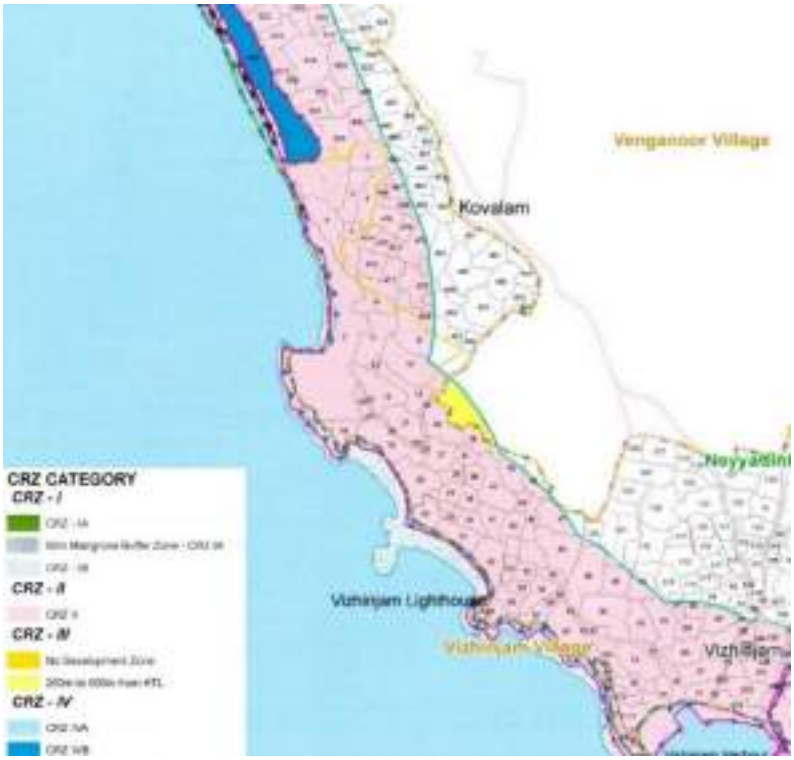


Figure 3-14 Map showing the CRZ of Thiruvananthapuram district with Kovalam under CRZ II and Vizhinjam under CRZ- I B.

Figure 3-15 Map showing Adimalathura CRZ Zone.

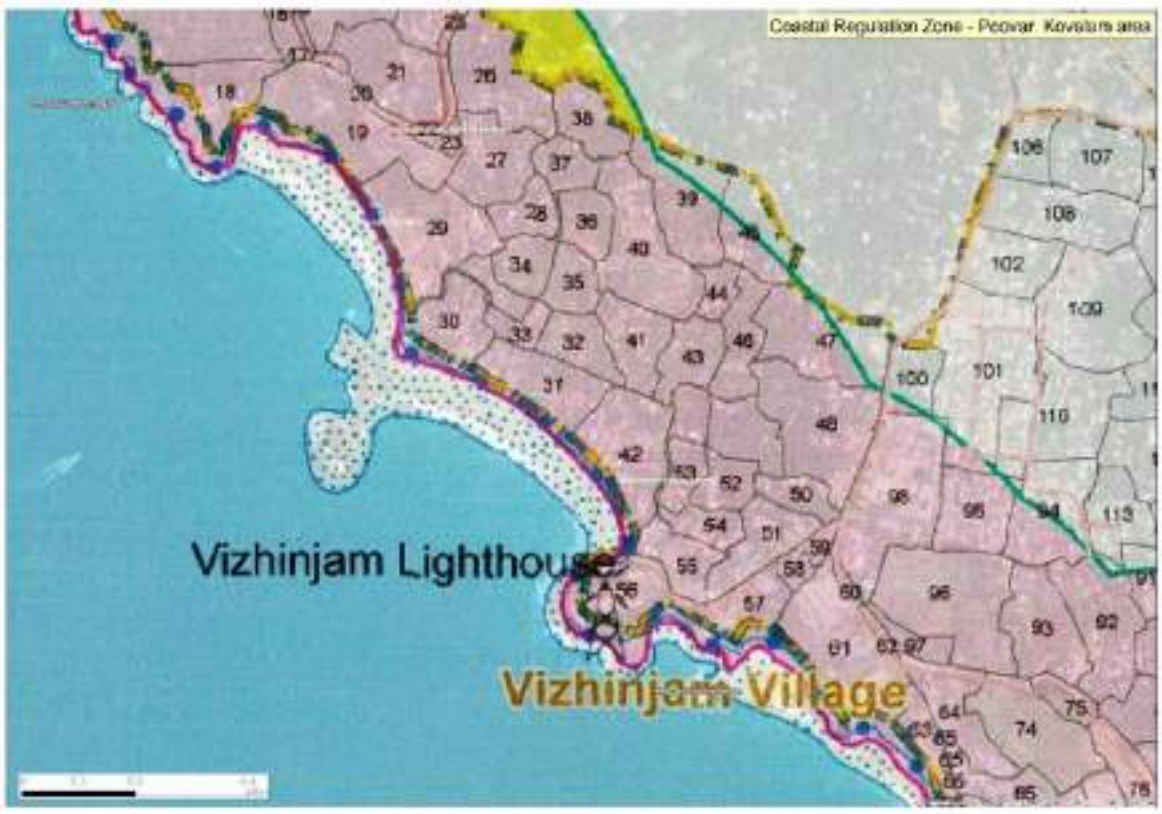


Figure 3-16 CRZ map of project area with Survey number

All efforts has been put to ensure that the suggested proposals in this project are complying the latest CRZ regulations in Coastal regulations Zone notification 2019 for Kerala published by the Ministry of environment and Forests 2019.

04 Project Background

4 PROJECT BACKGROUND

4.1 Current Situation of Kovalam

4.1.1 Beach side Infrastructure

The Light house beach and Hawa Beach is observed with encroachments because of the lack in proper maintenance and conservation of beaches. During monsoon, the ocean waves tend to reach the pedestrian walkway, that severely damage the walkway. Low hanging overhead electric lines, old lamp post in a deteriorated condition make it unappealing to the visitor' s eye. Also, there are insufficient seating facilities for accommodating the beach crowd in Light house and Hawa beach.

Figure 4-1 Dilapidated Condition of the Pathway at Light House Beach (left); Overhead Lines and Light Posts at Light House Beach (Right)

Dilapidated condition of the limited available basic facilities like the toilet cum changing room, first aid facility, waiting areas or resting places, etc. were observed, due to which the visitors are forced to change in open spaces or within their personal cars. The current walkway does not support an easy access for the differently abled. Thus, it is necessary to improve the existing infrastructure at Hawa beach and Light house Beach.

4.1.2 Hawa Beach

Hawa beach also well known as Eve's beach lies opposite the Lighthouse beach and one of the most well-known tourist spots in Kovalam. The exquisiteness of Hawa beach is enhanced by the stack of palm grooves which reward a unique elegance to

this place. The natural beauty of this beach is so attractive that it draws thousands of tourists from all over the world every year to deliver fun and frolic to them as much as possible. The Hawa beach in the early morning is found crowded with native fishermen who rely completely on the sea for their living.

Hawa beach is separated from other beaches by the foreland of Edakkal. From Edakkal, you can get the majestic view of sunset at its apex grace. After the sun sets, the calm cove of waters in the beach provides a visual charm of moonlit nights.

The renovation of Silent Valley Sun Bath Park at the Hawa Beach to convey the heritage value it holds is proposed. At mid rock on Hawa & Eve's beach a floating deck is to be built to facilitate water sports.

Figure 4-2 Hawa Beach

4.1.2.1 Silent Valley Sun Bath

The Silent Valley Sun Bath is located adjacent to tourist information center at Kovalam enroute to the Hotel Raviz, Kovalam and with a private beach access. This property bears a unique traditional character and heritage. The existing structures does not do justice to the heritage value that the site holds. There are also no

parking provisions. The common approach road via Hotel Raviz is the only access road to the Sun Bath Park. There' s an entry way available from Kovalam government guest house to this property.

Figure 4-3 Silent Valley Sun Bath Park

Some of the amenities inside the facility are reception block, viewing deck, Sun bath area, Toilet block, Security room and a Traditional pool with changing rooms.

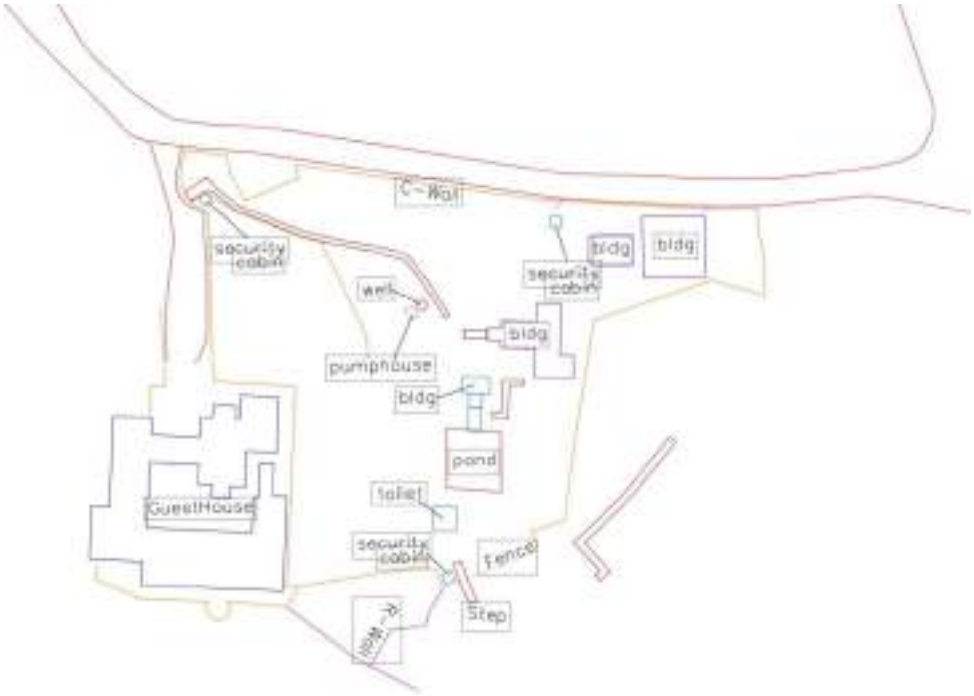


Figure 4-4 Existing Layout Plan of Silent Valley Sun Bath Park

4.1.2.1.1 Existing Conditions and Concerns

Figure 4-5 Entrance to Silent Valley Sun Bath Park from the Hawa beach (left); Existing condition of the Kovalam Beach (Right)

Figure 4-6 View of Silent Valley Sub Bath Park (left); Toilet block in Sun Bath Park (Right)

The existing situation identified at the Silent valley Sun Batch after Site survey are as follows:

- Visually, there is a lack of heritage appearance in the architecture of the existing building in Silent Valley.
- Lack of Parking facility.
- Absence of direct access to the Sun Bath Park. Currently, it can be only accessed via the private road leading to Hotel Hotel Raviz.
- Absence of a proper walkway providing direct access from Hawa Beach to the rear entrance of the Sun bath park facing the sea.
- The Steps providing entry to Sun Bath Park from the Hawa Beach visually looks sleaze and is not at all welcoming which is shown in Fig 4-5.
- Lack of proper drain and its maintenance.

The existing situation identified at the Hawa Beach after Site survey are as follows:

- Absence of a proper walkway.
- Absence of Mechanical Security systems like the CCTV.
- Absence of Signages and Information boards.
- No lifeguard is assigned to ensure the safety of the visitors or tourists.
- The Erosion of Beach during monsoon is identified along the shore of Hawa beach. Thus, a proper Coastal Protection measure is to be adopted.
- Presence of vacant plots creates an opportunity for people to dump waste which is unhygienic and may cause poor sanitation issues.

4.1.3 Light House Beach

Lighthouse Beach is the largest one among the three spell binding beaches found at Kovalam Beach. The Light House is located towards the southern end of the beach and it's on a cape. There is an observation platform from which you can see Poovar in one direction and the famous Beemapalli mosque on the other. The beach unlike other beaches in Kovalam, has a huge stretch of silver-hued sand and edgings of greenish palm trees. Lighthouse beach is likewise an ideal area for different adventure sports at Kovalam.

Figure 4-7 Light House Beach

4.1.3.1 Existing Conditions and Concerns

Light House Beach is the most active of all the beaches in Kovalam. There are different kinds of eateries and other shops situated at the beach. The existing conditions at light house beach are explained below:

- Lack of maintenance on the beach front and lack of conservation of beaches has resulted with encroachment into the beach stretch.
- During monsoon, the ocean waves tend to reach the pedestrian walkway. There are instances wherein lives were put at risk because of the rising ocean waves on to the walkways.
- Many of the walkway tiles are broken and some areas are severely damaged due to the wave action. Also, there are no proper seating facilities for the beach crowd.

Figure 4-8 Damaged pedestrian pathway (left); Damaged Lamp Post (Right)

- Low lying overhead electric lines, deteriorated lamp post obstructing free movement are major concerns.
- Lack of most basic facilities such as toilet cum changing room, waiting areas or resting places, first aid facility, access for ambulances during emergencies and CCTV surveillance.
- The existing toilets are found to be in dilapidated condition. There are no proper changing rooms or cloak rooms. People are forced to change in open spaces and in their own cars.

- Lack of proper waste management, inter departmental coordination gaps has resulted in uncontrolled activities in beaches. Checks on license, waste disposal mechanisms, safety measures, etc found not in order.

Figure 4-9 Existing toilet to the southern end of light house beach

Figure 4-10 Poorly maintained corporation land

- Wastes are found to be littered all through the beach showing the lack of proper waste management facility at the beach.
- The area surrounding the lighthouse is occupied with unwanted bushes and weeds.
- There is an unnoticed corporation land with several cottages and marshy land area behind the lighthouse beach which is extremely in a deteriorated condition.

4.2 Current Situation of Adjacent Beaches

Two adjacent beach stretches not explored to the full potential is also considered as part of the studies.

4.2.1 IB Beach

The IB beach, an untouched beach lies between the Vizhinjam Lighthouse and the Vizhinjam Harbour that begin from the Lighthouse beach. The beach stretch does lack proper access for the public. The IB beach fall under the CRZ– I B.

Figure 4-11 IB Beach

4.2.1.1 Existing Condition and Concerns

- A Secluded beach between the light house beach and IB house.
- Absence of Amenity Block.
- There is only restricted entry to the beach that is from IB House and Rockholm Resort at the Light house beach.
- The IB Beach is clean compared to other adjacent beaches as only limited people visit the beach.
- Currently, there is no encroachment identified.

Figure 4-12 View of IB Beach from IB House

4.2.2 Adimalathura Beach

The location of Adimalathura village is on the top of a vast undersea submarine mountain range in the Arabian Sea near Kovalam in Thiruvananthapuram district. It is bordered by the Karichal lake in the eastern side, the Chowara hills in the north, rocks vanishing into the Arabian sea in the south and west. It languishes under the green canopy formed by coconut palms. This village has traditional resorts which highly function as ayurveda resorts and heritage sites. Somatheeram Ayurveda Resort (the world' s first Ayurveda Beach resort), Manaltheeram Ayurveda Resort, Travancore Heritage and Abad Harmonia Ayurveda Resort can be found here.

Figure 4-13 Adimalathura Beach

Figure 4-14 Project Location at Adimalathura

4.2.2.1 Existing Conditions and Concerns

Figure 4-15 Existing Condition of Adimalathura Beach

- Adimalathura lies to the south of Vizhinjam and the port works at Vizhnjam has led to the nourishment of the beach here.
- The beach has a marshy land area, and several grazing cattle were observed.
- Slow encroachment of the beach area identified.

- Poor waste management has led to the careless littering of plastic and other waste to the beach premises.

05 Project Phasing

5 PROJECT PHASING

The Project area stretches over a total length of 3. 65 km, out of which the 1.75 km constitute the Kovalam Beach that begin from Silent valley to IB beach, and the rest 1.90 km constitute the Adimalathura Beach that begin from Somatheeram to towards south of Adimalathura Beach. The project is carried out in two Phases: Phase I and Phase II. Phase I covers the detailed survey and investigations along with the Concept proposals and design. Phase II covers only the brief concept and further detailing of the development to be executed in the project area included in Phase II will be implemented in the future.

Phase 1 includes:

- The Infrastructural development at light house beach and Hawa Beach;
- The renovation of the Silent Valley Sun Bath Park at Hawa beach;
- Development of Corporation land;
- Developing the Connectivity to Corporation land;
- Developing an access to IB Beach;
- Land demarcation at the adjacent beaches, i.e., IB Beach and Adimalathura beach;
- Land acquisition of Coconut Plantation Land.

Phase 2 involves:

- The further development of IB Beach and Adimalathura beach; and
- The development of Coconut Plantation Land.

Shore protection measures at Kovalam beach shall be taken up in Phase I as a different project.

06

Survey and Investigations

6 SURVEY AND INVESTIGATIONS

As part of planning and identifying the shortfalls at Kovalam and its adjoining beaches, initially, a team of officials had visited the proposed site. Based on the feedbacks and the current proposals as available with DTPC, an initial assessment of the site was carried out.

After the site inspection, a drone survey was carried out to identify the extends of Kovalam and adjacent beaches. After the drone survey, the photographs from the drone are used to create drawings and subsequently design concepts.

Figure 6-1 Drone survey

Drone survey and Total station survey were carried out for obtaining contour maps for the preparation of Detailed Master Plan of Kovalam and its adjacent beaches. Then, a questionnaire survey was also carried out for analysing the current issues faced by the shops, restaurants and resorts lying along the shore side of the beach.

Suggestions collected from the beneficiaries during the questionnaire survey is considered for planning and implementing the development proposals. Also, Geotechnical investigation were carried out to ascertain information regarding the physical properties of soil earthworks and foundations for the proposed structures.

6.1 Survey Results and Analysis

A questionnaire was developed and interviewed among shops, restaurants, resorts as well as the visitors following the random sampling method in the beach of Kovalam. A total of 142 completed questionnaires were collected. The questionnaire included the information regarding the status of the shops and restaurants alongside the Kovalam light house beach, existing infrastructural condition, frequency of visitors to beach, about coastal erosion, etc. Finally, collected information from questionnaires was coded and entered into a database system in Microsoft Excel for analysis to produce descriptive statistics.

The results obtained from the questionnaire survey is discussed below:

1. Land Ownership Status

The Land ownership status of each of the shop and restaurants were collected during the survey. About 89 percent of the Shops and restaurants are provided on a rental basis and the rest 11 percent of the shops are under individual ownership.

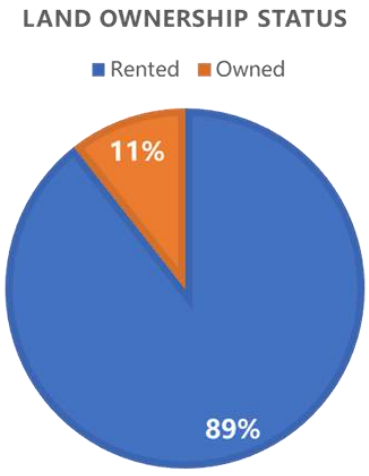


Figure 6-2 Land ownership Status

2. Type of building and Number of Storey's

About 86 percent of the Shops and restaurants are Permanent buildings, only 8 percent of the buildings are found to be temporary. Some of the buildings represent traditional Kerala architecture with truss and tiled roof.

It was found that, most of the shops and restaurant buildings along the light house beach region are single storied, i.e., about 42 percent buildings occupied are single storied, 26 percent are double storied, and the rest 32 percent of building are multi storied. It was also observed that most of the multi storied building represent mixed use developments.

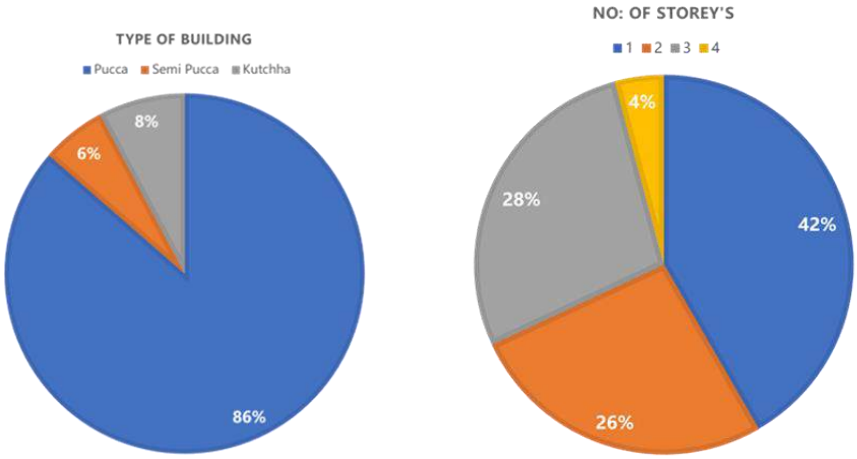


Figure 6-3 Type of building (left); No of Storey's (right)

3. Peak time of customers

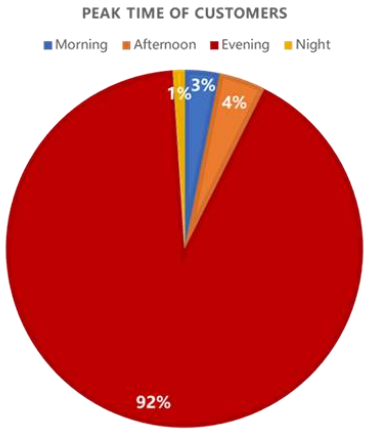


Figure 6-4 Peak time of customers

The survey explored the type of customers visiting the shops and their frequency of visit since the type of customers and frequency of visits plays an important role towards determining the quality and improvement in facilities required in the Kovalam beach.

According to the survey, about 92 percent of customers visit the shop in the evening, 4 percent customers in the afternoon, 3 percent customers in the morning and only 1 percent customers visit the shop in the night. Also, about 62 percent of the customers visiting the shops and restaurants are Natives and other domestic tourists. It was also recorded during the survey that the peak month in which a greater number of customers visit the Kovalam beach is from November to March.

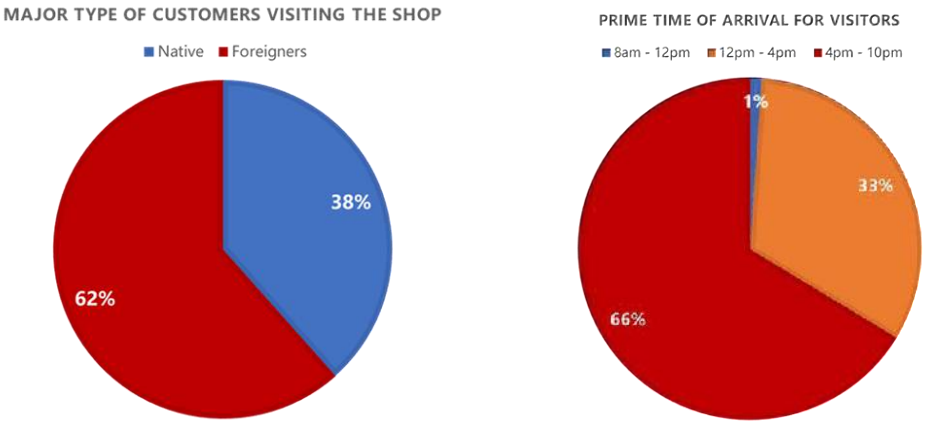


Figure 6-5 Major type of customers visiting the shop (left); Prime time of arrival for visitors (right)

The responses on the prime time of arrival by the visitors to the Kovalam beach is shown in fig 6-5. The response indicates that about 66 percent of the people visit the beach during the time from 4 pm to 10 pm, i.e., in the evening.

4. Water supply and Washroom facilities

The water requirement in Kovalam beach is of prime importance to meet the need of the shops, restaurants, and resorts as well as the native visitors, domestic and foreign tourists. The source of water supply provided to the shops and restaurants, availability of water purifier and Washroom facilities were recorded for the questionnaire survey.

It was observed that 44 percent of the shops and restaurants rely on other sources like bottled water for meeting their daily water demand. 25 percent of them depends on open well within their premises or nearby area. 19 percent of them rely on public tap and the remaining 12 percent depends on Bore well/ Tube well. The availability of water purifier is observed to be 91 percent as per the survey. Most of the shops, restaurant and resorts have washroom facility, out of which 46 percent of them have western latrine facility, 48 percent of them have washbasin inside and only 6 percent have separate urinal facility.

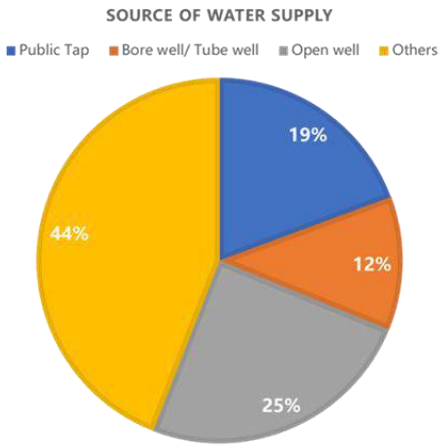


Figure 6-6 Source of water supply (middle)

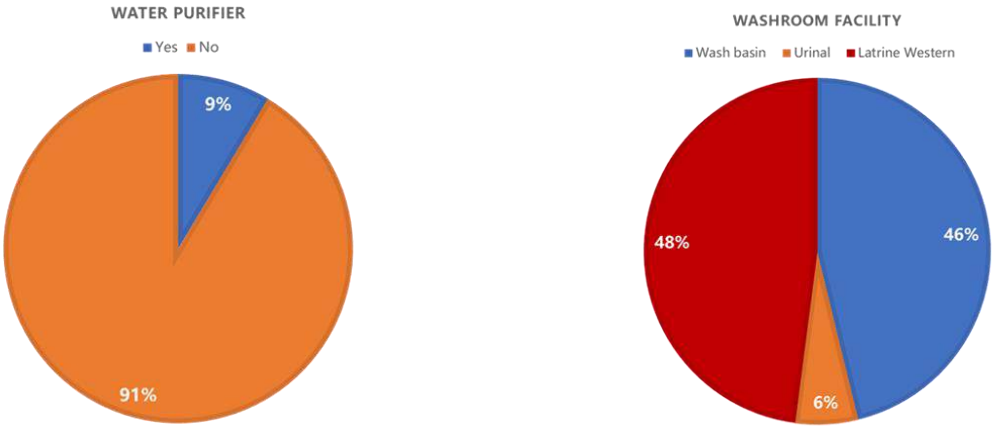


Figure 6-7 Water Purifier (Left); Washroom facility (right)

5. Solid waste management

The cleanliness of beach is being considered very important among users. Thus, a proper management of Solid waste should be given higher priority. For the purpose,

survey was conducted to collect the information regarding the solid waste management in the Kovalam beach.

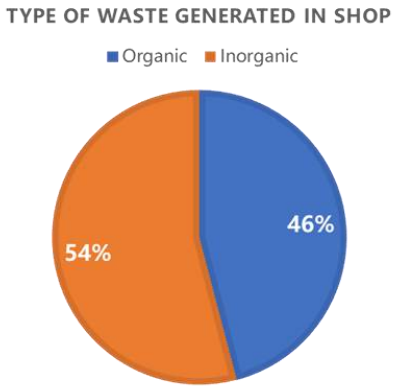


Figure 6-8 Type of waste generated in shop (middle)

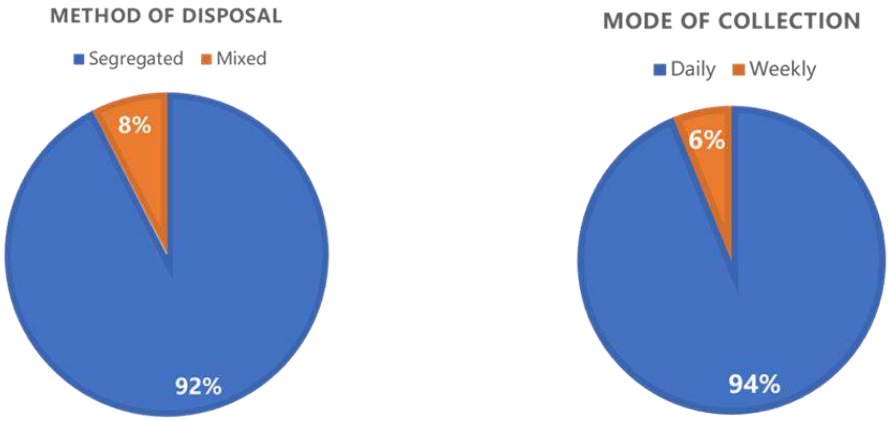


Figure 6-9 Method of disposal (left); Mode of collection (right)

The disposed Organic and Inorganic Solid waste in Kovalam beach is co-ordinately collected by the Haritha Karma Sena and Green Kovalam charging a monthly user fee of 1000 or 1500 per month for waste collection. About 9 percent of the users are burning Inorganic waste within their premises which is extremely harmful for the environment. Also, according to the survey, it observed a lack of litter bins in and around the beach. Around 94 percent of responders stated the insufficiency of litter bins at Kovalam beach, due to which most visitors are encouraged to do unauthorised dumping. The remaining 6 percent that have litter bin facility shown in the fig 6-12 represent response recorded from the resorts.

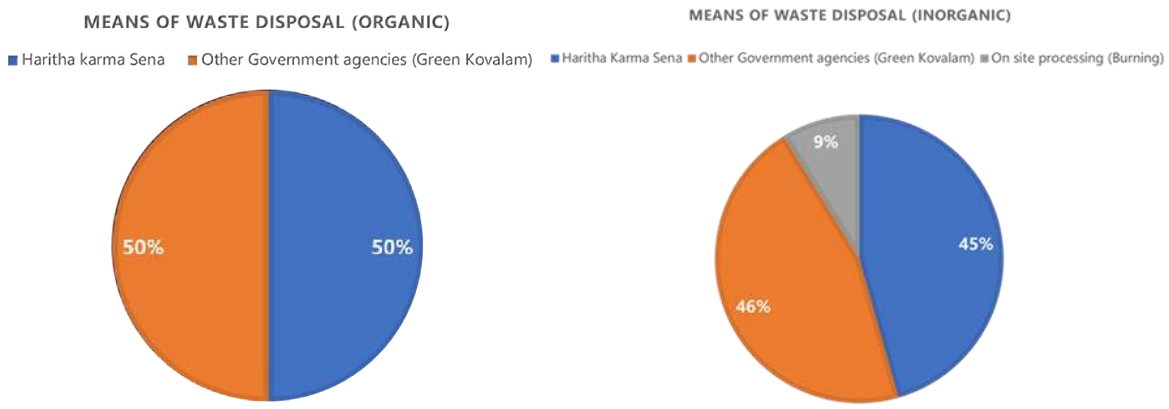


Figure 6-10 Means of waste disposal – Organic (left); Inorganic (Right)

Around 86 percent of the respondents are satisfied with services provided by government agencies like Haritha Karma Sena and Green Kovalam on Solid waste management; 12 percent are highly satisfied and only 2 percent are unsatisfied with their services.

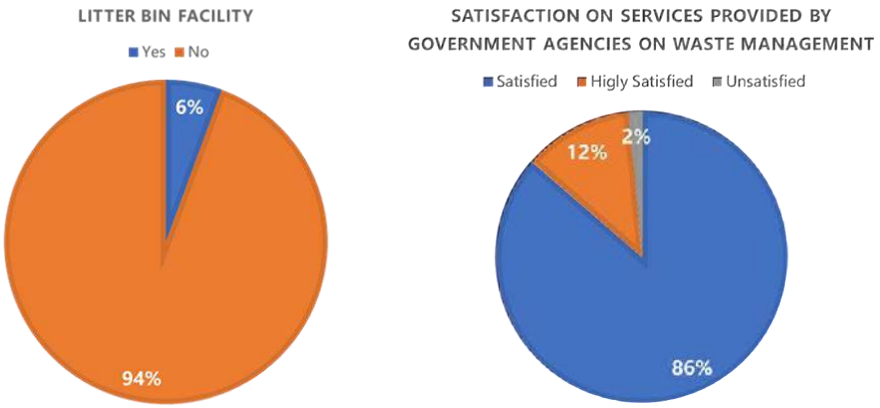


Figure 6-11 Litter Bin facility (Left); Satisfaction on services provided by government agencies on waste management (right)

6. Liquid waste management

The cleanliness of the beach is also determined by the management of liquid waste generated from the shops, restaurants, and resorts along the beach. Thus, the existing system of liquid waste management in Kovalam beach were recorded as a part of the questionnaire survey.

According to the survey, about 99 percent of the shops have septic tank within their premises. Only 1 percent agreed that the liquid waste is being discharged directly to

the sea. But on reconnaissance survey, the sea and the surrounding drains were observed to be more polluted with liquid waste generated from around the beach.

The need for public toilets was found to be a prerequisite requirement as per the beneficiaries. From the survey, the frequency of usage of available toilets (frequency<10) in Kovalam beach which includes the toilets in the shops and restaurants other than the existing 2 public toilets, was found to be 94 percent.

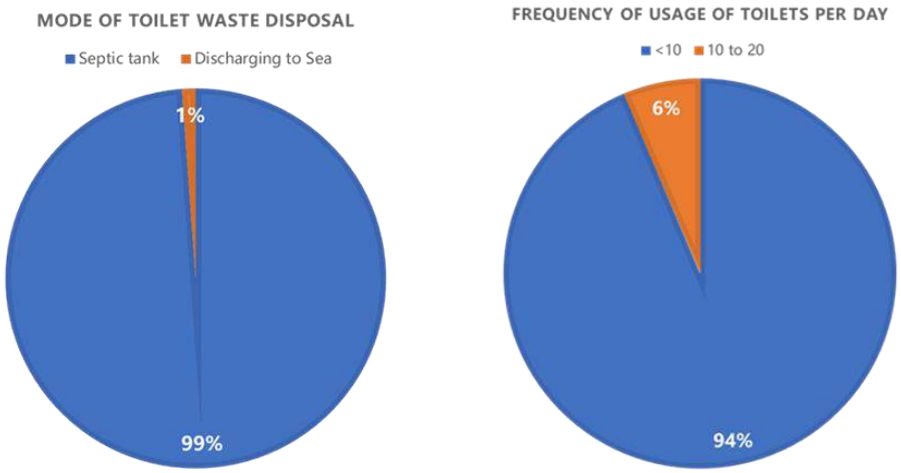


Figure 6-12 Mode of toilet waste disposal (left); Frequency of usage of toilets per day (right)

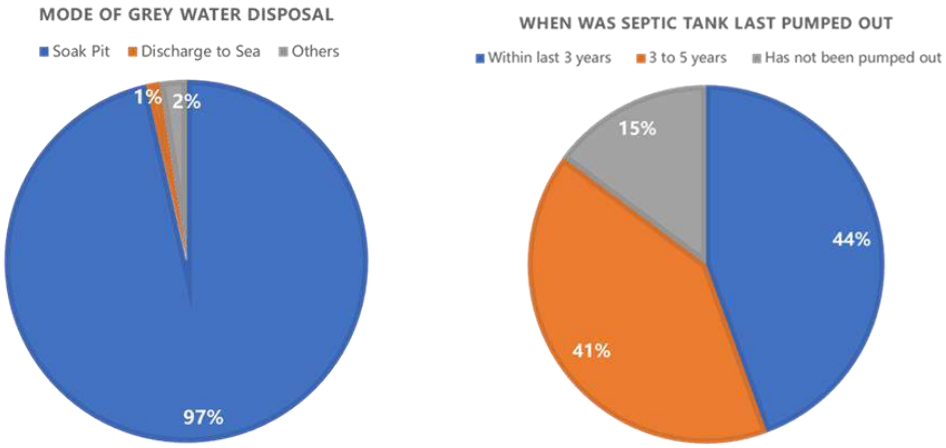


Figure 6-13 Mode of grey water disposal (left); Time period in which the septic tank was last pumped out (right)

Around 99 percent of the grey water discharge from the shops and restaurants are collected in Soak pit; and remaining 3 percent is either discharged to sea or by any

other means of disposal. In some cases, the grey water is also pumped directly to the septic tank. The responders also stated that the septic tank within their premises have sufficient capacity to hold sewage for years in which about 44 percent of the shops have cleaned their septic tank within every 3 years; around 41 percent in every 3 to 5 years and the remaining 15 percent of the shops has not cleared the septic tanks yet.

7. Condition of Footpath Lighting and availability of CCTV Camera

The maintenance of the infrastructural facilities available in the beach is of utmost importance to keep the beach always welcoming the visitors. Lighting is an important facility that always keep the beaches vibrant and joyful even in the darkest of the day. During the survey, it was observed that around 65 percent of the available lights are in working condition; the remaining 35 percent is wither not working or very rarely works.

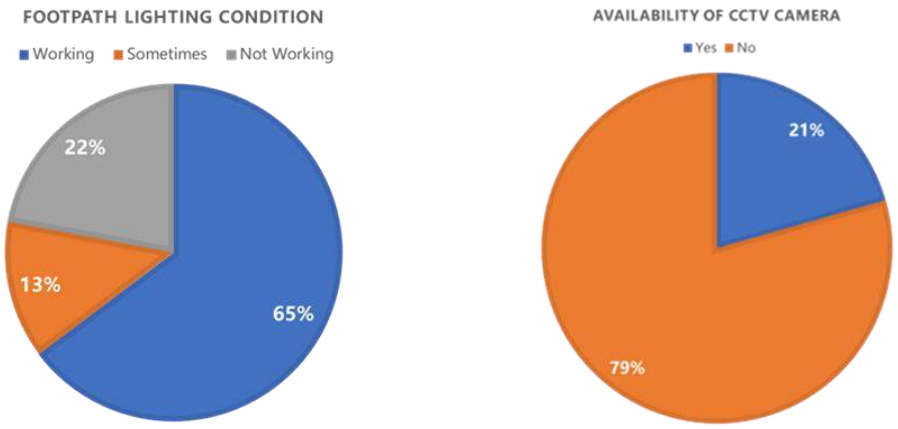


Figure 6-14 Condition of footpath lighting (left); Availability of CCTV (right)

The CCTV camera is another major lacking in Kovalam beach in which only 21 percent of the CCTV camera are available and in working condition, which includes the CCTV inside the shops and provided in the outdoor; the remaining responded there is a lack of about 79 percent CCTV cameras at the designated locations. The availability of CCTV is closely connected to ensuring the safety of the visitors.

8. Damage caused by Coastal Erosion

During monsoon, the rough sea conditions pushed the waves to the landward side causing erosion. But about 94 percent of the shops and restaurants are not affected

by the erosion; only 6 percent of the shops lying close to the sea are only affected due to erosion.

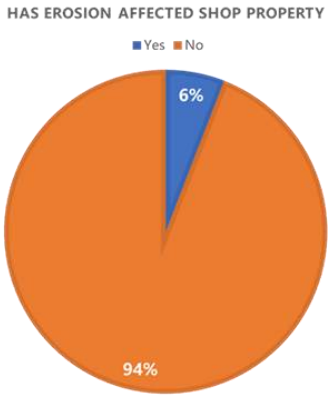


Figure 6-15 Damage caused by coastal erosion

9. Visitors Survey

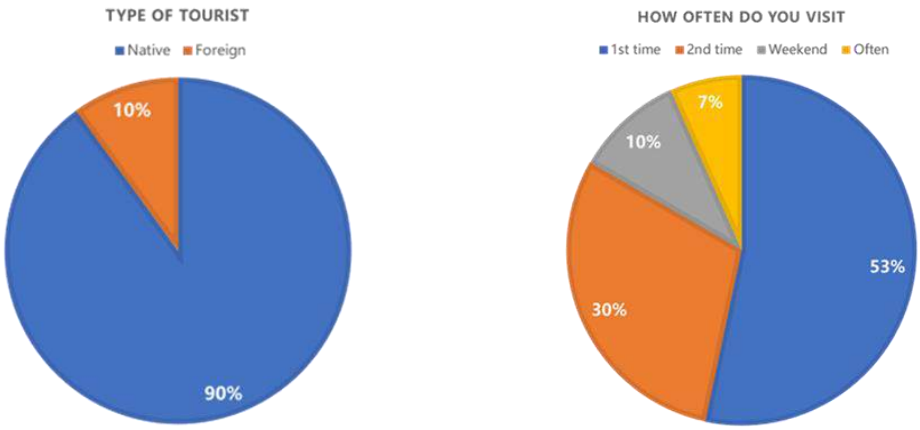


Figure 6-16 Type of tourist (left); Period of visit (right)

The Visitor responses were also recorded with the help of questionnaire survey. Since the wave of Corona virus pandemic, the beach is mostly visited by the native and domestic tourists. From the survey, about 90 percent of the tourists visiting the Kovalam beach are Native. Most of the tourists are first time visitors, i.e., about 53 percent visited the beach for the first time; 30 percent was visiting for the second time; 10 percent visit the beach on weekends and only 7 percent opined that they visit often.

Well cleaned and maintained beaches are particularly important because everyone will visit the beach as beaches display the destination for enjoyment and recreation

activities. Thus, about the cleanliness of the beach were opined, in which about 45 percent of the visitors are satisfied with the cleanliness; 34 percent opined it to be good; 14 percent opined it as moderate, and the remaining 7 percent opined that the beach is not clean and poorly maintained.

Around 72 percent of visitors are satisfied with the cleanliness of toilet facility and changing room at beach; the remaining 28 percent are not at all satisfied with the cleanliness of toilet facility.

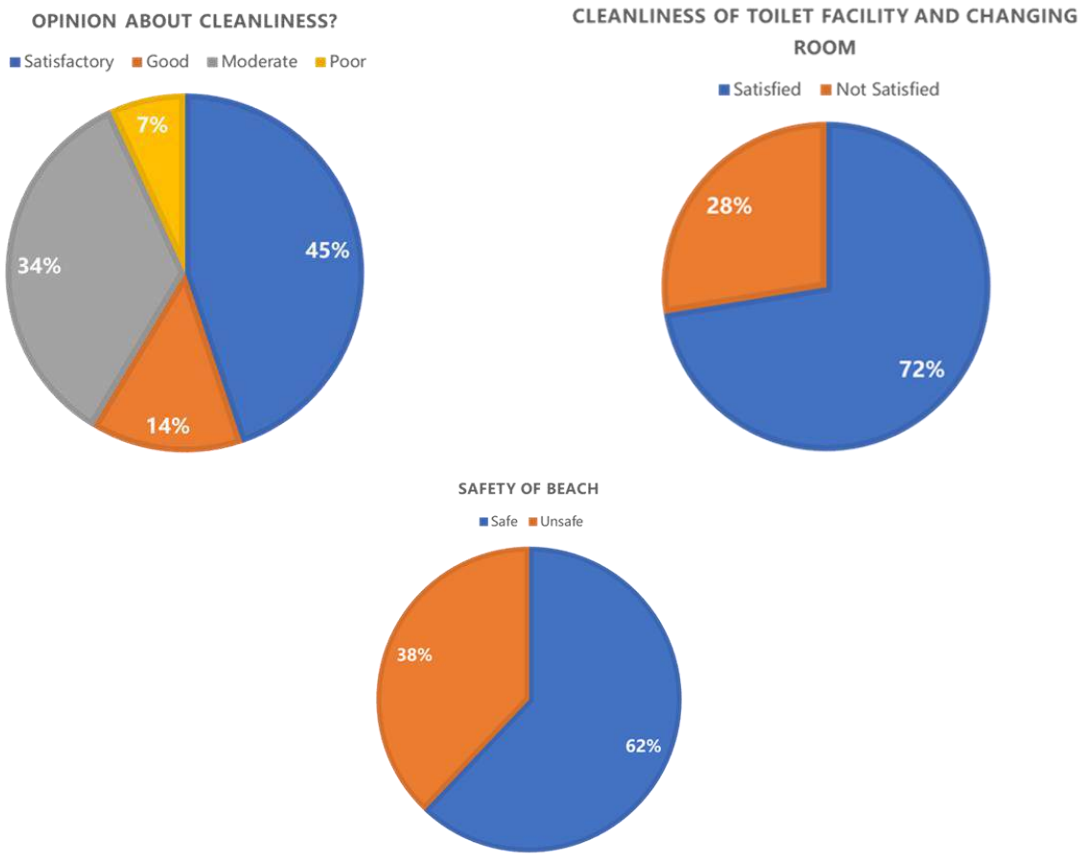


Figure 6-17 Cleanliness and Safety Concerns

The survey also enquired about the safety of the beach for the visitors and about 62 percent of the respondents found the Kovalam beach as a Safe place to visit anytime in a day; and the rest 38 percent opined that the beach is not safe especially during night.

About 96 percent of the visitors opined that the existing lights provided at the kovalam beach are in better working condition and the remaining 4 percent respondents opined that the light are either not working or not properly working.

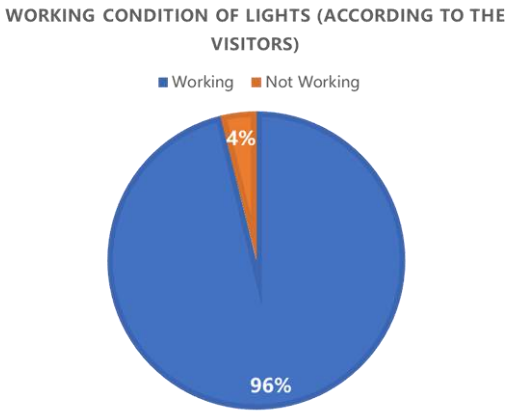


Figure 6-18 Condition of Lights in Beach

About 22 percent of the visitors opined there is need of more food court in the beach and the majority 78 percent are already satisfied with the current food courts available in the beach.

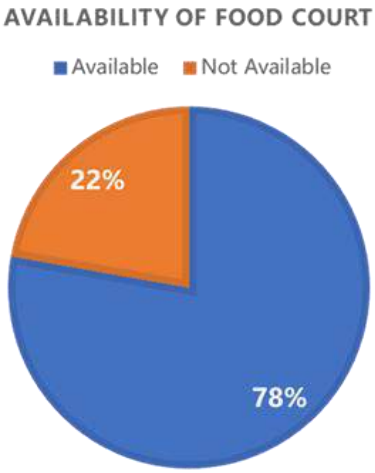


Figure 6-19 Availability of Food court

There are also perceptions to improve the parking area of the beach. In addition, also to compliment the beach with play area for children. These two elements were also surveyed. About 70 percent of the respondents are satisfied with the existing parking facility at the beach; and remaining 30 percent showed dissatisfaction with the

parking facility. About 44 percent of the respondents showed the interest to incorporate play area for children to the beach.

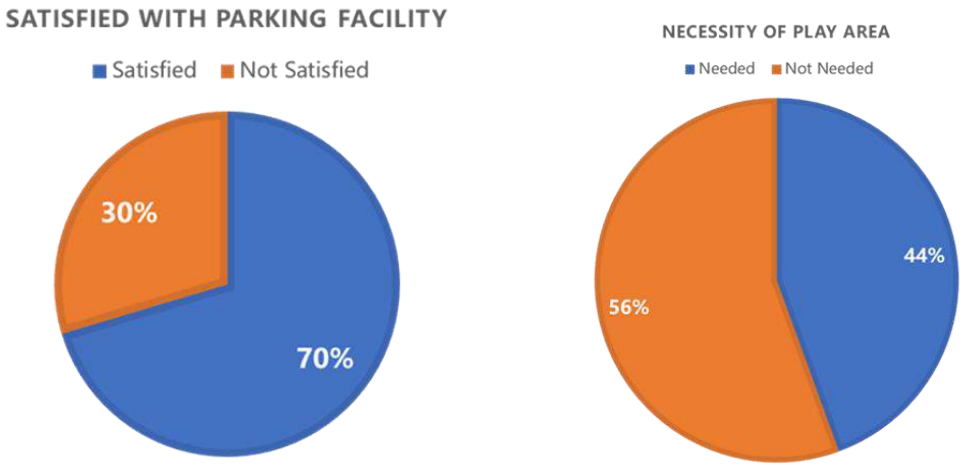


Figure 6-20 Necessity of Parking Facility and Play Area

6.1.1 Conclusion

The survey concluded that there is a severe lack in the facilities at the beach. Also, the poor control in the operation and maintenance of the existing beach facilities and its surrounding caused the destination to be less attractive to the visitors in the recent days. Thus, it is extremely important to develop this international tourist destination by adopting infrastructural facilities with world class standards, in addition to which the upgradation of the existing infrastructure is also important.

07 Project Concept

7 PROJECT CONCEPT

7.1 Development of Kovalam

The Master Plan of Kovalam Beachfront Development in Phase I is shown in Fig 7-1. The Master Plan represent the Concept proposals of Infrastructural development to be executed at the Project area, which includes Renovation of Silent Valley Sun Bath Park (Anantha Park); Royal Gateway entrance at Hawa Beach; Bridge connectivity at the Edakkal/ Mid- Rock; Walkway along Hawa beach connecting the Anantha park to the Beach; Renovation of existing walkway and proposing new Infrastructure facilities like Toilet Block, Gazebos, etc. at Light house Beach; Development of Corporation Land; Ambulance entry at southern end of Light House Beach; Connecting bridge providing access to IB Beach.

Figure 7-1 Master Plan of Kovalam Beachfront Development.

7.1.1 Beach side infrastructure

The existing walkway at Light house beach is proposed to be renovated and a diaphragm wall need to be constructed to protect the walkway from the effect of extreme waves. A walkway from Silent valley sun bath park to the main entrance of Hawa beach is also proposed. Designated spots will be provided for the installation of lighting, information boards, seating facilities, underground cabling along the renovated walkway and Gazebos in beach area. A unique identity of Trivandrum royal heritage to be brought in designing of all the components like the light poles, handrails etc. to be installed in the region.

Walkways are paved with black checkered terrazzo tile, red checkered terrazzo tile and yellow tactile paving. Keeping the beautification of the beach in mind suitable landscaping are proposed. Additional components proposed are seating benches, light poles, drain spouts, bollards, stairs, stone pillars, spotlights and pergola along the walkway as part of the beautification work.

Figure 7-2 Pergola along the Walkway from Anantha Park to main entrance of Hawa beach

Stone benches with finished granite slab on top, high mast? Mini mast lights along the route, Kiosks are proposed at different areas in the walkway, stairways leading to the beach and RCC Diaphragm walls throughout the length to protect the sea attack is planned.

Figure 7-3 Walkway passing through the rocky mass at Hawa Beach

Figure 7-4 Seating provisions provided along the walkway

Figure 7-5 Walkway from Anantha Park to main entrance of Hawa beach

The *Gazebos* provided along the walkway at Light House Beach are total 3 in number and has been designed as per traditional aspect with wooden seating and stone pillars. It serves the purpose of sightseeing as well as relaxing.

Figure 7-6 Gazebo along Light House Beach walkway

The existing Toilet Block at south end of Light House Beach is proposed to be renovated fulfilling access for male, female, differently abled and arethetically pleasing. For female toilet section four water closets, for shower, one janitor room and three wash basins. For male section three water closets, three shower, four urinals, three wash basins and one janitor room.

Figure 7-7 Toilet Block at Light House Beach

7.1.1.1 Ambulance Entry Point- Development of access road to the Southern part of the beach

The South end of Light House beach along with the existing park will be developed in such a way as to enable Ambulance access into the beachfront. The existing roadway leading from Light House gate to the beach shall be developed as well as Graffiti work /sculptures can be displayed in existing compound wall and rocks. The development shall be suitable to facilitate the operations of Electric buggy system and SEG way, etc. The existing Gandhi Statue will be renovate with proper Landscaping, Lighting, etc.

Figure 7-8 Development of the access road at the southern end of light house beach- 3 D View

Figure 7-9 Ambulance entry point at the Southern end of Light House Beach

7.1.1.2 Royal Gate House entrance at Hawa Beach:

A Traditional/Heritage style Gate House building at the entrance plaza of Hawa beach is proposed considering two options,

- ✓ Option 1 – At the present entrance of Hawa Beach within the Road/ Beach limits.
- ✓ Option 2 - A grand royal entry occupying a portion of adjacent private land.

The additional land to be acquired from the private party (Hotel Raviz) can enable smooth traffic and parking at the entry.

The Gate House entrance at Hawa beach comprises of Tourist information centre, security cabin, ticket counter, security cabin, easy access for differently Abled, lighting bollards, electrical panel room, entrance arch and entrance pergola. Entrance arch is of RCC structure with cast iron design work at the top. The entrance is furnished with a stone pergola with pillars. Ramps are provided at the front.

Figure 7-10 Gate house building at the entrance of Hawa Beach

Figure 7-11 View of Gate house entrance from the beachside

Figure 7-12 Night View of Gate house entrance

7.1.2 Anantha Park (Current Silent Valley Sun Bath Park)

Figure 7-13 Anantha Park

The renovation of the park will exhibit a heritage appearance to the existing structure incorporating it with landscaping, hardscaping and electrification works. Without affecting the existing architecture and integrating some new elements, blending the complete structure with traditional aspect. The approach is to minimalize demolition and keeping the vegetation intact.

Figure 7-14 Beach View from Anantha Park

The existing structure is proposed to be developed to an Art Café, kitchen block at the ground floor and a library room on the first floor. Structural elements are changed in connection with matching the thematic representation of art café, such as columns, roofs etc are made with stone masonry on columns, wooden finishes in

ceiling, mangalore pattern tile with ceiling tiles etc. The surrounding landscapes are provided with the provision for sitting and relaxing for reading. For security and controlling aspects security cabins are provided. Interlocks are provided around the pool area. In addition, an Open-air theatre is proposed for entertainment purposes. All the developments shall be taking into account the salient, ambience of the area.

Figure 7-15 Proposed Layout Plan of Anantha Park

Figure 7-16 Entry to Library room on first floor

Figure 7-17 View to Beach from first floor of Anantha Park

Figure 7-18 Landscaping at Anantha Park

Figure 7-19 Steps leading to the Government Guest house incorporated with landscaping

7.1.3 Rock Bridge Connecting Edakkal and Water Sport Facility Centre

Figure 7-20 Stone Bridge at the Edakkal/ Mid- Rock

At the mid rock on Hawah & Eve's beach, Stone arch bridge is proposed for interconnecting the two existing rock mass. Over the Rock mass, on the farthest end,

the branding of 'KOVALAM' is proposed. A launching deck to facilitate water sport activities is also planned to be incorporated.

7.1.4 Upgradation of Corporation land

The Corporation land is proposed to be developed to a Happening Area. The proposal for the plot includes an Open-Air Theatre, Admin block, Restroom and amenities centre for male, female and differently- abled, an internal walkway, Open Gym, Play area, etc.

Open Air Theatre consisting of a feature wall for the purpose of displaying history as well as cultural aspects are also proposed. Cobble stones and kerb stones are used along the pathway. Natural stones are used near pathway and admin block for the landscaping purpose. Granite benches are provided for sitting. The frontage of Admin block as well as Restroom and Amenities centre blocks are paved with interlocks.

Figure 7-21 Corporation Land development Layout- 3 D

Figure 7-22 Proposed concept design at Corporation land

Figure 7-23 Night view of the concept design at Corporation land

Figure 7-24 Admin Block at Corporation Land

Admin block is proposed as a structure with ground and first floor which includes a green room and room for beach manager, reception, security guard office, staff room, toilet facilities, first aid room and a mini conference hall on the ground floor. First floor includes Amenities, storage room, electrical panel room, surveillance and security room, security guard rest area and library with additional three lavatories as well as a janitor room. The foundation for the public amenities building is laid for three storied building considering future vertical expansion.

Figure 7-25 Restroom and Amenities Centre at Corporation Land

Restroom and amenities centre includes both gents and ladies toilet sections with separate entrance, easy ramp access for differently abled, feeding room, etc.

7.1.5 Coconut Plantation Land.

A land parcel of about 7 acres lying beside the Corporation land is planned to be acquired in Phase I which shall be developed as detailed in Section 7.2. The details of Land acquisition are discussed in Section 7.3.

Figure 7-26 Connectivity leading to Corporation land and Coconut Plantation land

7.1.6 Access to IB Beach

Phase I of the project includes the Land Demarcation of IB beach and an access bridge.

The access to IB Beach, lying between the Light house and IB Bungalow, is proposed from the road leading to the Light House through a vacant land beside Light House. A Cable stayed bridge is proposed to access the IB Beach.

The cable stayed Bridge comprises of 40 mm thick laminated toughened glass flooring consisting of 2m width, and glass railings with handrails on either side with a height of 1.2 m.

Figure 7-27 Proposed Access to IB Beach

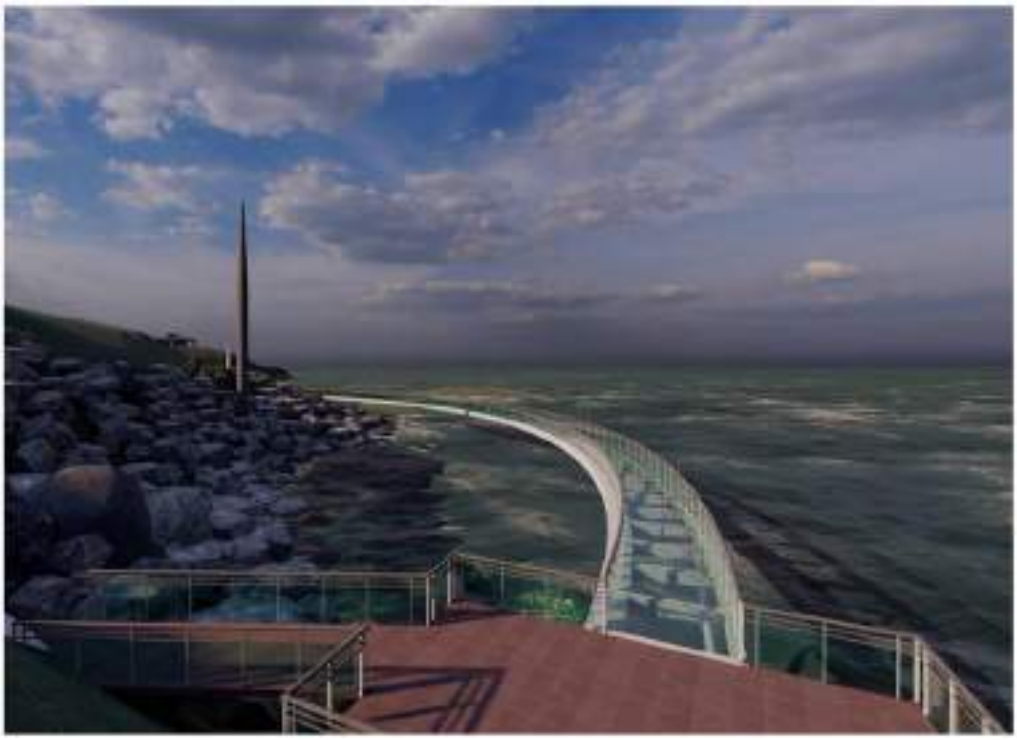


Figure 7-28 Entrance of Cable Stayed Bridge leading to IB Beach

7.1.7 Land Demarcation

The boundary demarcation of IB Beach and Adimalathura Beach by Bio- fencing the boundaries is planned to be included in Phase I of the project.

Figure 7-29 Proposed Land Demarcation at Adimalathura Beach

Figure 7-30 Land Demarcation at Adimalathura Beach- View 1

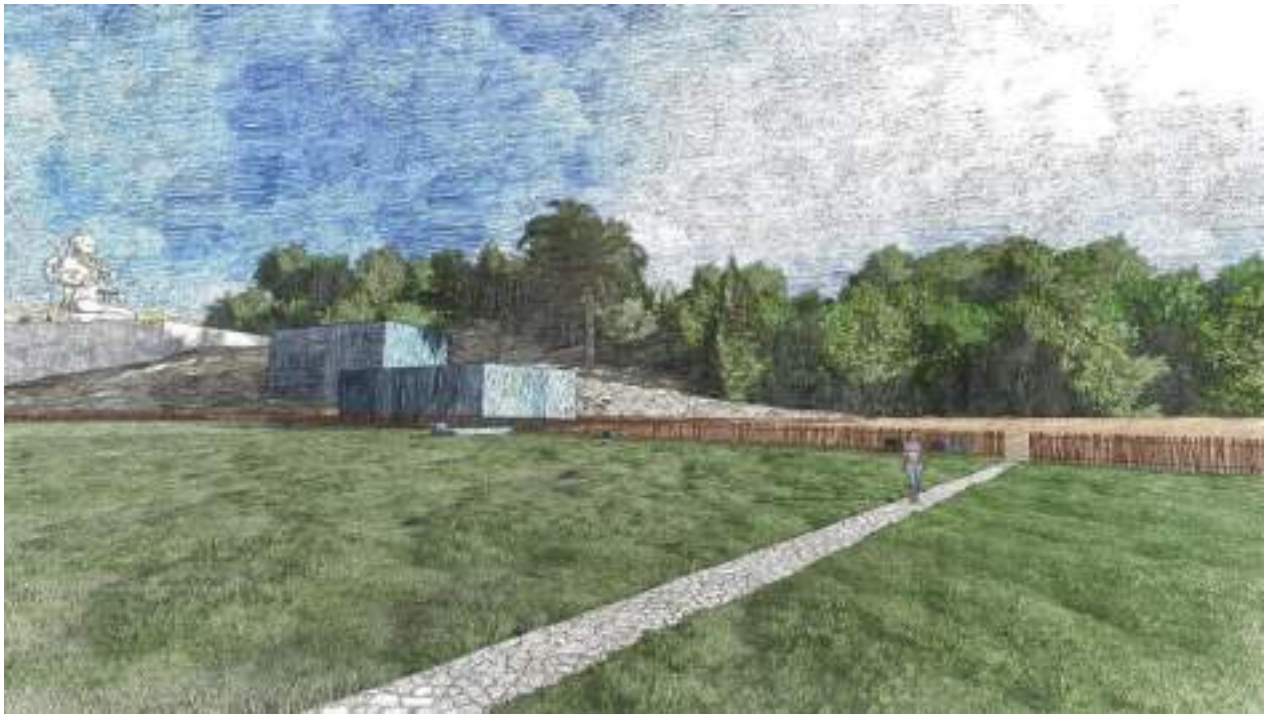


Figure 7-31 Land Demarcation at Adimalathura Beach- View 2

7.2 Development of Adjacent Beaches and Development of Coconut Plantation Land (Phase II)

Phase II of the project aims to develop two other beaches adjoining Kovalam with a potential for development such as IB Beach and Adimalathura Beach.

Phase II also envisages the development of the Coconut Plantation land along with connectivity to main roads, Corporation Land, etc.

7.2.1 IB Beach

The beach area between light house and IB is proposed to be developed as an executive beach with controlled entry (charged with an entry fee) in Phase II. The proposed bridge providing access to the IB Beach will attract and welcome tourists to the Beach.

Figure 7-32 Connecting bridge giving access to IB Beach

7.2.2 Adimalathura Beach

Adimalathura, a beautiful white sandy beach is proposed to be developed with the concept "Fisherman's Village". The beach along with the adjacent fisherman is to be developed through responsible tourism.

The different activities which form the part of fishermen's daily routine such as long net fishing, fish auctioning, live seafood counters, folklore and also art performance can be explored to develop this beach as the most sought- after destination.

Local accommodation, fooding, Kayaking in nearby estuary and rivers by engaging the local people providing special training can uplift the local community socially and economically.

Cleaning equipment is required as beach is to be cleaned on a regular basis and a proper pathway is proposed. The marshy land area is to be developed by using

wooden structures and mangroves can also be planted. Bamboo huts are proposed to be constructed. Toilet blocks, changing rooms, cloak rooms and locker rooms and toilet facilities for lifeguards shall also be provided. A police aid post is to be provided.

7.2.3 Development of Coconut Plantation Land

Lack of proper parking facility for domestic tourists is one of the major challenges faced in Kovalam. The land parcel of about 7 acres, as identified to be acquired in Phase I of the project (Refer 7.3) is proposed to be developed which can resolve the parking as well as the connectivity woes at Kovalam.

A parking facility along with OAT, Gym, Kiosks, play station for children, and other entertainment facilities is proposed on the 7 acres (approximate) of coconut plantation land situated just behind the corporation land.
Connectivity to the main roads from this land as shown in Fig 8.9 is to be developed.
A Sewage treatment plant is proposed in the land for treating the sewage around the region- the capacity, collection of sewage, etc is not covered in the study. Pedestrian pathway connecting this land through Corporation Land leading to the beach along with other existing pedestrian pathways are planned to be developed wherein proper lighting, flooring, surveillance system, etc are proposed.

The light and power system has been considered for Phase II development also. The light includes general and architectural lighting for the development. The beach area general light can be achieved by suitable high mast light system. The panel boards and building internal wiring system all has been proposed as per the IS code standards and all the material considered are weatherproof.

The Development of the coconut plantation will only be executed in Phase II after clearing the Land acquisition in Phase I.

The materials used in designing and construction of the proposed concept is listed in Annexure III.

7.3 Land Acquisition

Figure 7-33 Land to be acquired for the development activities

The project requires only limited land for the development of Corporation Land. Currently, the Corporation land (Survey land 31), has only a pedestrian access to the beach. The corporation land, being cut off from the main beach view, due to a Restaurant functioning at beach side, can be developed to the full potential by providing a direct access/view from the beach. For the purpose, the buildings included in the Land acquisition is identified which is shown in the Fig 7-33. Two options of proposal offering access to the Corporation Land are considered,

- Option 1: Providing direct frontal access to the Corporation land from the Beach by acquiring and dismantling the Restaurant in front of it and compensating them as per the current market value.
- Option 2: Widening the existing pathway of road access leading to the Corporation land by partially acquiring the Restaurants lying beside.

A Land parcel of 7 acres (approximate) should be acquired for the development of Coconut Plantation land (Survey land No: 31, 32 and 35). This will develop the connectivity to the Corporation land and Coconut plantation Land from the main road, as a Parking lot facility is proposed in the Coconut planation Land in Phase II.

Figure 7-34 Land to be acquired in No Man' s land

The entry to IB Beach from the Light house road is through a proposed Suspended Cable Stayed bridge with clear glass top. For which Land (Survey Land No: Between 56 or 57) is to be acquired lying beside the entrance of Kovalam Light House.

08

Engineering Design

8 ENGINEERING DESIGN

8.1 Codes and Standards adopted for Engineering Design

❖ The latest versions of the following Codes and Standards are used in this calculation.

Table 8-1 Codes and Standards for Structural Design

A	**IS:456-2000**	**Code of Practice for Plain Reinforced Concrete**
B	IS:875 Part I to Part V	Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures- Imposed Loads.
C	SP:16	Design aids for Reinforced Concrete to IS:456
D	SP:34	Handbook on Concrete Reinforcement & Detailing
E	IS 1893 (Part1):2016	Criteria for Earthquake Resistant Design of Structures
F	IS 13920: 2016	Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces
G	IS 800-2007	Code of practice for general construction in steel
H	SP 6-1	Handbook for structural engineers- Structural steel sections

❖ The following standards and codes (latest editions/ revisions) shall be used to govern the detail design of the electrical system:

- BIS: Bureau of Indian Standard.
- IEC: International Electro technical commission.
- Practices being followed by KSEB.
- Regulations laid down by Indian Electricity Rules.
- IS: Indian Standard.
- Rules and regulations laid by KSEI.
- National Electrical Code.
- National Lighting Code.
- KSEB Supply Code
- Any other regulations laid down by the local authorities.

- Regulations laid down by tariff advisory committee / Fire insurance regulations.

❖ The design and planning of fire protection, Detection shall be done while keeping in view of the following codes and standards (Latest editions)
- National building code
- IS: 15683,9457,1239 and other relevant standards
- Local fire authority
- NFPA

8.2 Geological Investigation

8.2.1 Geology of Thiruvananthapuram

Thiruvananthapuram is the southernmost district of Kerala which has a total area of 2192 sq.km and forms 5.64 % of the total area of the state. The large part of the district is made up of Archean gneisses. The main rock type are the charnockites, pyroxene granulate, garnet- biotite gneisses, garnet-silliminate gneisses, quartz-feldspar gneisses with or without garnet, calc-granulates and quartzites. All the above rock types are traversed by dykes of doloritic and gabboric composition. Swarms of thin, impersistent quartz and pegmatite veins also traverse the gneisses. Charnockites are acidic to intermediate in composition. Irregular patches of khondalite, veins of pegmatite and quartz are seen within the charnockite. Pyroxene granulite occurs within the khondalite as thin discontinuous lenticular bands conformable to the foliation planes. Thin and impersistent veins of pegmatite and quartz are also very common. Quaternary sediments which include sand dunes, soils, teris, black mud, alluvium filling river banks and mouths are also met with. The crystalline in the district in general strike in a more or less northwest, southeast direction. Regional dips are easterly, but local opposing dips are also noticed. The dip caries from 250 to almost vertical.

8.2.2 Geological setting and field relationship

Predominant lithological features observed in the study area are coastal sand deposits and exposures of massive charnockite.

8.2.2.1 Coastal sand deposits

The coastal sand deposits of the kovalam beach shows very conspicuous black sand which occur in irregular patches and in alternate black and white layers within the beach sands. The source of these sands lies in the crystalline Precambrian complex consisting of khondalites, charnokites and garnet gneisses and pegmatites of Western Ghats. Earlier studies, envisage that the beach deposits are replenished with every monsoon have led to the belief that also there could be a considerable offshore resource for heavy mineral. Heavy minerals of the beach sand in the order of abundance are opaque, sillimanite garnet, zircon, monazite and kyanite. The beaches of Kovalam are the parts of a submergent coastline and at the same time are morphodynamically in a reflective stage. Beach profiles thus periodically change in the temporal wave climate and in accordance with the grain size-beach slope relationship.

Figure 8-1 Representative field photographs of the black beach sand deposit at Guest house beach.

8.2.2.2 Charnockite

Charnockite occurs as large patches extending for scores of meters around Kovalam, Vizhinjam, Mannanthala and Nedumangad. Two generations of charnockites are reported and both the generations have comparable mineralogical assemblage and consists of K- feldspar + plagioclase + quartz + orthopyroxene + garnet + biotite. Other than these two major horizons, garnet granite (garnet+feldspars+quartz neosomes) also occurs as patches, domes/sheet rocks showing both concordant and cross cutting relations with khondalites and charnockite suites. Major granulite masses in southern India constitute magmatic charnockites. Compared to the older charnockite massifs from Madras-Northern-Nilgiri blocks, the Madurai and Trivandrum blocks expose early- to late-Proterozoic charnockite massifs.

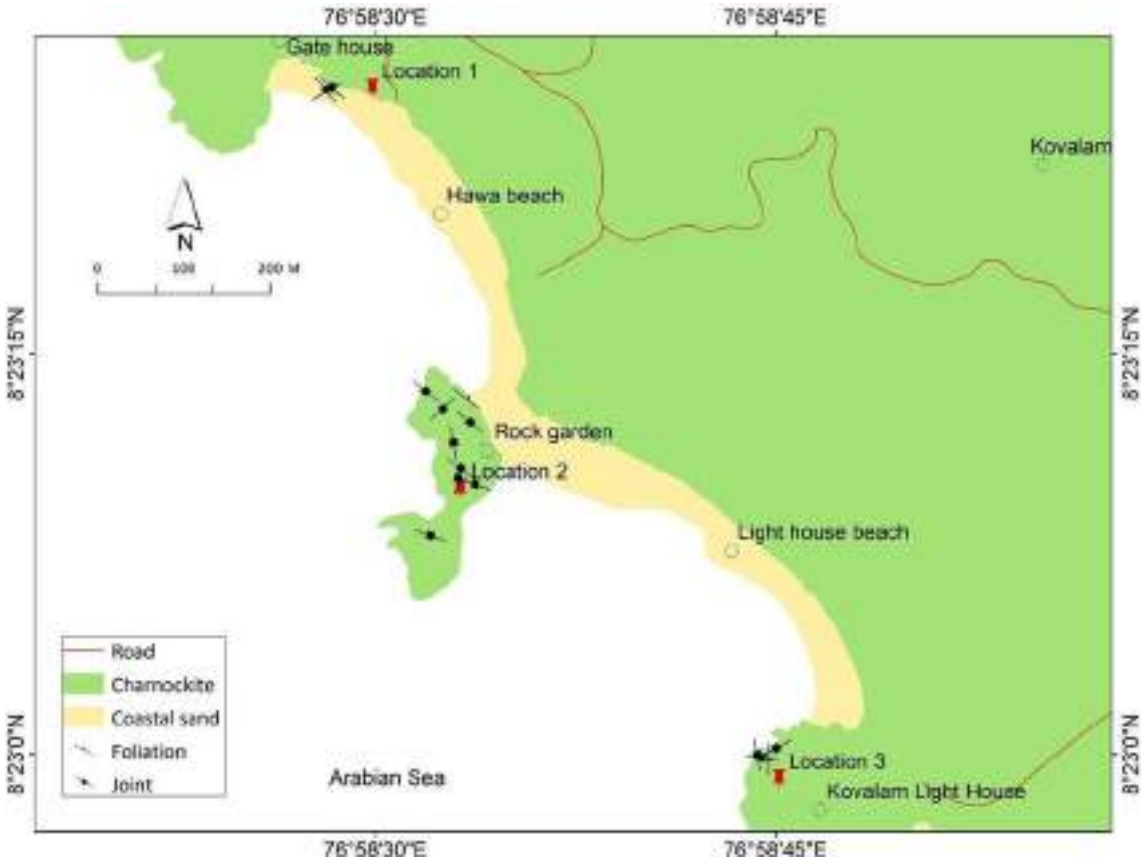


Figure 8-2 Geological map of the kovalam beach, showing field investigated localities and major rock structures.

Most of the exposed rocks of these massifs comprise intermediate type (enderbites) and/or felsic type (charnoenderbites to charnockites). Their greenish to

greenishyellow colour in fresh outcrops, unusual for granitic rocks, is due, at least in part, to fine alteration and fracture fillings in the feldspars. Both types usually have a dark greasy homogenous and massive appearance in quarry exposures. Some of the massive charnockite exposures show streaky gneissic foliation and signs of retrogression (retrogressed portions are lighter in colour). The lineation, generally parallel to the foliation, observed in some of the massifs is made conspicuous by the differential weathering of feldspars and quartz (fig.8-2).

Figure 8-3 Representative field photographs of the massive charnockite with multiple joints and fractures at Edakkal/ Mid- rock, Kovalam.

The rock exposures of the area predominantly belong to charnockite massifs mainly consisting of felsic charnockites of Trivandrum Block (fig 8-3). Previous studies proposed a two-stage model for the formation of southern Indian charnockites. Emplacement of basalt with low water content would lead to dehydration melting of the lower crust forming intermediate charnockites. Conversely, emplacement of hydrous basalt would result in melting at higher fH2O favouring production of more siliceous felsic charnockites. Southern Indian crust affected by at least two crustal thickening phases, one during late Archaean to early Proterozoic and one during late Proterozoic. The basement rock, Charnockite and gnessic charnockite with highly fractured with multiple joints constitute the large rocky promontories in the study area. Massive charnockite are dominantly consist of quartz, K- feldspar, plagioclase, orthopyroxene, garnet, and biotite. Accessory minerals are Fe–Ti oxides (dominantly ilmenite), apatite, and zircon. Irregular patches of khondalite, veins of quartz, garnet-

bearing charnockite are also observed. The available age data indicate that the massive charnockites are older and their ages range between 2155 and 2930 + 50 Ma whereas the younger incipient charnockite ages 550 Ma.

8.2.3 Objective and Methodology

The focus of this report is to make a preliminary assessment of the geological suitability of the bedrock along the kovalam beach as a potential location for an upcoming tourism development project. Surface geological investigation field visit was conducted at the proposed sites in May 2022. This include preliminary geological mapping, physical identification of joints, fractures, faults and rock fabrics of the basement rock. Surface geologic investigations concentrated on the multiple joints, fractures and defect zones on the specific proposed sites. Rock structural discontinuities were located and strikes and dips of these features were measured and plotted to develop a preliminary structural analysis of the bedrock. The strike and dip of joints and rock foliations were measured in the field and analysed to determine if there were any preferred structural orientations in the bedrock.

8.2.4 Field Observations

8.2.4.1 Location 1: Gate house beach

Charnockite exposure were greenish grey to bluish black colour, medium to coarse grained predominantly equigranular, granulitic texture, massive, gneissic in parts, patches of dark colour is due to the presence of orthopyroxene and cordierite. Rock surface is weathered with presents of multiple joints. The major joints observed are NNW-SSE to NW-SE directions with dip ranging from 600 to 700. Multiple vertical joints with strike 210-30, 220-40 are present (fig 8-4).

Figure 8-4 Representative field photographs of the charnockite exposure with multiple joins near gate house beach.

8.2.4.2 Location 2: Edakkal/ Mid- Rock

The proposed site is located entirely within Charnockite promontories, the rock is medium to coarse grained, greenish grey to bluish black colour, exhibits equigranular, granoblastic structure, in parts the grains vary in their size and shape. The most important minerals presents in the rock are quartz, K- feldspar, plagioclase, orthopyroxene, garnet, and biotite. The light coloured bands are made up of feldspars and quartz while the dark bands consist of biotite or garnet. Occasionally garnet present as Irregular patches (fig 8-5). Well foliated, medium to coarse grained gneissic exposure, hornblende bearing gneisses containing amphibolite observed along the entrance of Edakkal/ Mid- Rock. Presence of thin quartz veins are recognized by their clear appearance, vitreous lustre, conchoidal fracture, absence of cleavage and high hardness (fig 8-6).

Figure 8-5 Representative field photographs of the Irregular patches in the massive charnockite exposure at SE side of Edakkal/ Mid- Rock.

Figure 8-6 Representative field photographs of the Irregular patches in the massive charnockite exposure at SE side of Edakkal/ Mid- Rock.

Irregular variation of colours and presence of quartz veins are considered major defect. These variations are due to colour predominant minerals, accessory minerals, textural characters, inclusion, intrusion and variation in temperature and pressure during crystallization. Quartz veins in rocks displaced mineral constituents, and as a result, white lines are formed with silica or calcite minerals. The impact of quartz vein intrusions results in the quality and workability of the rock deposits. The width of quartz veins ranges from a few millimeters to centimeters.

The eastern exposure demarked with an intersection of vertical joints with trending 340-160 and 260-80. The major joint with striking 340-160 have spacing of roughly 1 m. Another minor joints are trending 280-100 with dips of 60 degree to the north. These orientations are similar to the dominant NW-SE direction with vertical dip. Rock near surface is subjected to severe chemical and physical weathering also the fracturing and jointing of rock mass normally increases near the surface (fig 8-7). The joints generally become fewer and tighter as distance from the surface increases. The vertical extension of major joints and fractures are unknown due to the unavailability of cross-cut section also there is no accessibility to the rock exposure far from the shore side. Based on the fracture orientation, which follow the predominant trend of NW-SE and physical rock fabrics colour and texture the exposure must be the extension of charnockite basement rock. Other than those mentioned rock defects this surface geologic investigation did not observed any significant structural or undesirable geotechnical conditions for the further development of the project even though an appropriate Geotechnical evaluation of the bedrock section to measure the strength of the bed rock and extension of fractures is recommended.

Figure 8-7 Representative field photographs of the massive charnockite exposure at eastern side of Edakkal/ Mid- Rock with multiple joints and partially weathered surface.

8.2.4.3 Location 3: Light House

The proposed site is located entirely within the elongated NW-SE trending gneissic charnockite complex. The exposure is predominantly well foliated with medium to coarse grained inequigranular texture. Most of the grains are subhedral to anhedral. It is mainly made up of quartz, feldspar, biotite and garnet. The light coloured bands are made up of feldspars and quartz while the dark bands consist of biotite or garnet. Feldspar grains are distinguished by white to grey colour, sub vitreous lustre and good prismatic cleavages. Quartz grains in the rock are identified by their clear appearance, vitreous lustre, conchoidal fracture, absence of cleavage and high hardness. Biotite grains are recognized by their brownish black colour, flaky habit, pearly lustre, transparency perfect basal cleavage and low hardness. Observed a major intrusive vein of granitic rock roughly 2m width cut across the formation (fig 8-8) causing retrogression in the host charnockite. The rocks along the intrusive areas are lighter in colour margined with large quartz veins.

Rock exposure foliation along NW-SE (270-90) parallel to the regional structure of the western Trivandrum granulite block. Major joint orientation follows the general trend as 350-170. Minor vertical joints are observed with strike of 210-30 and 280-100. The light-coloured granitic intrusion and quartz vein is parallel to the leading joint, which follow the predominant trend of NW-SE. The physical rock fabrics, colour and texture indicate the exposure must be the extension of charnockite basement rock. The intrusive parts are undergone surface weathering and observed laterization in several places. As intrusive constitute major rock defect it' s advised to avoid intrusive veins for the foundation structure.

Figure 8-8 Representative field photographs of the light coloured granitic intrusive rock, NW side of light house.

8.2.5 Conclusions

On the basis of preliminary field investigation with the available surface structural and petrographic observations, the following provisional conclusions can be drawn.
The area forms a part of Precambrian Crystalline rocks of Peninsular India. The proposed site is composed of Precambrian crystalline rocks and their weathered products.

Charnockite massifs, Biotite Gneiss, Hornblende Gneiss are the dominant rock types. Locally, these rock types show considerable compositional variation. Feldspar, quartz, biotite, pyroxene, garnet, hornblende etc. were the minerals found in abundance in the rocks in the study area. Mineralogy and texture of the rock types indicate that the rocks of the area have witnessed amphibolite granulite facies of metamorphism (which is medium to high grade). Several sets of fractures and joints are also observed in the area.

Based on the physical characteristics charnockite rocks emerged as the best stable and reliable rock. It is recommended to follow the fracture intersections and avoid veins for the foundation purposes.

The minor joints and hair cracks are to be considered as defect and must be especially investigated. Rock core analysis are recommended for fracture depth extension and sub- surface crack determination and also rock sample Laboratory tests for geotechnical parameters.

Any kind of construction should not interrupt the present scenario of water movement and also provide facility for local surface runoff and overtopping runoff. Hard structures should preserve shoreline morphology and natural delivery of coastal sand. Recommended detailed analysis of wave heights and water level ranges of the terrain.

8.3 Geotechnical Investigation

The Geotechnical Investigation were carried out for the proposed walkway along Hawa Beach, the existing walkway along the Light House Beach and for the construction of diaphragm wall throughout the length of Hawa and Light house

beach to protect the walkway from erosion of beach due to high waves and to counter the effect of coastal erosion.

Altogether four bore holes were taken along the proposed and existing foot path area, with two bore holes in the parking area behind Hotel Hotel Raviz (proposed Walkway) and two bore holes in the existing walkway area. Bore holes 1 and 2 were taken in the proposed walkway area in the parking area coming behind Hotel Hotel Raviz. Bore holes 2 and 3 were taken in the existing walkway area on the right side of the road to Hawa beach.

8.3.1 Details of Bore Holes

The bore hole locations are attached in Annexure II. The bore logs of all the four bore holes are also enclosed in Annexure II.

In the proposed Walkway area, behind Hotel Hotel Raviz, BH1 and BH2 represents the soil profile. Up to 4.00 m depth, the soil consists of dense silty sand or and silty sand with shell particles. In this stretch a soft clay layer is existing from 4.50 to 6.00 m. There after medium to dense clay with sand is available.

BH3 and BH4 belongs to the existing walkway area. In BH3, the bore hole was terminated at 4.00 m depth owing to the presence of rock. Up to 4.00 m depth dense sand is available. In BH4 very dense silty sand is available upto 10.00 m depth.

BH5 and BH6 are taken in the proposed G+2 building area. BH5 shows very dense silty sand upto 4.50 m depth, with an N value of 16 at 1.00m depth and 25 at 2.00 m depth. From 5.00 m depth onwards very soft sandy clay is existing upto 10.00 m depth.

BH6 also has the same profile as that of BH5 upto 5.00 m and below 5.00 m fine sand in a dense state is available for 10.00 m depth.

8.3.2 Recommendations

It is assumed that the proposed footpath is 1.50 m above the existing ground level. The footpath foundation can be placed at a depth of 1.00 m or 2.00 m below existing

ground level, considering the scouring effect of the waves during monsoon season. The safe bearing capacity of the soil at various bore hole locations and depth are given in the Table 8-2.

Table 8-2 SBC of soil at bore hole locations.

Bore Hole	SBC @1.50 m Depth in kN/m2	SBC @ 2.00 m Depth in kN/m2	Remarks
1	220	250	While selecting the depth offoundation of footpath, scourdepth due to high waves during monsoon season may beconsidered.
2	150	250	
3	200	250	
4	220	250	

In BH5 and BH6 the following safe bearing capacity shown in Table 8-3 can be taken for shallow foundation.

Table 8-3 SBC of soil at bore hole locations

Bore Hole	SBC @1.50 m Depth in kN/m2	SBC @ 2.00 m Depth in kN/m2	Remarks
5	120	180	Strip raft foundation will be ideal rather than isolated column footing as very loose soil is available in BH5 from 4.50 m depth
6	120	180	

A diaphragm wall is considered in front of the walkway in the seaward side, all along the walkway length on either side of the entry road to protect it from high waves of the sea especially during monsoon. A diaphragm wall projecting 1.50 m above ground level (to be in level with the footpath) and penetrating the ground for about 3.00 to 3.50 m is recommended. Structural design of the diaphragm wall is given in Annexure IV. Rubble packing as an additional protection measure can be adopted for erosion control of soil from behind the footpath if necessary.

8.4 Engineering Structural Design

8.4.1 General

The proposed admin block building consists of G+1 floors and toilet block consist of G+2 Floors. A framed structure with RCC column, beam and slab is the ideal solution

for such buildings. In case of RCC framed structures, the interior arrangement of rooms can be altered by changing the position of partition walls. Monolithic construction is possible with R.C.C framed structures so they can resist earthquakes and vibrations more effectively than load bearing structures.

8.4.2 Soil Condition and foundation

Soil investigation has been conducted in the site. Soil is of sandy nature and isolated foundation is adopted at 2 m depth based on soil investigation report.

8.4.3 Structural Design

8.4.3.1 Design Approach

This chapter includes details of applicable codes and standards for the design, geotechnical properties for foundation medium, loading and load combinations applicable for structural analysis and design.

Table 8-4 Unit Weight of Materials

Sl. No.	Material	Unit weight (KN/m^3)
1	Normal density reinforced concrete	**25**
2	Plain Cement Concrete	**24**
3	Solid Block masonry	**20**
4	**Structural Steel**	**78.5**

Grade of Concrete: M30 grade of concrete is considered for all buildings.

Grade of Reinforcement: Thermo-mechanically treated (TMT) reinforcing bars of grade Fe500D conforming to IS: 1786-2008 shall be considered in all RCC construction. The total elongation shall be more than 14.5% and UTS shall be 15% more than actual yield stress or 0.2% proof stress.

Sub grade properties and type of Substructure: The topographic properties based on the ocular survey and soil investigation conducted are analyzed and isolated foundation at a depth of 2m is proposed for the buildings.

8.4.3.2 Loads on the structure and Load combinations

Following sections describe the type of loading and its method of application. Exact details of various loads e.g., magnitude of loads, location etc. are presented below.

Dead load (DL): Dead load consists of self-weight of various structural elements mentioned as below

Table 8-5 Structural elements (Dead Load)

Sl. No.	Item	Load (KN/m^2)
1	Columns, RC walls, RC beams and slabs, floor finishes, solid block masonry, Sunken slab filling, Structural Steel floors and truss.	Unit weight of various materials as specified in Table above

Live load (LL): The live load intensities are applied as given in IS 875 (Part 2):1987 for different occupancies.

Wind Load (WL): All exposed structures or parts of structures shall be designed to resist the pressures due to wind in any direction in accordance with IS 875 (Part 3):2015. The wind speed to be followed in accordance with IS 875 (Part 3), based on return period of 100 years. The wind analysis shall consider the wind direction relative to the structure and external and internal pressures are applied to the windward and leeward sides of the structure respectively. Since Earthquake load is found to be the governing load, Wind load is not applied in the STAAD/ETABS model.

Earthquake Load (EL): Earthquake load is considered for the design of all structures. The loads due to earthquake are generated by the response of the structure to design spectrum as specified in IS 1893 (Part 1):2016. The proposed site is located in Earthquake Zone III and seismic zone factor corresponding to that zone is adopted in calculation of response. Ductile design & detailing as per IS 13920:2016 is also followed.

Combination of loads: The individual members of the frame shall be designed for worst combination of forces such as bending moment, axial force, shear force and torsion. Wind and seismic forces shall not be considered to act simultaneously.

Factored load combinations: For the strength design, factored load combinations as specified in IS: 456 shall be used.

Table 8-6 Design of Structure

Basic Load Case					
COMB1	1.5 DL	+	1.5 LL		
Seismic Load Cases*					
COMB2	1.5 DL	+	1.5 EQ+X		
COMB3	1.5 DL	+	1.5 EQ-X		
COMB4	1.5 DL	+	1.5 EQ+Z		
COMB5	1.5 DL	+	1.5 EQ-Z		
COMB6	1.2 DL	+	1.2 LL	+	1.2 EQ+X
COMB7	1.2 DL	+	1.2 LL	+	1.2 EQ-X
COMB8	1.2 DL	+	1.2 LL	+	1.2 EQ+Z
COMB9	1.2 DL	+	1.2 LL	+	1.2 EQ-Z
COMB10	0.9 DL	+	1.5 EQ+X		
COMB11	0.9DL	+	1.5 EQ-X		
COMB12	0.9 DL	+	1.5 EQ+Z		
COMB13	0.9 DL	+	1.5 EQ-Z		
Unfactored load combinations: For the foundation design & service design considerations, Unfactored load combinations as specified in IS: 456 shall be used.					
Design of Foundation					
Basic Load Case					
COMB14	1.0 DL	+	1.0 LL		
Seismic Load Cases*					
COMB15	1.0DL	+	1.0 EQ+X		
COMB16	1.0DL	+	1.0 EQ-X		
COMB17	1.0DL	+	1.0 EQ+Z		
COMB18	1.0DL	+	1.0 EQ-Z		
COMB19	1.0DL	+	0.8 LL	+	0.8 EQ+X
COMB20	1.0DL	+	0.8 LL	+	0.8 EQ-X
COMB21	1.0DL	+	0.8 LL	+	0.8 EQ+Z

The methodology adopted for the structural analysis for static loading & seismic loading for the proposed structures is given below.

8.4.3.3 Static analysis

Mathematical Model: The physical structure is transformed into a mathematical model for structural analysis using software STAAD Pro V8i/EtabsV17. Entire model is composed of integrated three-dimensional elements of beams, columns and floor slabs forming regular orthogonal frames tied together to act as one unit responding to the loading on the structure.

8.4.3.4 Design of RC Members

Design philosophy of RC members viz. columns, Beams etc. are given below. Limit state Design is carried out for RC members, as per IS: 456 using the forces obtained from the critical combination of loads.

Design philosophy for RC members

Nominal Clear Cover to Reinforcement: Nominal cover is the design depth of concrete cover to all steel reinforcement, including links as per Table 3 of IS: 456 considering 'severe exposure' conditions.

Table 8-7 Design Specifications of RC members

Sl. No	Member	Minimum Nominal Cover Adopted for Design (mm)
1	Footing	75
2	Columns	50
3	Grade Beam	50
4	Floor Beams	50
5	Slabs	40

Design of Columns: RC Columns are designed using Limit State Method of design as per IS: 456 using spread sheets/design output from software.

Design of Beams: Beams are designed using Limit State Method of design as per IS: 456 using spread sheets/design output from software. Beams are primarily designed

as flexural members. Effect of axial force, shear and torsion are also considered in design wherever applicable.

Design of Slabs: Floor slabs are designed using Limit State Method of design as per IS: 456 and design is carried out separately using spread sheets.
Design of Water retaining structures: Water retaining structures are designed using working stress method with permissible stress in steel as 130 N/mm2. For water retaining structures water load is applied as area load in base slab (density of water x water column height). In walls, triangular pressure is applied with respective water column height and earth pressure in case of underground structures.

8.4.3.5 Design of Steel Members

Steel members are designed as per IS 800: 2007 where limit state method is applied for the design. For structural members like truss roof, canopy etc. wind load is applied in software and analysis carried out. The deflection under serviceability loads of a building or a building component should not impair the strength of the structure or cause damage to finishes. Deflections are checked for most adverse combination of service loads. These limits shall be used for the deflection check for various members of the structure.

8.5 Circulation and Mobility Plan

8.5.1 Connectivity/ Circulation Plan

Kovalam though being an internationally renowned beach with three adjacent crescent beaches, the road connectivity and parking facility lacks the basic requirements. Many minor roads connect to different areas of the beach from the Beach Road. Some of them include the GV Raja road which connects to the KTDC Samudra hotel, Country Spa Road and Palace Road. These small roads are not sufficient to cater the incoming traffic to the beach. The overall connectivity to Kovalam needs to be improved and there is a need for an integrated road development to assure good standard roads for easy access to and from the beach.

There are many alleys connecting to the beach and some of them are already paved with brick pavers. A new Walkway is proposed to the beach from point A to point B

as shown in the Key map (Figure 8-9). This proposed walkway has the potential to be developed as a beautiful walkway cum cycle track which opens to the beach. The proposed walkway starts near Adavuthura temple from the beach road (Coordinates 8.388798º N, 76.978526ºE) and opens to the beach near Puppies café coffee shop (Coordinates 8.386025ºN, 76.978526ºE).

Figure 8-9 Proposed Connectivity Map

The proposed walkway runs parallel to an existing canal for stormwater draining. The total length of this proposed walkway is 0.50 km. Handrails can be provided on either side of the walkway in areas where it runs parallel to the canal.

Another particular feature of this walkway is that it provides connectivity to the coconut plantation and the corporation land at the beach. Thus, the proposed walkway can be considered for future expansion that will provide four-wheeler access to the Coconut plantation or Corporation Land, as parking is to proposed in the Coconut Plantation Land in Phase II of the project. Since it passes through less populated area and through good vegetation cover, by proper landscaping the proposed walkway can be developed into a peaceful entrance to the beach. Some portions of this pathway are already paved towards the beach end which requires refurbishment.

Figure 8-10 Starting point of proposed walkway (left); proposed walkway path and side canal (Right)

Figure 8-11 Connection to Corporation land (left); End point of proposed walkway opening to the beach (right)

8.6 Waste Management Plan

Waste management presents special challenges for tourism destinations in the developing world. Although large tourist inflows and accompanying development can greatly increase the volume of municipal waste, affluent travellers expect high aesthetic and sanitary standards to be met. Local governments often lack sufficient capacity to handle waste sustainably and local awareness of the need for waste segregation, recycling, or other practices may be low.

Kovalam is a classic example of a coastal resort of the developing world where immediate monetary benefit has always taken the front seat whenever the questions of conservation and sustainable management rise. In these places, environmental conservation and community development have never been taken as the prerequisites for the betterment of tourism industry. As a result of the ever-increasing conflicts between the demands of existing environmental and tourism development policies, one may see the seeds of demise of a prospective industry by the deterioration of that very ecological milieu on which it thrives. The 'Zero Waste

Kovalam Project' is an exception in this regard due to its holistic nature in protecting the environment and local communities.

8.6.1 Solid Waste Management in the Beaches of Kovalam

I. Managing Solid Wastes – The Present Scenario

Today, Kovalam is a beach with many activities, globally positioned as one of the most important tourism destinations in the western costal region of India. This situation allows (besides a lot of people entering the territory), the entry of a significant amount of waste associated with tourism, which directly impact on beach areas; this situation combined with the lack of environmental awareness, both of tourists and residents who use the beaches as well, and limitations in infrastructure and equipment related with suitable sites for solid waste disposal, has been causing a gradual deterioration in the quality of the beaches as a result of the accumulation of solid waste.

The Zero Waste Kovalam Project, envisaged in association with city-based NGO Thanal in the late 1990s; and the Plastic-free Kovalam Project, under the Kerala Tourism Protection Development Council (KTPDC), and the Association of Tourism Trade Organisation' s India (ATTOI) in 2011 have not succeeded. The setting up biogas plants in 1,500 houses is only half-way through. Volunteers employed by certain NGOs entrusted by DTPC, has been taking care of the waste disposal for the last one decade. The food waste from the 150 hotels that have enrolled in the project is collected between 11 p.m. and 2 a.m. Plastic waste is collected during daytime. As there is no dumping yard, the food waste collected that comes up to two trucks is transported immediately to be disposed of. The plastic collected daily comes to around 150 sacks. A reasonable amount of monthly user fee is collected from the beneficiaries for waste collection. The sanitation workers also execute the related activities like clearing the beach, sweeping the walkway, etc. twice a day, mostly in the morning and in the evening.

Since the project area falls within two local self-government divisions, i.e., under Vizhijam Panchayath and Thiruvananthapuram Corporation, there exists a lack of coordination in executing the waste management strategies in Kovalam. Absence of proper waste bins on the beach premises leads to haphazard and careless dumping

of organic and inorganic waste to the shore and sea. Some unauthorized bulk dumping of the food waste and other solid waste to nearby area was also observed during the waste audit.

Figure 8-12 Unauthorized dumping of solid waste at Kovalam

II. Quantity of Solid Waste Generated

On an average, one ton of bio-degradable waste and half a ton non-biodegradable waste are generated per day during the four-month peak season

8.6.2 Solid Waste Management Plan in Kovalam

8.6.2.1 Suggested Approach: Technical and Managerial

Solid wastes consist of wastes which includes paper, plastics, rubber, leather, metals, vegetable discards, meat/fish discards, cooked food etc. When mixed and discarded together, such wastes present a serious threat to the environment and health and are aesthetically unpleasant. Segregation of waste streams is the key for proper solid waste management.

1. Segregation and Storage of Waste at Source

Promotion of the practice of segregation and storage of waste at source in THREE bins-for wet waste, other for dry waste and another for domestic Hazardous waste, to facilitate an organized and hierarchical system of waste collection and disposal, without letting the waste to reach the ground in the primary and secondary collection stages. Source segregation of recyclables (dry waste) and biodegradables (wet waste) will not only provide an efficient mode for resource recovery but will also reduce pressure and pollution at final disposal sites, substantially and domestic

hazardous waste like batteries, expired medicines, bulbs etc. can be stored separately, which will be lifted separately.

A. Waste from Residents/Restaurants/Shops and Other Establishments

Segregation of three different fractions of waste could be undertaken without mixing them, but directly depositing into separate bin / bag as and when generated.

Table 8-8 Waste Segregation Categories

Category 1. Food & Green waste (wet waste)	Category 2. Recyclable & Non-bio-degradable (dry waste)	Category 3: Domestic Hazardous waste
Cooked/uncooked food, vegetable, fruit, meat, borne, fish waste, leaves, grass	Paper, Plastics, glass, metal, ceramic, rubber, leather, rags, used cloths, wood, stone, sand, ash, thermocol, straw & packing materials, sanitary napkins and diapers (to be packed and disposed)	batteries, expired medicines, bulbs etc.

The efficiency of the proposed Waste Management Plan described below is driven by separation of waste at the primary collection level. For this purpose, following approach needs to be adopted by the residents, tourists as well as the authorities

- The waste should be stored by the generators in three separate bins, one for bio-degradable and one for non-biodegradable and another for domestic hazardous waste.
- Waste collectors will collect wet waste and dry waste on a day-to-day basis.
- Domestic Hazardous waste will be collected once in a week separately.

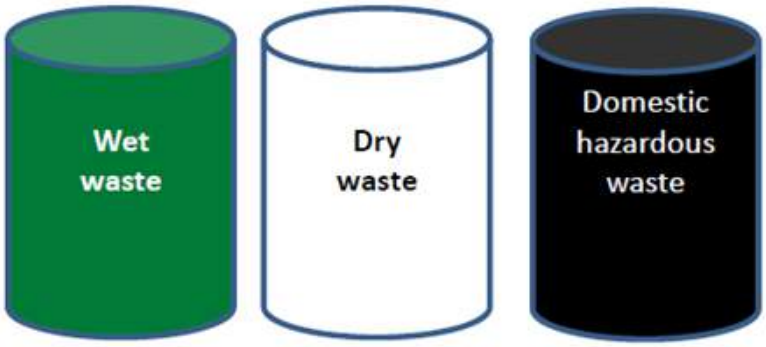


Figure 8-13 Waste Segregation

Separate storage facilities for food/biodegradables, recyclables/non-bio-degradable and domestic hazardous waste should be encouraged and to ensure that no waste goes to ground and a system of 'Single handling' is developed. Residents will be made aware to segregate waste at the source and store it in separate bins, prior to the collection and transportation by the operator. A 3-bin system of storage of waste is suggested.

Figure 8-14 Type of Solid waste generated and Capacity of the bins for waste collection

Sl. No.	Source	Capacity of bins (litre)	No. of Bins	Type of Waste
1	Households & Small Shops	15	3	Wet, Dry & Hazardous
2	Restaurants	120	2	Wet & Dry
		25	1	Hazardous
3	Hotels	180	2	Wet & Dry
		50	1	Hazardous
4	Other Bulk Generators	240	2	Wet & Dry
		50	1	Hazardous

B. Waste from Walkway/Shore and Other Public Spaces

Solid waste generated from the walkways can be collected by placing 240 litres Communal bins or Waste containers at 50-meter intervals. For keeping proper cleanliness in the walkways and shore, manual sweeping and picking of solid wastes to be practised twice in a day (morning and evening). All together 16 waste pickers should be regularly employed for cleaning the Kovalam beach. The solid wastes are collected both manually and mechanically and collected in dustbins of 240 litre capacity placed along the beach and are transferred to the containerised push carts for primary transportation.

1. Primary Collection

Primary collection or Door to Door collection of waste is the second essential step of Solid Waste Management activity. Primary collection system is necessary to ensure that waste stored at source is collected regularly and it is not disposed of on the streets, drains, water bodies, etc. This step must synchronize well with the first step-Storage of Waste at source.

Primary Collection or Door to door collection services includes collection of waste from households, shops, restaurants, commercial establishments etc and from the communal bins provided at walkway and beach. The range of vehicles recommended for primary collection is containerized handcarts/tricycles with active community participation.

Hand Carts:

Hand carts having 4 to 6 detachable containers of capacity ranging from 30-40 litres i.e., 0.03 to 0.04 cu.m each should be used. The containers should be of sturdy material preferably strong polyethylene/plastic with a handle on the top and rim at the bottom for easy handling of the container. The handcarts should have preferably three wheels and sealed ball bearing. There should be locking arrangement with a chain and a lock.

Figure 8-15 Handcart With 6 Detachable Containers

It is necessary to provide a daily service to all households, shops and establishments for the collection of putrescible organic/food/bio -degradable waste from the doorstep because of the hot climatic conditions. This service must be regular and reliable – recyclable material can be collected at longer regular intervals as may be convenient to the waste producer and the waste collector, as this waste does not normally decay and need not be collected daily.

The door-to-door collection of waste shall be done on a day-to-day basis between 7:00am to 11:00am. Each waste collector with the handcart shall be given a fixed area with a route map for collection of solid waste from establishments and the communal bins.

2. Secondary Collection

All the collected solid wastes are then to be transported to a secondary collection centre from there it is further transported or treated. The land for secondary collection should be identified and provided by corporation or DTPC. The land for secondary collection should be conveniently located for all the primary collection vehicles (handcarts) to get an easy access. At the same time the location should be a truck accessible site for the trouble-free secondary transportation of waste for disposal.

4. Disposal of Solid Waste

a. Organic Waste (Wet Waste)

Aerobic Bin Composting method can be adopted for converting the biodegradable waste into compost or manure which can be used for landscaping on the beach premises. Aerobic Bin Composting units can be provided at the land for secondary collection or any other nearby land if provided by the authorities.

a. Aerobic Bin Composting Unit:

The composting unit includes a box like structure with Ferro cement floor. Layers of cow dung, carbon source and waste materials are subjected to composting in presence of oxygen. The temperature rises rapidly in the waste to almost 70˚C, the peak temperature with pathogens. An aerobic compost bin, under the correct conditions creates a lot of heat; this can kill all sorts of seeds and pathogens. An efficient aerobic compost bin does not emit foul ammonia like smell. An aerobic compost bin reduces the biomass to usable compost quicker than its anaerobic counterpart.

Technical Aspects of the Aerobic Bin Composting Unit:

Aerobic cluster is an eco-friendly waste management system consisting of two units. Each unit is a 120cm x 120cm x 120cm ferro cement bin with airspace and grooves

utilizing bacteria consortium from cow dung and carbon source from dry leaves and paper bits with a roof to prevent rainwater during monsoon. 6-inch layer of fresh cow dung as the first layer with 6-inch layer of dried leaves provided the carbon source for the bacteria to flourish, above that another six-inch layer waste is converted into compost. The core temperature built up in this layering is 70 - 75˚C which prevents the breeding of flies and parasites. Moreover, due to aerobic functioning no putrid smell is there. About 2000 kg waste can be managed in a bin. We can get compost with carbon nitrogen ratio 20 - 30% after 90 days.

Operation & Maintenance Protocols:

1. A 6-inch layer of fresh cow dung is laid as the first layer.
2. A 6-inch layer of dried leaves is laid on top of the cow dung layer.
3. Above that 6-inch layer waste is added and inoculum containing enzymes made from cow dung is sprayed, this hastens composting.
4. Alternate, 6-inch layers of dried leaves and waste sprayed with inoculum is repeated till the bin is filled.
5. Once the first bin is filled, start using the second bin. By the time the second bin is filled the contents in the first bin will turn into compost. If not, take it out and dry it in dry beds.

Unit Cost:

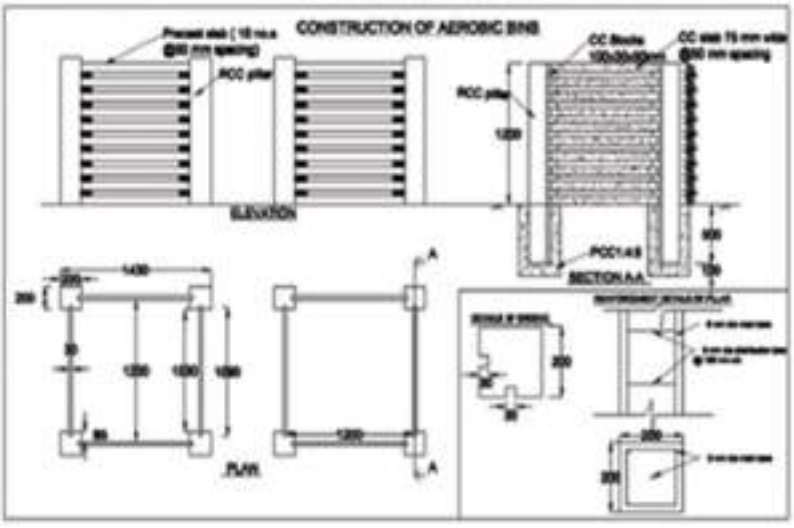


Figure 8-16 Plan, Section and Elevation of Aerobic Bin Composting Unit

A unit with two aerobic bins will cost Rs.48,000. Providing enclosed shed with provision for drainage and soak pit for leachate, ramp for trolley etc. will cost Rs 1,90,000.

If suitable land for Aerobic bin composting facility is not available in the premises of Kovalam, another option for disposal is the transportation of organic waste to Thumboormuzhi aerobic compost unit in covered trucks. Thumboormuzhi compost unit, which is around 18 kms from Kovalam is a well-equipped treatment facility under Govt. of Kerala.

Figure 8-17 Thumboormuzhi aerobic compost unit

b. Inorganic Waste (Dry Waste) & Hazardous waste

All the collected inorganic waste can be transported in covered trucks to resource recovery centre Muttathra which is around 8km from Kovalam. RRC Muttathara is a well-equipped recycling unit under Govt. of Kerala. Hazardous waste can be sold to authorised recyclers for proper recycling or disposal

8.6.3 Toilet Waste Management

A well-equipped Sewage Treatment Plant is proposed for treating the waste generated from the proposed toilet block in the Corporation land area at Kovalam beach. Since the ground water table is very high in the Corporation land area, a conventional septic tank is not feasible. For the toilet block at the end of walkway near lighthouse cliff, conventional septic tank with soak pit can be provided.

The proposed aerobic treatment system for wastewater is a compact and effective system using the revolutionary Moving Bed Bio Reactor (MBBR) technology. This is

achieved by growing the bio-film on smaller carrier media that move along with the waste water in the reactor. The air stream constantly keeps the bio media is in suspension and at the same time provides the required oxygen to the biomass. The system uses specially designed bio-media, made of long-lasting virgin polyethylene, which provides a large surface area for biological growth. The media is cylindrical in shape with grooves to provide a large surface area in a small volume tank. The media provides about 500 m^2 effective area for growth of the bio film per m^3 of volume. The bio media has been developed after years of laboratory research and field tests. This system is having low sensitivity to changes in external parameters, which is one of the primary drawbacks with the conventional activated sludge system and is therefore easy to operate. It also operates under lower volumes, reducing the tank sizes by more than half when compared to conventional aeration systems.

1. PROCESS DESCRIPTION

a. Pre-treatment

The sewage is passed through a screen. The screening process enables removal of coarse particles from the stream that may clog pipes and cause operational disruptions in downstream unit processes.

b. Grit cum Oil Separator

The screened sewage approaches the Grit and Oil Trap. In this chamber a series of baffles are provided which enable the settlement of grit particles at the bottom and the separation of the oil in the stream at the top. The final oil and grit free stream is directed to the equalisation tank.

c. Equalization tank

An equalization tank is provided for receiving the pre-treated wastewater. The equalization tank will have the capacity to cope with peak flow conditions. The wastewater from the equalization tank is then pumped to anaerobic tank at a uniform rate. Two pumps are provided with one on duty and the other on standby.

d. Anaerobic Reactor

An anaerobic reactor is provided by which the organic matter (BOD) in the wastewater is biologically degraded by micro-organisms in the absence of air. The

anaerobic reactor is provided with a media to provide a surface for the anaerobic bio-film to attach and grow. Around 30-40% reduction of BOD and COD is achieved in this anaerobic system. This reduces the load on the aerobic system, reducing electrical costs. The effluent from the anaerobic reactor flows into Anoxic System.

e. Anoxic System

A denitrification tank is provided for de-nitrification process, for the removal of Nitrogen by converting nitrates with the help of denitrifying bacteria. An internal recirculation loop from the Aeration tank is provided to supply the nitrates. The influent wastewater with organic load is mixed with the re circulation from the aeration tank with sufficient reaction tank for de-nitrification to occur. Anoxic condition is maintained in the tank. Overflow from the tank is fed to the MBBR.

f. Aerobic System

i) MBBR

The Moving Bed Bio Reactor consists of two aeration tanks in series which are located adjacent to each other. Each tank will be provided with an aeration grid at the bottom, which is made of anticorrosive material and covers the entire area of the tank. The Aeration tank is filled with a specific volume of the bio-media, which are made of a plastic compound with a specific gravity just below that of water, so that they remain in suspension.

The inlet to the aeration tank is at the top with the wastewater falling freely into the MBBR tank. The outlet is located on the opposite side, which has a perforated screen mounted on it, to prevent the bio-media from flowing out of the MBBR tank. Both compartments are connected to each other by openings, which have perforated screens at both ends.

Micro-organisms grow on the surface of the plastic media, feed on the organic content of the wastewater, and after a complete growth cycle, detach from the surface of the medium. The detached cells form a semisolid mass called bio-sludge. Treated water from the second MBBR along with the bio-sludge flows into a Flocculation Tank.

ii) Aeration grid

The Aeration System consists of 2 air blowers. One blower shall be on duty and the other on standby. The blowers will be used for the aeration inside the MBBR.

g. Flocculation Tank

A mild dose of coagulants and flocculants is dosed into the flocculation tank. The addition of these chemicals will aid in the formation of large flocs consisting of the bio-sludge flowing in from the MBBR. This step also helps in de-emulsifying the emulsified oil present in the wastewater and settling the same along with the sludge.

h. Secondary Settling Tank

The wastewater from the flocculation tank along with biologically stabilized solids and chemically precipitated sludge will flow by gravity to the secondary settling tank. The separation of solids from wastewater is achieved by laminar flow developed inside the settling tank. Due to this, heavier solids settle down, whereas the clear water rises up and flows out into the filter feed tank. The sludge settling at the bottom of the settling tank is drained to the sludge digester.

i. Filtration – Disinfection

a) Pressure Sand Filter

The treated effluent overflow from the secondary settling tank is directed to a filter feed tank. From here it is pumped through a pressure sand filter. The media in the filter contains fine grain sand that serves to trap any small particles that might have escaped removal in the settling tank.

b) Activated Carbon Filter

From the pressure sand filter the effluent passes through an activated carbon filter. The media in the filter contains granular activated carbon that serves to remove chemical compounds in the effluent by adsorption. Colour causing and odour forming compounds are removed in this stage.

c) Disinfection

The filter feed tank receives a pre-calculated dose of oxidative disinfectant chemicals to destroy micro-organisms in the effluent stream. The dosed water remains in the tank for a designed amount of time for effective disinfection.

j. Sludge Handling

The sludge from the settling tank is drained via airlifting and is fed to a sludge digester. Anaerobic digestion is involved in the unit, generating biogas. Proper pH, alkalinity and anaerobic condition enhances the production of biogas and sludge digestion.

2. Process Flow Diagram

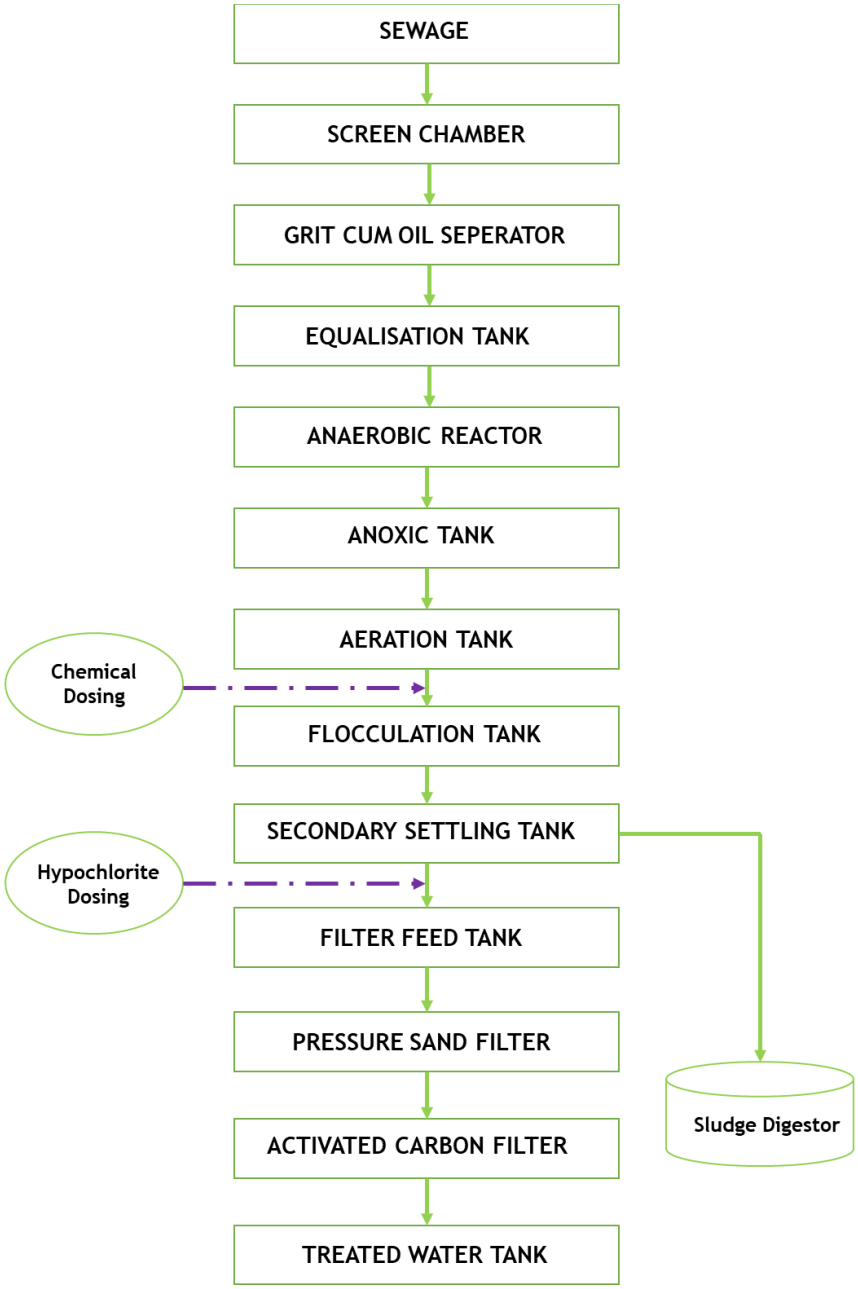


Figure 8-18 Process Flow Diagram

3. Major Components of the Treatment Plant

Table 8-9 Major components of treatment Plant

Sl. No.	Description	Quantity
1.	Coarse Screen	1 set
2.	Wastewater Transfer pumps	2 Nos
3.	Fixed bed Packing Media	1 set
4.	Recirculation pumps	2 Nos
5.	Aeration manifold and sieves for MBBR tanks	1 Nos
6.	Blowers with motor	2 Nos
7.	MBBR Media	2 Sets
8.	Pressure Sand Filter	1 No
9.	Activated Carbon Filter	1 No
10.	Dosing system	2 Sets
11.	Hypo chlorite Dosing system	1 Set
12.	Filter Feed Pumps	2 Nos
13.	Interconnecting pipeline Pipes: High Pressure PVC	1 Set
14.	Electrification works with control panel	1 Lot
15.	Water meter and Energy meter	1 Nos

4. Tank Sizes

Table 8-10 Size of the Tank

Sl. No.	Item	QTY.	Size	MOC
1.	Screen Chamber	1	1.00m x 0.60m x0.50m	RCC
2.	Grit Cum Oil Separator	1	1.80m x 0.60m x 0.80m + FB	RCC

3.	Equalization Tank	1	$7m^3$ +0.50mFB	RCC
4.	Sludge Digester	1	2.50m dia x 2.50m ht	RCC
5.	Platform	1	As per requirement	RCC
FRP TANKS				
6.	Anaerobic Tank	1	1.20m x 1.20m x 2.50m	FRP
7.	Anoxic Tank	1	1.00m x 0.70m x 2.00m +0.50mFB	FRP
8.	Aeration tank (Split in to Two)	1	1.20m x 0.70m x 1.90m + 0.60m FB	FRP
9.	Flocculation Tank	1	0.50m x 0.50m x 0.50m + 0.30m FB	FRP
10.	Settling Tank	1	0.90m x 0.90m x 1.00m SWD, 0.6m CWD +0.40 FB	FRP
11.	Filter Feed Tank	1	500 l	HDPE
12.	Treated water tank	1	1500 l	HDPE
13.	Plant room	1	Suitable size	Truss roofing

5. Details of Mechanical Equipment

Table 8-11 Details of Mechanical equipment

Sl. No.	Item	Specification	Qty
1.	Coarse Screen	MOC: SS 304	1 set
2.	Fixed bed Packing Media	Make : MM Aqua	1 set

3.	Wastewater Transfer Pumps	Capacity: 0.50 m^3/hr Head: 8-10m Type: Self-priming, Non-clog Make: Kirloskar/ eqvt.	2 (1D + 1S)
4.	Recirculation Pumps	Capacity: 1.50 m^3/hr Head: 10-12m Type : Self-Priming Make: Kirloskar/ eqvt.	2 (1D +1S)
5.	Aeration Manifold and Sieves for Aeration Tank	Make : GME	2 Set
6.	MBBR Media	MOC : PE	2 Sets
7.	Blower	Capacity: 28 m^3/hr Head : 0.25 bar Make : Everest Motor Make: Kirloskar/Havells	2 (1D + 1S)
8.	Filter Feed pumps	Capacity: 0.50m^3/hr Head: 25m Type: Monobloc Make: Kirloskar/ eqvt	2 (1D + 1S)
9.	Pressure Sand Filter	Size : 0.33 Ø x 1.37mHt Construction: FRP Type:Vertical Valves: Multiport Valve Make: Pentair/Eqvt Filtering Media:Graded pebble and sand	1 No

8.7 Electrical Power Distribution System

Kovalam is the prestigious beach spread across the Arabian Sea. As a part of beach beautification, the complete existing electrical system has been retrofitted for adapting new facilities such as connecting walkway through the Hawa beach and Light house beach, Ananta Park (Old Silent Valley Park), Administrative building,

Toilet blocks, Connecting bridge area etc. The lighting system proposed will fulfil the functional and aesthetic goal of this project.

8.7.1 Existing electrical system

The Kovalam beach electrical system are powered through the two numbers of distribution transformers located near the beach side. The details as follows.

- The all-beach side shops and buildings are powered through overhead lines.
- The existing CI (Cast Iron) post top lamps are corroded and not in proper working conditions.
- The Mini- mast lights are not in proper working condition and sufficient coverage are not provided.
- Lighting is not considered in the corporation land area.
- Ananth Park area building and pond area having only minimal light provisions and the distribution panels are rusted and in danger condition.

8.7.2 Design assumptions

The Overhead lines and RCC poles proposed in the walkway will be dismantled and Underground cable has been considered. The post top lights, High mast lights has been considered based on the lighting calculations and software study basis. The RGB lights and bollard lights has been proposed for aesthetic enhancement.
Design Assumptions as follows.

I. The Overhead Lines provided for power and data will be replaced by underground cabling system.
II. All light poles, Light fixtures, Feeder pillars, Outdoor lighting panels, Solar panels, CCTV and PA systems are considered with corrosion resistive materials.
III. The Feeder pillar and cables are selected according to the present connected load received from the KSEB.
IV. The lux levels for different areas are considered as per the National Building Code and Indian standards.
V. All shops and buildings adjacent to the walkway area will be fed by the LT UG distribution network running through the utility corridor of the pathway network with a power supply connecting facility to the plot.
VI. The routing through the premises will be made available by the building owner itself.

VII. Provision of Rooftop Photovoltaic system shall be proposed as per the availability of space upon the roof of buildings and other available space; to meet partial power demand of the area. Solar Panel & inverter cum rectifier unit will be placed along with the LT panel.

VIII. Energy efficient smart LED lighting will be considering for entire indoor and outdoor area application.

8.7.3 Planning and consideration.

The Ultimate aim in the design of an electrical distribution system is to provide reliable and satisfactory service consistent with the requirements of safety and economy. The primary factors involved in this are:

- Energy savings System
- Minimum Initial Investment
- Maximum Service Continuity
- Maximum Electrical Efficiency
- Operating limits to service voltage (consumer terminal voltage)
- Distribution design level
- Basic insulation level
- Thermal limits
- Protection against faults
- Reliable and secure system
- Safety
- Minimum Operation & Maintenance Cost
- Maximum Power Quality
- Environmental & Social impact
- Low Maintenance & Quick Restoration
- Carbon Footprint: as small and compact as possible with energy efficient installations

8.7.3.1 LT cable laying & Utility shifting.

1100V LT cable will be 3.5-core Aluminium Armoured XLPE type in accordance with IEC 60502-2. The LT cable will be installed underground at a minimum depth of 1000mm below ground level through Galvanised tray specifically for Outdoor Application having min 72 microns of Zinc coating for Ladder Cable trays with suitable mounting anchor fasteners & mounting accessories as required confirming to IEC-61537. The Tray shall be galvanized for corrosion protection as per IS 277. The

cable will terminate at each feeder pillars. The cables will be run through the RCC Masonry Cable Trenches. The feeder pillars are proposed at 17 locations. The existing Over Head lines provided for power are converted to underground Cables, data cables shall be converted to underground cables by the service provider. The Main Feeder Pillar has been proposed at the electrical panel room in administrative block. The 17 Nos feeder pillars for feeding the adjacent building has been provided across the walkway side.

The typical cross section of RCC Masonry cable trenches will be as follows:

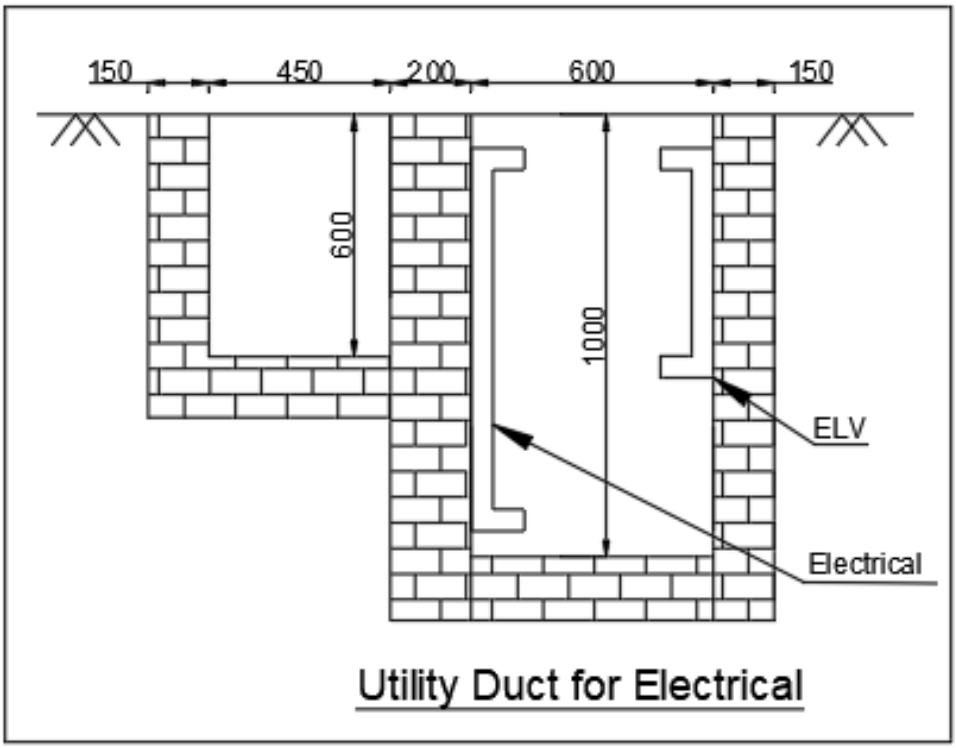


Figure 8-19 The typical cross section of RCC Masonry cable trenches

8.7.3.2 Internal and External illumination system.

The walkway of Kovalam beach having a minimum width of 3.5m and shall generally cater to:

- Movement of persons.
- Movement of persons through buggies including cyclist/pedestrian.

Basic requirement of walkway and beach side lighting proposed be as follows:

- Adequate level of illuminations for light vehicles/cyclist/ pedestrian.
- Uniform illumination level over carriage way with minimum glare

- Safety of movement.
- Minimum disturbance during any climatic conditions.
- Use of high efficiency lighting fixtures with high lumen output and low power consumption.
- Beautification and pleasing view.
- The outdoor lighting panels are facilitated with automatic operation through 24hrs timer with contactor system.

1. Technical Details of walkway lighting system

Table 8-12 Technical Details of walkway lighting system

SL NO	DESCRIPTION	3.5M WIDE PATWAY
1.	Area of installation.	Beach side.
2.	Pole mounting details.	Post top on one side of the pathway.
3.	Light fixture.	28W LED lamp with fixture of IP 65.
4.	Boom length/Angle.	0 Meter/0°
5.	Maintenance Factor	0.8
6.	Mounting height.	3.6Meter.
7.	Spacing.	15Meter.
8.	Lux level. (E_{av})	17lux
9.	Colour Temperature	3000 K

2. Anatha PARK (Old Silent Valley) & Corporation Area Development

The Anantha Park and Corporation area are proposed with Post top lights, Special bollards, Wall washer lights and RGB lights for external illumination. The all areas shall be designed to have required illumination level as per NBC.

3. Beach area and bridge areas

The sand area of the Kovalam beach can be lighted up with different patterns with projections from a single point light source that can be mounted on a normal pole on the corner side of the beach. These light projections can project any pattern of an abstract of our traditional artforms like Kathakali, Theyyam, Kalari etc. in the beach.

The watch tower, Bridges and wall areas can be washed with colour changing light fixtures it can be programmable to different themes. These types of light fixtures

make high impact on architectural effects, 20m long high mast lights are proposed across the beach area for general lighting.

8.7.3.3 LV distribution

1. Feeder pillar and outdoor lighting panel

The all-LV switch gear panel boards are considered with Fibreglass Reinforced Polyester / Marine class paint coating on sheet steel frame for protect the panel board from saline atmosphere. The form of separation considered for main panel are 3 & 4 as per the requirement of KSEI/KSEB. The current density considered for bus bar design is 0.8A/mm^2 for aluminium and 1.2A/mm^2 for copper. The main feeder pillar incomer provided with 2 Nos 400A Microprocessor release MCCB with bus coupler facility to accommodate supply from two different distribution transformers. The code compliance is IS 8623 and IEC 61439 1 and 2.

2. LV cables and wires.

1100V grade Aluminium/ copper conductor, XLPE/PVC insulated, armoured and un-armoured cables complying with IS: 7098 and IS: 1554. Cables shall be designed a maximum voltage drop less than or equal to 3%. Double compression brass cable glands for outdoor, single compression brass cable glands for indoor cable termination.

Wiring shall be carried out as per IS 732, Wires shall be FRLS PVC insulated multi strand copper conductor for Lighting circuit. Lighting point looping wire from circuits / 6A sockets wiring shall be 3R-1.5 mm² wires. Lighting circuit mains shall be 3C x 2.5 mm² cable wires. 16A Sockets (RP/UPS) circuit mains wiring shall be 3C x 4.0 mm² cable / wires. The modular type switches are considered for internal wiring.

3. Distribution boards

All distribution boards shall have provision for close monitoring of Circuit breaker trip and power monitoring. The power and light DBs are proposed along with vertical DBs. Each DB shall be provided with a drawing giving detail of each circuit with its controls, the current rating of the circuit, the rating of the MCBs and all the important details given in the circuit diagram. This drawing shall be made on durable material

like PVC and pasted inside the DB. The board shall be installed in a clean, dry and well-ventilated area. The access to the board and the area in front of the board shall always remain free without any blockage or hindrance. The MCB DB shall be installed with the bottom side of the DB at a minimum height of 1500mm from the finished floor level. The Distribution Boards shall conform the relevant IS codes.

8.7.3.4 Renewable Energy considerations.

- Provision of Rooftop Photovoltaic system shall be proposed as per the availability of space upon the roof of buildings and open spaces; to meet partial power demand of the development area. Solar Panel & inverter cum rectifier unit will be placed along with the LT panel.
- Present availability of the building roof area 5 to 10 kW solar energy can be produced.
- For solar system grid- tie system has been adopted for more efficient and economical choice.
- The solar roof top system has been considered in the phase-II development also.
- Solar Rooftop System provides following benefits.
    - Utilization of available vacant roof space.
    - Lower transmission and distribution losses.
    - Improvement in the tail-end grid voltages and reduction of system congestion.
    - Loss mitigation by utilization of distribution network as a source of storage through net metering.
    - Long term energy and ecological security by reduction in carbon emission.
    - Better Management of daytime peak loads.

8.7.3.5 Extra Low Voltage system.

1. Introduction.

The communication systems will be designed to provide voice, video and data communications from all ancillary spaces to the Central control room/Server Room located within the Facility and it can be remotely accessed for operations to ensure the safety of the proposed development area. The design of the communication systems will include the following:

- Telephone - Private Automated Branch Exchange (PABX) System.
- Closed Circuit Television (CCTV)
- Local Area Network (LAN) System
- Public Address (PA) System

2. Telephone - Private Automated Branch Exchange (PABX) System

The PABX system has been proposed only for the administrative building. The following points are considered for PABX system design: -

- Provision for analogue or digital phone.
- Provision of 4-pairs telephone cables with the minor cable containment and appropriate type of phone jack for the end devices.
- All cables shall be PVC insulated and shall be housed in PVC conduit/Trunking.

3. Closed Circuit Television (CCTV)

The CCTV proposed across the walkway area for public protection. The NVR and CCTV display units has been accommodated in the administration building proposed in the corporation land area. This includes varifocal bullet cameras and PTZ cameras with following specifications.

- 4MP resolutions.
- IP 67 and IK10 rating.
- Marine/Corrosion proof rated.
- SD card support for 64GB (Addition facility if cable breaked, it can store up to 2 days)
- Wide Dynamic Range (WDR)

4. LOCAL AREA NETWORKING SYSTEM(LAN) with cabling.

All necessary horizontal cabling from server Room located in administrative building to all the Access Points and a POE Network Switch (i.e., CISCO 2960 or equivalent) shall also be provided. All upstream cabling works shall be for voice and data cabling works. CAT 6 unshielded twisted pair network cables of approved make shall be used for data communication. The data points are limited to required areas only. All voice and data cabling outlets, fibre and copper termination frames, media converters, junction boxes, termination boxes, faceplates, etc. which are installed in exposed outdoor environment shall be provided with suitable weather-proof housing with a minimum standard of IP65 rating. Cabling provisions shall be low smoke and fume (LSF/LSOH) type and shall apply to optic fibre and Cat 5e or Cat 6 UTP cables. Cable

labelling, numbering and marker for all cables, patch panels, equipment racks, frames, outlets, patch cords, etc; in particular, all the external cables shall be labelled properly in each draw pit at cable entry and exit points.

5. Public Address (PA) System

The public addressing system includes the power amplifier and speaker system. The horn/column type speaker system has been proposed across the walkway area. The coverage of the speaker has been considered as 30 to 40m in range. The speaker provided in the walkway also proposed as corrosion free. The public addressing system controls are provided in the administration building, the system can be used for announcements and light music for the walkway areas.

8.8 Fire Protection System

The objective of the fire protection system is to provide safety of occupants and properties while complying to all statutory requirements.

8.8.1 Fire Hazard Category

As per NBC, the Admin Office building is classified as Group E, Business building (Less than 10m in height).

As per Department of Fire and Rescue Services, Government of Kerala, the building comes under the category of Form No "B-1" , Business building (Height up to 10 meters).

Table 8-13 System Components considered

System	Components
Down Comer system	Down Comer pipe with valves and fittings Hydrant Valve First Aid Hose Reel RRL Hose Branch Pipe
Signages	Exit Assembly point
Extinguishers	ABC (Dry Chemical) Extinguisher
Fire alarm	Hooter and Manual Call Point

8.8.2 Pump selection

The following pump set is selected as per NBC 2016/ Kerala Fire and Rescue Services check list: Terrace Electric pump 450 LPM (1 in Number).

8.8.3 Fire water tanks

Terrace tank or overhead tank of specified capacity is required as per applicable fire code.

Table 8-14 Capacity of Terrace/ Overhead tank

Tank	Mode of Storage	Capacity
Terrace / Overhead tank	Static storage	10,000 Litres

Fire extinguishers and signages are considered for Anantha parks and toilet block.

09

Environmental and Sustainability Aspects

9 ENVIRONMENTAL AND SUSTAINABILITY ASPECTS

9.1 Sustainability Aspects

Beach profile

Beach profiles are important tools for elucidating long-term trends, such as erosion and accretion, and for predicting the future evolution of coastal landforms for better coastal management. Vizhinjam port is 1 km away from project area. As a part of port management strategy, a 30 km stretch (15 km on both north and south ends) is monitored by Vizhinjam transshipment port pvt. ltd. on regular basis. Even though LEO data is confined to port area only, the Port team have been collecting cross profiles for this 30 km stretch at 500m interval, monthly. CSPs 42 to 45 are (three segments) fall within the project area. The compliance reports are provided with VISL. The data shared by VISL for the years 2020 and 2021 have been discussed here.

According to data for the two-year periods 2020 and 2021, November and December saw the highest yield of beach sediments. Between August and October, erosion is at its worst. An inconsistency was discovered while analysing the profiles in April. In 2020, the beach revealed significant berm losses, whereas shifting to 2021 reveals good accretion. The sea advanced, and there was a 10-15m increase in coastal transgression in 2021 compared to 2020.

Kerala's rainfall pattern is directly impacted by climate change over the Arabian Sea, as shown by the amount of precipitation the state has received over the past four years. Due to the warm surface temperature of the Arabian Sea, two to three tropical cyclones pass over the Arabian Sea each year during the pre-monsoon season, which lasts primarily from April to May, and the post-monsoon season, which lasts from September to December.

Bathymetry approaches are important to identify the actual sedimentary allocation. The wave pattern has to a great extent marginalised the cross-shore type. The swell waves are mainly seasonal and highly synchronised to geomorphological factors that shape the beach. Strong, aggressive monsoon waves are behind erosion and the eroded sand may be stored somewhere offshore for the redistribution to the coast by

swells (gentle, long-period waves) found in calmer weather tend to move sediment onshore, building up the beach. Climatic changes and a series of cyclones are susceptible to reluctant swell formation and result in multiple erosions and washouts. The possibility of offshore bar (wave breaker) formation, beach stabilisation by nourishment once if the shore deposits found are not enough to be a natural wave breaker, etc are the means for preserving the beach. The Beach protection and nourishment forms part of a different project. Shore protection measures at Kovalam beach shall be taken up in Phase I as a different project.

Figure 9-1Location details of beach profiles (42-44) collected for Kovalam stretch (source: Vizhinjam Port Pvt. Ltd.)

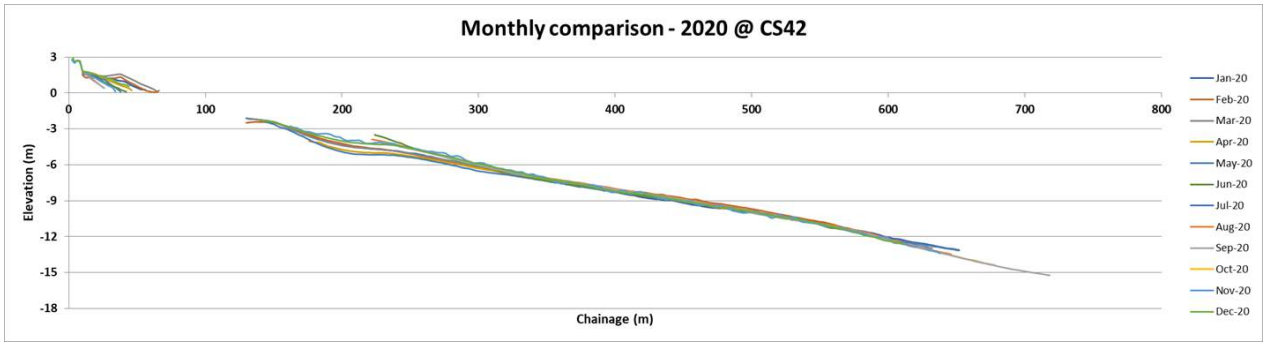


Figure 9-2 Beach profile information of Lighthouse Beach-1, Kovalam, 2020

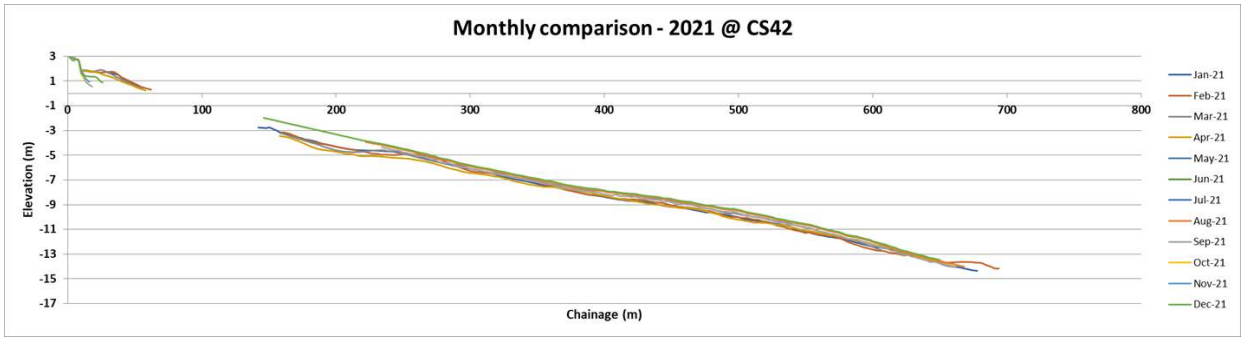


Figure 9-3 Beach profile information of Lighthouse Beach-1, Kovalam, 2021

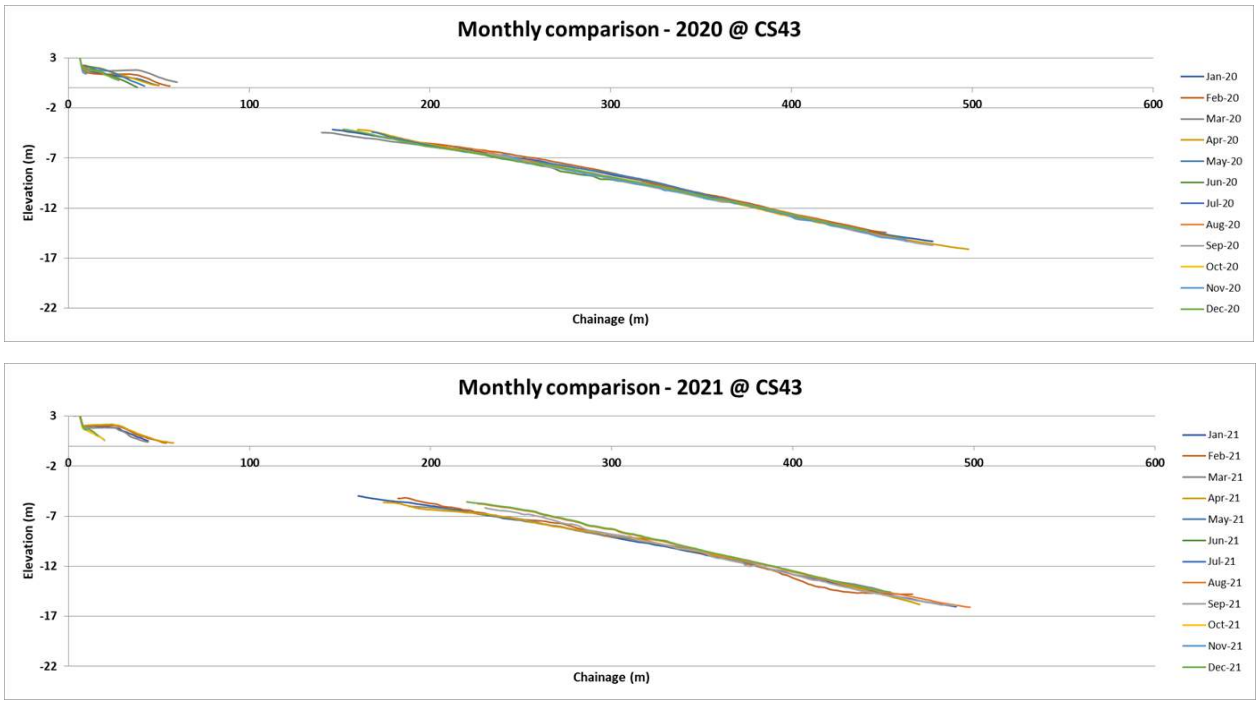


Figure 9-4 Beach profile information of Lighthouse Beach-2, Kovalam, 2020-2021

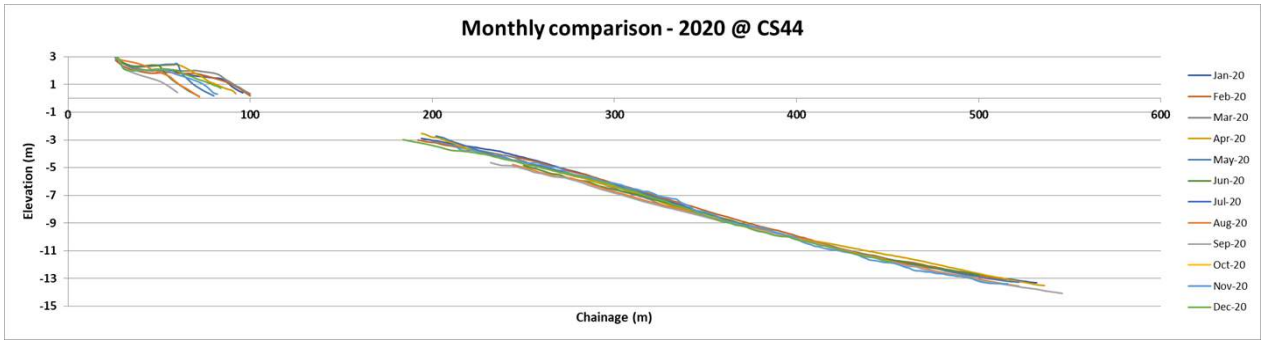


Figure 9-5 Beach profile information of Hawah Beach, Kovalam, 2020

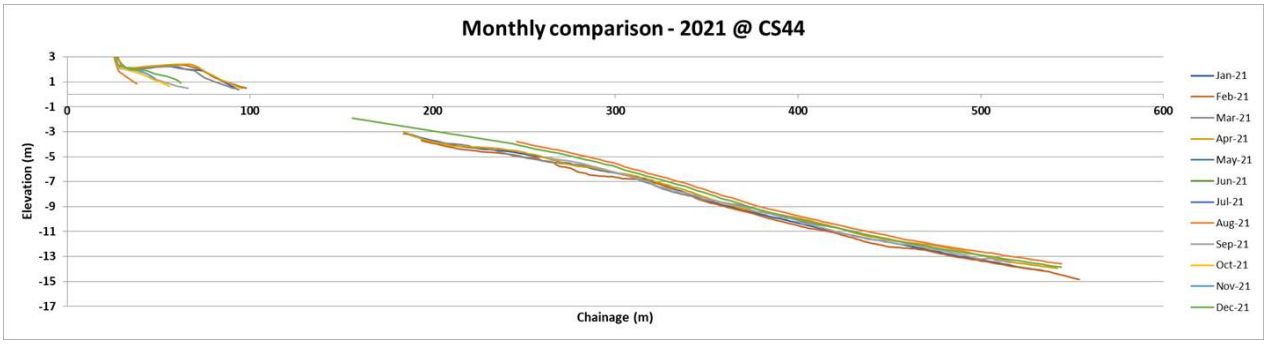


Figure 9-6 Beach profile information of Hawah Beach, Kovalam, 2021

9.2 Carrying Capacity

It is estimated and considered as a potential method for minimising the negative effects of recreation on any fragile tourism areas/centres. It is necessary to understand the relationship between the management parameters of the area and the dynamic of the impacts caused by the activities that are developed in the area in order to calculate the tourism carrying capacity of a specific site. According to the unique physical and ecological conditions, as well as the area's management capacity, a protected area's visitor carrying capacity varies. Therefore, an area's carrying capacity for visitors would increase if its management capacity were improved. This gives you the freedom to experiment with new visitor management techniques.

For Kovalam, the crystal blue waters that provide the perfect playground to do activities like boating, fishing, surfing, kayaking, scuba diving, parasailing, windsurfing or any water sports. The main attractions of this site are light house, heritage centres, Halcyon castle, art gallery, nearby beaches, and holy places, etc. Furthermore, there is a great biodiversity with marine fauna and flora with variety of small and medium mammals. The marine diversity of Kovalam is miniatured in the marine aquarium, Vizhinjam, established in 1997.

Environmental carrying capacity determines the maximum level of tourism over which the physical and ecological structure of the ecosystem recreation area may change and it may be evident by means of erosion, soil compaction, vegetation loss and etc. The considerable physical, ecological, social and managerial variables according to the site-specific characteristics are aesthetic value, overall cleanliness,

performance of management/ authority, safety provisions, erosion resistance belts, tourism amenities, social factor, accessibility, and temporal closing. Existing legal frame, policies, equipment, competence of the staff, funding, infrastructure, and existing facilities are the sub factors that determine the performance of management/ authority. ECC is very much reliant on these variables and considered for standard deviation.

Figure 9-7 Area estimation of beaches of Kovalam, TVM

The physical carrying capacity is the maximum number of visits that is possible to admit during the allowed time in a given tourist area. Estimation is very simple calculation based of the major variables *i.e.,* space and time. There exists a calibration according to the relationship between the actual available variables (space and time) and dependent variables.

In order to estimate of the above parameters, the following assumptions were made:

- One complete visit: Visitors go in one direction around the walking trail/ sandy beach, necessary purchase, kiosk usage and sport activities.

- *per capita* space to move freely (**Avg**.): a couple uses 5 sq. m. (vary with domestic and foreign visitors, use of properties like bed, umbrella, table, etc)
- The open hours to visitors in Kovalam beach are from 6:30 to 18:30 hrs. This means that there are 12 hours available each day.

$$PCC = \frac{SA}{sap} X\ nV$$

where SA is available surface, sap is the area used per person and nV number of times the site can be visited in a given day.

Table 9-1 Kovalam beaches with individual physical carrying capacity

Sl. No.	Beach name	Carrying Capacity (No)
1	Hawa Beach	24562
2	Light House Beach	35092
3	IB Beach	5594
Overall	**A+B**	**59654**
	A+B+C	**65248**

9.3 Biodiversity

Coastal communities contribute significantly to the preservation of the marine environment along the Southern coast especially Trivandrum conceiving Kovalam by engaging in sustainable and environmentally friendly fishing operations. People are reluctant to permit the deployment of nets that harm local ecosystems, fish eggs, fish hatchlings, and other creatures. It's their unspoken rule. They oppose ecological damage and the extinction of fish and plant species. So that there exist vast diverse marine flora and fauna. Some of general existence are portraited as Fig 9-8.

Some of the world's most productive and biologically varied populations can be found on rocky coasts. Sand beaches can be found at Kovalam, but there are also many more promontories. On the rocky outcrops of Hawah Beach and Edakkallu, polychaete colonies can be discovered. Due to their abundance and variety of feeding strategies, which include functioning as detritivores or primary/secondary

consumers, polychaetes are significant parts of the trophic webs of sandy beaches. Somehow, the sandy beach's intertidal region and its motile residents are very lively.

			
Bullia melanoides	Shells of *Purpura and Perna*	*Astropecten indicus*	*Echinometra mathaei*
			
Grapsus albolineatus	*Nerita albicilla*	*Saccostrea cucullata*	*Oliva oliva*
			
Ipomea biloba	Polychaete colony	*Dotilla malabarica*	*Clerodendrum inerme*

Figure 9-8 Biodiversity of Kovalam beach, Thiruvananthapuram

9.4 Geomorphology

The project area comprises of many spectacular geomorphological units viz., lateritic surfaces and valley flats with alluvial fills, in addition to coastal zone characteristics such as beaches, beach-cliffs, stacks, shore platforms, beach ridges, estuaries, and lagoons. Indeed, it is discovered that the complete range of land-forming forces, accompanied by tectonic movements, had a substantial impact on the evolution of these polycyclic and polygenetic landscapes (Mallik, 1987).

9.5 Beach morphology

The Kovalam beaches are one-of-a-kind, with numerous promontories and natural groynes. Even if substantial erosion occurs as expected, the accretion phase is missed. Cross-shore waves are the wave pattern that contributes to erosion in this area. These waves are very active during the monsoon season. Because of the quiet weather, sand from other surrounding beaches can be deposited. This phenomenon is caused by swell waves. The unequal distribution of rainfall in Kerala has been critical in suppressing the impact of swell waves. There are research being conducted to determine the involvement of Vizhinjam port in this, if any.

Figure 9-9 Natural distribution of groynes along the Kovalam shoreline

The maritime habitat, which includes marine species, plants, and corals, is impacted by the shoreline shift. For marine life and those who depend on it to survive, shorelines must be conserved and protected. It's mainly dependent relative to tidal action, naturally. However, there are physical factors that influence the coastal dynamics and have unique impact on tidal formation and beach morphology. These factors include wind, temperature, wave action, and pressure. While temperature causes climatic fluctuations, wind affects sediment transport, like that. Stronger erosion and subsequent accretion occur simultaneously at various areas as a result of the wind generating wind waves along the shoreline.

The shape of a beach at the moment of measurement is shown by beach profiles. The overall physical energy that waves and currents supply causes beach profiles to change. The beach often assumes one of two shapes: a high energy erosional profile or a low energy accretional profile. Long-term erosion is indicated by the beach's steep slope, while progressive accretion is shown by the beach's gentle slope. The

upward erosional profile is relatively homogeneous, gently sloping, and somewhat concave. A substantial berm, a level, mildly landward-sloping back-beach zone, and a moderately steep foreshore zone define the accretional profile. Hence the stability of a beach can be identified through its profile information.

Land loss and gain due to shoreline changes were quantified in square kilometres (sq.km) by geoprocessing shorelines of 1990 and 2016 in GIS environment. 11.13 sq.km of land is gained by accretion and 7.77 sq.km land is lost by erosion along the Kerala mainland. As far as Thiruvananthapuram is concerned erosion, accretion and stable conditions are observed in equal amounts.

Table 9-2 Summary of shoreline changes along the Indian coast (Source: NCESS, 2016)

Sl. No.	State		Shoreline Length (Km)	Shoreline Status (Km)					
				Erosion	%	Stable	%	Accretion	%
1	West Coast	Gujarat	1701.78	524.84	31	741.98	43	434.96	26
2		Maharashtra	739.57	178.26	24	472.67	64	88.64	12
3		Goa	139.64	16.82	12	98.58	68	27.24	20
4		Karnataka	313.02	70.02	22	151.16	48	91.84	30
5		Kerala	592.96	263.04	45	201.52	34	128.40	21
6	East Coast	Tamil Nadu	991.47	407.05	41	353.56	36	230.86	23
7		Pudhucherry	41.66	23.80	57	14.63	35	3.23	8
8		Andra Pradesh	1027.58	272.34	27	320.98	31	434.26	42
9		Odisha	549.50	153.80	28	113.52	21	282.18	51
10		West Bengal	534.35	336.52	63	68.78	13	129.05	24
Total			6631.53	2156.43		2533.86		1941.24	
%				33		38		29	

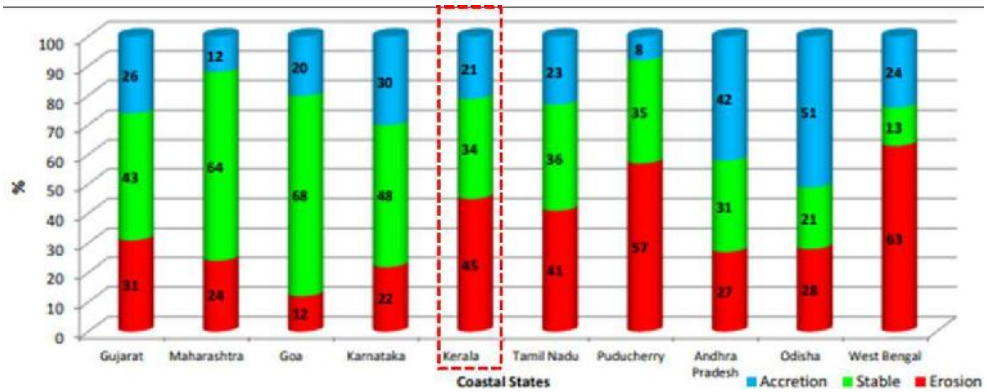


Figure 9-10 Percentage distribution of Coastal performance of Indian shoreline (Source: National Assessment of Shoreline changes along Indian Coast, NCCR, 2018)

Shoreline classification schemes used in the analysis by NCCR are High Erosion (area showing < -5.0 rate m/year) Moderate **Erosion** (rate of erosion is between -5.0 and -3 m/year) Low Erosion (rate of erosion is between -3.0 and -0.5 m/year) Stable Coast (rate of erosion is between --0.5 and 0.5 m/year) Low Accretion (rate of erosion is 0.5 to 3.0 m/year) Moderate Accretion (rate of erosion is 3.0 to 5.0 m/year) 3.0 to 5.0 High Accretion is > 5.0 m/year.

Table 9-3 Kerala coast-line profile showing erosion, accretion and stability (Source: NCCR, 2018)

Sl. No	District	Coast Length (Km)	Shoreline Status (Km)						
			High erosion	Moderate Erosion	Low Erosion	Stable	Low Accretion	Moderate Accretion	High Accretion
1	**Kasargode**	83.60	0.02	0.18	28.48	40.20	12.64	0.44	1.64
2	**Kannur**	69.05	0.04	0.14	28.04	27.85	9.92	2.60	0.46
3	**Kozhikkode**	78.03	0.46	0.84	47.56	24.93	3.74	0.24	0.26
4	**Malappuram**	50.85	0.22	1.06	23.70	18.45	7.10	0.18	0.14
5	**Thrissur**	61.50	0.00	0.34	17.58	12.76	18.72	6.08	6.02
6	**Ernakulam**	45.04	0.00	0.30	20.80	16.76	3.32	0.72	3.14
7	**Alappuzha**	83.56	2.12	5.08	40.66	15.84	13.08	2.68	4.10
8	**Kollam**	45.72	164	0.20	16.88	19.42	6.52	0.30	0.76
9	**TVM**	75.61	0.80	0.84	25.06	25.31	21.46	1.44	0.70
	TOTAL	**592.96**	**5.30**	**8.98**	**248.76**	**201.52**	**96.50**	**14.68**	**17.22**

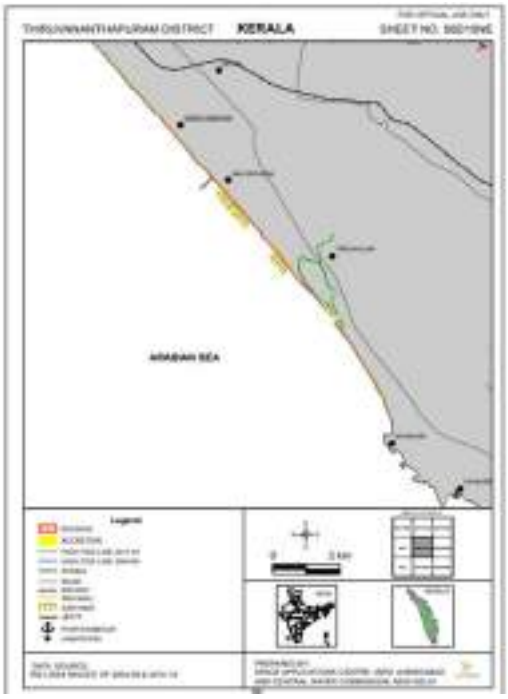


Figure 9-11 Shoreline change map of Kerala (Source: Space Application Centre, ISRO, Aug 2021)

The latest published record of Space Application Centre, ISRO that used IRS LISS IV images of 2014-2016 reveals the coastal line at Kovalam is stable. Even though it is stable there is evident report of alteration of permanent structures constructed by means of beach development during monsoon. Seasonal alteration of beaches has to be managed through scientific approaches with consultation of marine experts and researchers.

9.6 Morpho-dynamics

The beaches of Kovalam are a section of a shoreline that is underwater and is also morphodynamically in a reflective stage (Nair, 1987). As a result, due to the temporal wave climate and the relationship between grain size and beach slope, beach profiles change often. While the granite or gneiss rocks that make up the coastal region along the beaches have been extensively shattered and degraded.

Data on wave period, breaker height, angle of breaking waves to coast, breaking type, surf zone breadth, and longshore current speed and direction are provided by the Littoral Environmental Observation (LEO) programme. Due to the expense and accessibility issues, collecting data in this zone with gauges or other instruments is challenging. In the current investigation, ocular observations were made using conventional measurement methods at 3 chosen stations- Hawah beach, Lighthouse beach and IB beach.

Table 9-4 LEO of Kovalam beach

Sl. No	Factors	Range
1	Tide height	1.13 m @ IB beach **(May 2022)**
2	Wave	3.03m, Hmax. 5.04m
3	Wave direction	206˚
4	Wave period	5.9- 20 sec
5	Littoral drift	Southward (May – August)
		Northward (rest of the year)
6	Beach material	Fine to medium (0.24- 0.34 mm in radius)
7	Seasonal change	Erosion (April – September)
		Accretion (after September)
8	Beach width	35-38m
9	Berm height	1.5-2m
10	Wind interference and direction	13.64 mS-1 @ 308˚ (NW)

As a makeover for its former glory, it is presently being redeveloped according to a master plan, with more secure tourist accommodations, paid public restrooms, a clean and leak-free drainage system, and cleaner drinking water, among other amenities. Some initiatives are done already like a centralised solid waste management of the LSG (BIN system), which has been put up at Vizhinjam and Thiruvallam, will handle all type of solid wastes from the coastal area, all-time vigilant coastal guards will be employed to improve security for visitors, etc.

9.7 Green belt

The Adimalathura Beach, already cherished with diverse species of flora and fauna has a potential of being developed into a green belt.

The selection of the plant species will be based on how well they can adapt to the current geographic conditions and the local vegetation. The selection of plant species with deep fibrous root systems, resistance to salt and drought, nitrogen-fixing capacity, ornamental value, rapid growth with adequate canopy cover, etc. will be prioritised for beach afforestation. To be chosen for planting, the plants must display the following desirable qualities: fast-growing species that offer maximum penetrability are ideal; the species ought to be deeply rooted and wind-resistant; a dense canopy of the many species and the species should be local and accessible as much as possible. In order to help the belt's air turbulence and mixing, the species should be permeable.

With consideration for the landscaping elements, the plantation must be handled appropriately. The choice of plant species for development is influenced by a number of variables, including soil, elevation, and climate. For beaches and beach resorts trees with dense foliage, leaves with a wide leaf area and hairs on both surfaces, and the capacity to endure drought and flooding are good.

The plants that may be considered for greenbelt development are as follows:

1. *Erythrina Indica*
2. *Terminalia Catappa*
3. *Tecoma cowdichowdi*
4. *Millingtonia hortensis*

5. *Delonix regia (Gulmohar)*
6. *Acacia auriculiformis*
7. *Casuarina equisetifolia*
8. *Leucaena macrophylla*
9. *Pongamia pinnata*
10. *Casuarina equisetifolia*
11. *Calophyllum inophyllum*

Besides, major Mangrove varieties available in Kerala are also tried. List of mangroves and associated flora are following.

Table 9-5 Mangrove varieties

Mangrove varieties		**Mangrove Associates**	
1.	Acanthus ilicifolius	1.	Achrostichum aureum
2.	Acrostichum aureum	2.	Anona glabra
3.	Avicennia marina	3.	Barringtonia racemosa
4.	Avicennia officinalis	4.	Cerebra odollum
5.	Bruguiera cylindrica	5.	Clerodendrum innerme
6.	Bruguiera gymnorrhiza	6.	Morinda citrifolium
7.	Bruguiera sexangula	7.	Derris scandens
8.	Excoecaria agallocha	8.	Derris trifoliata
9.	Excoecaria indica		
10.	Kandelia candel		
11.	Rhizophora apiculata		
12.	Rhizophora mucronata		
13.	Sonneratia alba		
14.	Sonneratia caseolaris		

9.8 Environmental Management Plan

9.8.1 Impacts of the Project on Environment

The Impacts are assessed in two Phases: Construction Phase and Operational phase which is described in Table 9-6.

Table 9-6 Identified of potential impacts during construction & operation phase

SL. NO.	COMPONENTS	ASPECT	POTENTIAL IMPACT	EXTENT OF IMPACTS
CONSTRUCTION PHASE				
1.	Ambient Air Quality	Dust emissions from site preparation, excavation, material handling and other construction activities at Site.	Minor negative impact inside the premises. No negative impact outside project site. Short term	Impacts are temporary during construction phase. Impacts will be confined to short distances, as coarse particles will settle within the short distance from activities.
2.	Noise	Noise generated from construction activities, operation of construction equipment and traffic.	Minor negative impact near noise generation sources inside premises. No significant impact on ambient noise levels at sensitive receptors. Short term	Temporary impacts during construction phase. No blasting or other high intensity noise activities envisaged. Contribution of noise during the operational phase will be confined in time and space.
3.	Water quality	Surface runoff from project site Oil/fuel and waste spills. Improper debris disposal Discharge of sewage from labour camp.	Minor negative impact properly managed inside the premises itself. Short term	Impact will be temporary. Expertise labour will be employed. Workers shall be provided potable water for drinking. Proper mitigation measures will be taken to avoid any runoff in the nearby seashore.
4.	Land-use and Aesthetics	Land development	No significant impact Or Permanent positive impact	The project has ample open areas and green spaces, with sustainable infrastructure plan that will enhance the visual appeal of the area.
5.	Topography & Geology	Tourism development Basic amenities	No significant impact Or	Constructions will be designed as per IS standards for

			Minor impacts	earthquake protection.
6.	Soil	Construction activity leading to topsoil removal and erosion.	No negative impacts	Temporary
7.	Ecology Flora & Fauna	Habitat disturbance during construction activity	Minor negative impacts Short term	The site and adjacent areas may have impact on flora and fauna diversity of the area and therefore proper care need to be taken to minimize the disturbance to local ecology.
8.	Socio-economy	Increased job opportunity for locals. Economy related to commercial real estate development, material supply etc. expected to boom.	Overall positive impact	
9.	Traffic Pattern	Truck movement and possibility of traffic congestion outside site access road	No significant impact short term	Beach use will be limited to a small extent.
OPERATIONAL PHASE				
1.	Ambient Air Quality	Particulate and gaseous emissions from DG sets and vehicle movement	Minor Negative impact No significant impact at sensitive receptors.	DG sets will be used only as back up and would be required a maximum for 8 hours a day. A higher stack is recommended in the EMP.
2.	Noise	Noise from vehicle movement and operation of diesel generator sets during power failure.	No significant impact at sensitive receptors.	Contribution of noise from the project during operational phase will be negligible.
3.	Water Quality	Oil/fuel and waste spills. Discharge of contaminated storm water	Significant adverse impact on nearby sea water, if not properly managed inside the premises itself	Proper waste management plan and storm water management plan will be developed inside the premises only to avoid any contamination of nearby seashore water.
4.	Water usage	Use of water is minimum	No significant impact	Public supply
5.	Soil	Storage and disposal	Minor negative	

		of solid and hazardous wastes Discharge of stormwater Fuel and material spills	impact	
6.	Ecology Flora & Fauna	Land-use change Discharge of stormwater to sea	Minor negative impact or Significant adverse impact on marine ecology and minor significant impact on terrestrial ecology	In whole study area highly significant flora and fauna was recorded. Therefore, proper care will be taken during the construction and operation phase to avoid any disturbance to local ecology
7.	Socio-economy	Increased job opportunity in the proposed project for the locals.	Overall positive impact	
8.	Traffic Pattern	The proposed project is likely to add significantly to the predicted traffic during peak hours.	Moderate Negative Impact	Traffic management measures and additional road infrastructure will be planned by the developers with the consent of the concerned authorities to meet the increased traffic loads.

9.8.2 Environmental Monitoring Plan

The monitored data will be analysed and compared with the baseline levels as established in the EMP and the regulatory standards specified by KSPCB. The standards against which the different environmental components will be compared are as per the following:

Table 9-7 Applicable standards for different environmental components

Sl. No.	Component	Applicable Standards
1	Ambient Air Quality	National Ambient Air Quality standards, KSPCB
2	Noise Quality	Ambient Air Quality Standards with Respect to Noise, KSPCB
3	Surface water quality	Water Standards, KSPCB
4	Groundwater quality	IS: 10500 Standards, BIS
6	Treated water quality (stormwater)	IS 2490(1974) – Discharge into surface water, IS 3306(1974) – Discharge on land, IS 3307(1974)- Discharge for agricultural use

10 Risk Assessment

10 RISK ASSESSMENT

Risk identification, managing through mitigative measures thereby reducing the impact is key to success of every project. Certain key risk as identified at the time of developing the concept of proposed development is listed in the below table. Possible means to control the impact is detailed in the mitigative measures

Table 10-1 Risks and Mitigation Plan

SL. No	Risk	Mitigation Plan
1	Land Acquisition	Timely action to identify and expedite the land acquisition shall be ensured. Department concerned shall work in tandem to acquire the land parcels as detailed in the report
2	Sea Attacks, Seismic Environment	The construction of the proposed walkway at the beachfront may get delayed due to unfavourable climatic condition during the phase of construction. Phased construction, Necessary protective measures etc shall be planned and put in place.
3	Damage to flora and fauna	The noise and water pollution due to construction activities can disturb the flora and fauna. Proper execution plans and control measures shall be put in place through EHS plan.
4	Inconvenience to Dwellers and Tourists	Phased manner construction, proper signages, dust/ noise control provisions, barricades, alternate pathways etc shall be planned
5	Local Agitation	Bringing the local community on bard from the initial planning stage. Timely and periodic interaction with local community. Addressing their grievances at right time.

11 SWOT Analysis

11 SWOT ANALYSIS

The Kerala government actively promotes tourism, even at the level of local bodies. Considerable budgetary provisions have been established in anticipation of the state's socio-economic development. They truly support eco-friendly tourism, emphasising the preservation of history and culture. Since 2017, responsible tourism has been promoted to go deeper into the theme by involving more local participation in the same. Through a concerted effort of all line departments, the private sector, and private-public partnerships, the government is formulating new regulations, improving the existing institutional structures for regulated tourist development, and moving on to fundamental infrastructure development. By ensuring quality services in all areas of tourism, they also hope to discover and expand Kerala's domestic and worldwide markets.

Table 11-1 SWOT Analysis of Beach tourism in Kovalam, Thiruvananthapuram

S STRENGTHS	W WEAKNESS	O OPPORTUNITIES	T THREATS
– Natural open beach – Promontories and stable shoreline – Innate ecotourism potential – Retains rural landscape – Comfortable climate – Hospitality – Proximity to waterways – Traditional architecture and historic	– Inadequate appraisal of natural resources – Inability to organize infrastructure and superstructure – Lack of qualified personnel – Lack of ecotourism standards and quality of service – Inadequate entertainment, shopping spots, health and hygiene condition	– Accessibility of area (waterways) – Growing world tourism – Ambient environment for responsible tourism – The rapid development of ICT – Proximity to potential tourism centers – Participation of Tour- agencies – Participation of universities and other research institutions	– Limited approaches to tackle carrying capacity. – Unorganised multidisciplinary approaches from authorities – Deterioration of natural and cultural identity *via* limited tourism perception – Participation and information on climate change, human pressures, and pollution are insufficient. – Resource management

monuments – Community level participation (Available labour force) – Vizhinjam port – Thick biodiversity	– Limited access to beach, nowadays – Faecal pollution		issues as a result of intensive use during the summer months

12

Project Cost Analysis

12 PROJECT COST ANALYSIS

The Expected project cost inclusive of GST of 18 percent is given in the table below. For the analysis of cost, Cost Index applied for estimate is 35.59 per cent.

Table 12-1 Total Project Cost Analysis - Phase I

Sl. No	Project Name	Total Project Cost (Including 18 % GST)
A	**Civil**	**Rs 41,87,90,000.00**
1	Anantha Park	Rs 3,06,80,000.00
2	Walkway	Rs 21,77,10,000.00
3	Corporation Land Development	Rs 3,54,00,000.00
4	Edakkal/ Mid- Rock Bridge	Rs 3,50,00,000.00
5	Cable Stayed Bridge	Rs 8,50,00,000.00
6	STP	Rs 50,00,000.00
7	Adimalathura	Rs 1,00,00,000.00
B	**Electrical**	**Rs 7,26,50,452.00**
C	**Fire- fighting**	**Rs 8,50,000.00**
Total		**Rs 49, 22,90,452.00**
	Centage + PMC (7%)	**Rs 3,44,60,331.64**
D	**Land Acquisition**	**Rs 40,00,00,000.00**
	Unforeseen Contingency	**Rs 32,49,216.36**
	Total	**Rs 93,00,00,000.00**
INR 93. 00 Crores		
Rupees Ninety-three crores only		

The Detailed estimate including the civil, electrical and fire protection is attached in Annexure V.

13 Revenue Streams

13 REVENUE STREAMS

Several simple revenue generating mechanisms can be adopted to generate revenues from visitors and tourists for the well maintenance and operation of the beaches. Charges can be assigned for renting the kiosks or leasing a property or building and generated revenue shall be handled by concerned department for Operation and Maintenance of the property or building. In general, following income collection categories are proposed.

Table 13-1 Type of Revenue Generation and Charges

Sl. No	Identified revenue generating components	Revenue to be collected
1	Kiosks (10 in No' s)	Rs 100 per day
2	Pay and use toilet	Rs 10 per head
3	Bath and changing area	Rs 20 per head
4	Cloak Room	Rs 20 per belongings
5	Ticket counter 1 - Foreigners (edakkal)	Rs 150 per head
6	Ticket counter 1 - Domestic (edakkal)	Rs 50 per head
7	Ticket counter 2 - Foreigners	Rs 500
8	Ticket counter 2 -Domestic	Rs 300
9	ticket counter @ mid rock - foreigners	Rs. 100 per person
10	ticket counter @ mid rock - domestic	Rs 50 per person
11	Bicycles (10 in no.s) (10 % for DTPC)	Rs 20 for each
12	Billboards (80 in Nos)	Rs. 3000 per billboard per month
13	Led walls- Advertising	800 per sq. ft per month
14	Silent Valley	Rs 1,00,000 per month
15	Water Sports Activity	Rs 30, 00, 000 per year
16	Scuba diving (10% for DTPC)	Rs 1500 daily 5 people
18	Hoardings	Rs 5000 per Hoardings
19	Solar panels	Rs 60,0000 per year
20	Cable Stayed bridge (Entry fee to IB beach)	Rs 500.00 per head
21	Boating	Rs 1500 per boat
22	Parking - 2 wheel	Rs 50 per vehicle
23	Parking - 4 wheel	Rs 35 per vehicle
24	Parking – Bus	Rs 70 per bus
25	Advertisement	Rs 300 per Advertisement

26	Open Theatre (2 shows per month)	Rs 7000 per show
27	Children' s Park	Rs 30 per head
28	Segway	Rs 30 per head

14

Cost benefit Analysis and Investment Criteria

14 COST BENEFIT ANALYSIS AND INVESTMENT CRITERIA

14.1 Economic Analysis

Economic analysis is primarily established to identify the risks as well as benefits of investment in any project. It acts as a tool for the bureaucrats in decision making.

The Economic Analysis Proposal for the Development of Beach Facilities at the proposed beach is to assess the benefits to the society. The very basis of economic analysis being the selection of the most attractive option and it is necessary that it evaluates a number of possible alternatives. The basic alternative is the 'do-nothing' (or the continuation of the present situation). Kovalam, being an international tourism hub, do nothing is not the right option. Hence development of the facilities beyond the economic feasibility is the need of the day.

14.2 Cost- Benefit Analysis (CBA)

The Cost Benefit Analysis (CBA) is the implicit or explicit assessment of the benefits and costs (i.e., economic costs and economic benefits) associated with an investment project. Benefits and costs may be non-monetary and monetary in nature.

Economic Rate of Return (ERR) and Cost Benefit Ratio (Benefit / Cost) are some of the measures to arrive at the social benefits from any infrastructure project. The financial analysis appraises the project in terms of return on investment while the economic analysis appraises the project contribution to the social and economic welfare of the city, region or country.

Though all the cost and benefits from tourism related project is not possible to be expressed in monitory terms, possible costs and benefits are being measured in monitory terms and evaluated to arrive at a conclusion whether the tourism project is worth to the society.

Thus cost-benefit analysis involves comparing the costs to the benefits of a project and then deciding whether to go ahead with the project. The costs and benefits of

the project are quantified in monetary terms after adjusting for the time value of money, which gives a real picture of the costs and benefits. The equation for finding the CBR is:

$$\textit{Cost Benefit Ratio} = \frac{\Sigma \textit{ Present value of Future Benefits} - \Sigma \textit{ Present Value of Future Costs}}{\Sigma \textit{ Present value of future cost}}$$

If the Cost Benefit ratio is greater than 1, go ahead with the project. If the benefit-cost ratio is less than 1, you should not go ahead with the project.

The present value of future cost is defined as the total project cost excluding taxes and duties, Land acquisition and other unforeseen expenses, which is estimated as Rs 49, 22,90,452.00.

Table 14-1 Cost Benefit Analysis

Year	Present Value of Future Benefits (Revenue)	Present Value of Future Costs (Expenditure)	(Revenue-Expenditure)	Cost Benefit Ratio (CBR)	Status
10th year	Rs 19,76,15,875.97	Rs 2,65,78,085.38	Rs 17,10,37,790.59	**0.35**	Not profitable
15th year	Rs 31,75,41,426.41	Rs 3,99,10,454.89	Rs 27,76,30,971.52	**0.56**	Not profitable
25th year	Rs 82,36,20,680.53	Rs 10,35,17,441.44	Rs 72,01,03,239.09	**1.46**	Profitable

As per the CBA calculations, the proposed development plan in Kovalam is economically profitable from 25th year onwards.

The detailed analysis and calculation of CBA is enclosed in Annexure VI.

15

Project Management Organization

15 PROJECT MANAGEMENT ORGANISATION

The Government shall decide the agency/ body for the purpose of implementing the project.

Administrative Department / Public Agency (Tourism Department)

The Administrative Department (Tourism Department) will appoint an Special Purpose Vehicle SPV to implement the project.

Special Purpose Vehicle (SPV)

The SPV may either render their services on its own or submit a proposal for obtaining the services of consultants for the various purposes connected with the project such as Project Consultancy, Planning, Implementation, Procurement, Management and Advisory Services.

The detailed scope of SPV for the implementation of the project is as follows:

1. SPV shall enter a contract with an agency (referred to as Contractor) for implementation of the project. The SPV shall ensure that all the obligations of the contractor such as detailed project tasks and timelines for execution as per the approved schedule.
2. SPV shall be ultimately responsible for monitoring the progress of the project, physical verification of the project and ensuring the quality and timely completion of implementation of the project.
3. SPV shall ensure the contractor to provide safe and healthy working environment for the workers engaged in the implementation of the project.
4. The SPV shall submit the completion report on completion of the implementation of the project through the public agency.

16 Project Schedule

16 PROJECT SCHEDULE

The project is planned to be executed in phased manner as detailed in Section 5 of the report.

Phase 1 of the project is scheduled for 305 days for construction activities. Pre-Construction activities such as administrative sanction, tendering etc is considered for a duration of 90 days.

A level 1 schedule for the Phase I activities are attached in Annexure I

17

Statutory Clearances

17 STATUTORY CLEARANCES

For any project, certain statutory clearances as well as adherence to certain stipulated rules are to be followed. List of approvals/ rules to be taken in account for the proposed development plan is listed in Table 18-1.

Table 17-1 Summary of Environmental Legislation Concerning Proposed Project

Sl No	Agency/ Department
1	Environment (Protection) Act, 1986 with Rules
2	Kerala Municipal Building Rules (KMBR), 2019
3	CRZ Notification, 2019
4	Guidelines for issuance of No Objection Certificate (NOC) (Constituted under sub-section (3) of section 3 of the Environment (Protection) Act, 1986)
5	Air (Prevention and Control of Pollution) Act, 1981 with Rules.
6	Water (Prevention and Control of Pollution) Act, 1974 with Rules.
7	Water Cess Act, 1977
8	The Biological Diversity Act, 2002
9	Noise Pollution (Regulation and Control) Rules, 2010, as amended
10	Construction and Demolition Waste Management Rules, 2016
11	Indian Electricity Rules,1956
12	Indian Motor Vehicles Act, 1988
13	Petroleum Act with Rules 2000
14	Municipal Solid Waste (Management and Handling) Rules, 2016
15	Plastic waste management amendment rules 2021
16	State Groundwater Regulation
17	Tourism Policy, 2017
18.	The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 (Act 30 of 2013) (LARR)
19.	Tree Cutting Permission
20.	Kerala conservation of Paddy and wetland Act, 2008

18 Operation and Maintenance Plan

18 OPERATION AND MAINTENANCE PLAN

- To monitor the operation and maintenance after the implementation of the project, it is recommended to form a committee constituting representatives from various government departments concerned, shop owners, public representatives, etc.
- The Revenue collected after the development of Kovalam beach can be utilized for the effective cleaning and maintenance.
- Lifeguards, Security guards, cleaning sweepers, supervisors,etc shall be employed to ensure the safety and upkeep of the proposed facilities.
- Supervisors and gardeners shall be appointed especially for the operation and maintenance of Landscaping.
- Proper waste management as detailed in Section 8.6 shall be implemented.

19 Recommendations

19 RECOMMENDATIONS

- A Joint Monitoring Committee (Kovalam Beach Monitoring Committee) of officials from departments concerned shall be assigned to monitor the activities, operation and maintenance at the beach frequently. Feedback and suggestions from visitors shall be recorded. Frequent evaluation meeting shall be conducted at the site for examining the site condition and insights from the committee shall be formulated to frame certain strategies for the further operation and maintenance of the beach and its surroundings.
- 'No Plastic, No waste' shall be the motto.
- Kovalam shall be declared as a Special Tourism Zone and license to shop owners can be given/renewed by a single window clearance board which constituting members from various departments concerned. Single window clearance board can consider the application for licence / renewal only after the recommendation of Monitoring Committee.
- The Monitoring Committee should formulate a clear set of guidelines which analyse whether the existing shops are maintaing a uniform design in elevation and fulfil the basic amenities in their individual shop. All these aspects shall be a checkpoint considered during the license renewal procedure. Form based coding is proposed for the existing facades which the monitoring committee can implement on a phased manner.
- The Adimalathura beach is well connected to Poovar which is then connected to Kanyakumari Uchakada Road. This Break water connectivity between the area shall be developed for providing water sport activities like Kayaking to enhance the responsible tourism as revenue generation mode as well as uplifting the local community. The Monitoring committee may develop strategies in this aspect.
- There shall be regular checks by the concerned authorities on licensed water sport activities for ensuring safety and training shall be provided to local community with support of RT mission to promote People' s Participation.

20 Conclusions

20 CONCLUSIONS

The city of Thiruvananthapuram has an enormous potential in the domain of Tourism. Kovalam in itself is a major tourism attraction for the foreigners as well as domestic tourists. Kovalam is losing its charm mainly due to unplanned construction, insufficient amenities and reducing beach which is result of changing climate and encroachment of beach zone. In order to improve visitor experience in Kovalam, there is a need to provide more facilities which includes a better parking area, toilet blocks and changing room, signages, encouraging water sport activities like paragliding, scuba diving, etc. Also, improving the waste management strategies in the beach aiming for a complete green protocol. Inclusive planning is another major factor considered with special provision for the differently abled. All these activities can be implemented with the involvement of local communities that provide them an employment opportunity.

This report analyzed the need for the development of Kovalam and its adjacent beaches; identified the existing shortfalls in the project location and challenges pertaining to it. The Major potential spots for augmenting tourism integrated with sustainable development are the Hawa Beach, Light House beach, IB Beach and Adimalathura Beach. The Project will be implemented in two Phases, in which, Phase-I will cover the development of Kovalam beach, i.e; Hawa Beach and Light house beach; and the Phase II will deal with the development of adjacent beaches, i.e., IB Beach and Adimalathura beach; and development of coconut plantation land. Shore protection measures at Kovalam beach will be taken up in Phase I as a separate project. The development of Kovalam beach will create a sense of economic, social and psychological empowerment and will act as a catalyst for economic growth of the state. The international infrastructure facilities proposed in Kovalam beachfront development will eventually become the landmark of international tourist map.

References

REFERENCES

1. Proshanta Kumar Ghosh, Debajit Datta *Coastal tourism and beach sustainability – An assessment of community perceptions in Kovalam, India;* Malaysia Journal of Society and Space 8 issue 7 (75 – 87) © 2012, ISSN 2180-2491
2. *20-year perspective plan final report of Kerala*: Tata Economic Consultancy Services Bangalore.
3. *Tourists' Perception - A Study on Tourism in Kovalam, Thiruvananthapuram District*; Yamuna V.L; IOSR Journal of Humanities And Social Science (IOSR-JHSS) Volume 26, Issue 1, Series 1 (January. 2021) 37-48
4. CRZ Kovalam - *Coastal Zone Management Plan Kerala, KCZMA*
5. *Kerala Tourism - The Role of the Government and Economic Impacts*, January 2018; Centre for Public Policy Research
6. *Status Report on Coastal Protection & Development in India*, Centre water commission, New Delhi, 2016
7. *Kerala Tourism Statistics, 2019*
8. *Wikipedia*
9. Sridhar R, Nair SK (2004) *Zero Waste Kovalam and employment opportunities*. Thanal Conservation Action and Information Network, Thanal, India.
10. Thanal (2005) *Case study of Zero Waste Kovalam: A progressive waste management programme with a focus on the best available technology options and material substitution*. Thanal, India.
11. Ahamed E (1972) *Coastal geomorphology of India.* Orient Longman, New Delhi.
12. Nair MM (1987) Coastal geomorphology of Kerala. *Journal of the Geological Society of India* **29** (4), 450-458.
13. Biju MR (2006) *Sustainable dimensions of tourism management*. Mittal Publications, India.
14. Jayashre AK (2000) *Tourism and women*: *Lessons from Kovalam*. [Article on the Internet] THRANI Center for Crisis Control [cited October 26th 2008]. http://www.tharani.com/pdf/tour.pdf.
15. NCSCM Carrying Capacity of Beaches of for Providing Shacks & Other Temporary Seasonal Structures in Private Areas. http://dstegoa.gov.in/Beach%20Carrying%20Capacity%20Report.pdf
16. Armono, H.D., Rosyid, D.M. and Nuzula, N.I. (2017). Carrying capacity model applied to coastal ecotourism of Baluran National Park, Indonesia. In *IOP Conference Series: Earth and Environmental Science* (Vol. 79, No. 1, p. 012004). IOP Publishing.
17. *Technical manual for scientific waste management, Suchitwa Mission*, LSGD Govt. of Kerala

18. *Septage management - A Practitioner′ s Guide*, Centre for Science and Environment, Ministry of Urban Development, Govt. of India
19. *Solid Waste Management in Tourist Destinations in Developing Nations: Case Studies in Hoi An, Vietnam, and Puncak, Indonesia ; Jane Singer, Kinh Thi Kieu and Andrea Emma Pravitasari* © Springer Nature Singapore Pte Ltd. 2019 W. W. M. So et al. (eds.), Environmental Sustainability and Education for Waste Management, Education for Sustainability.
20. *A Sustainable Solid Waste Management Plan for Sagarmatha* (Mt Everest) National Park and Buffer Zone, Nepal. Milan Shrestha, Netra B. Chhetri, Mountain Research and Development · December 2020

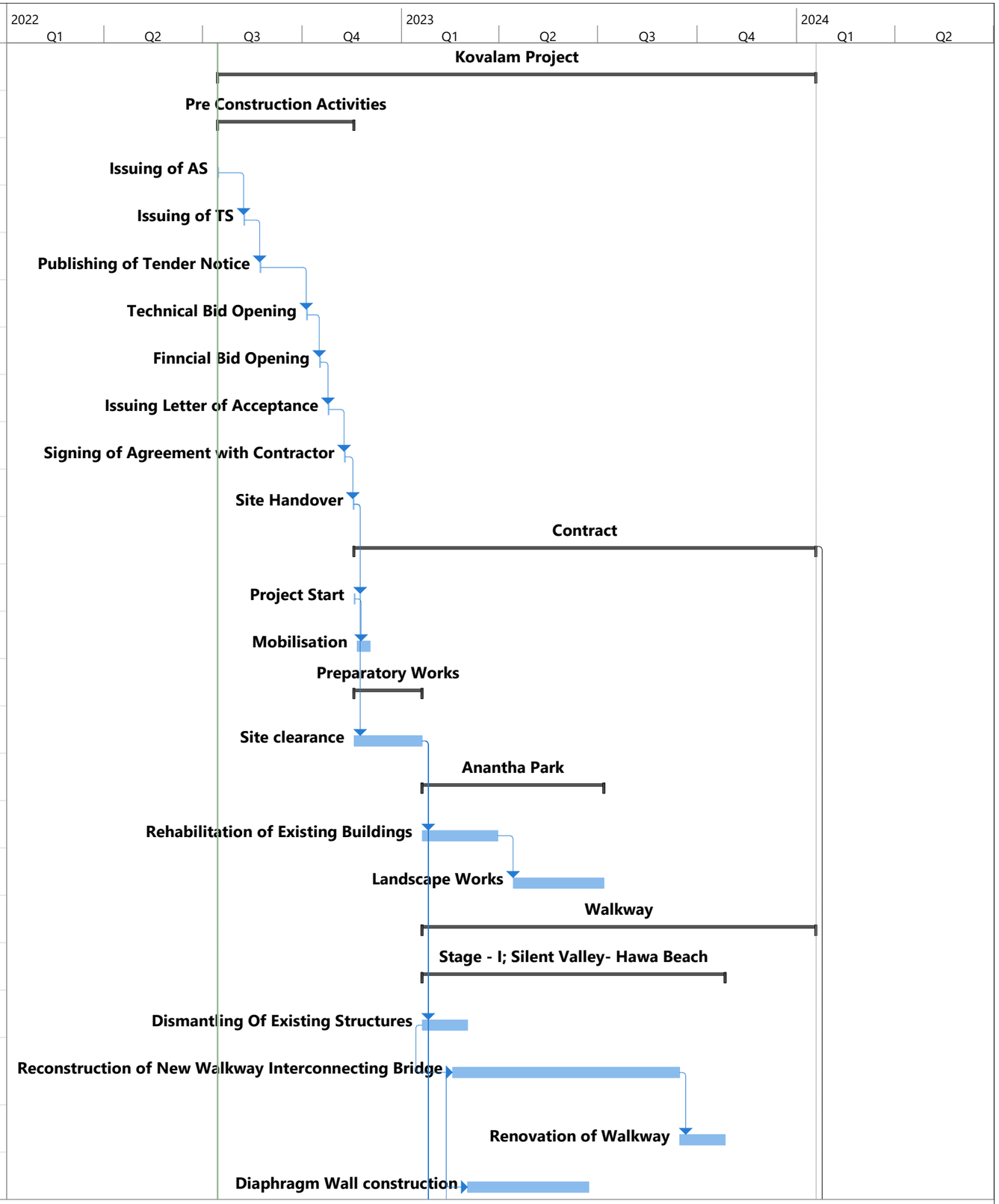
Annexures

Annexure

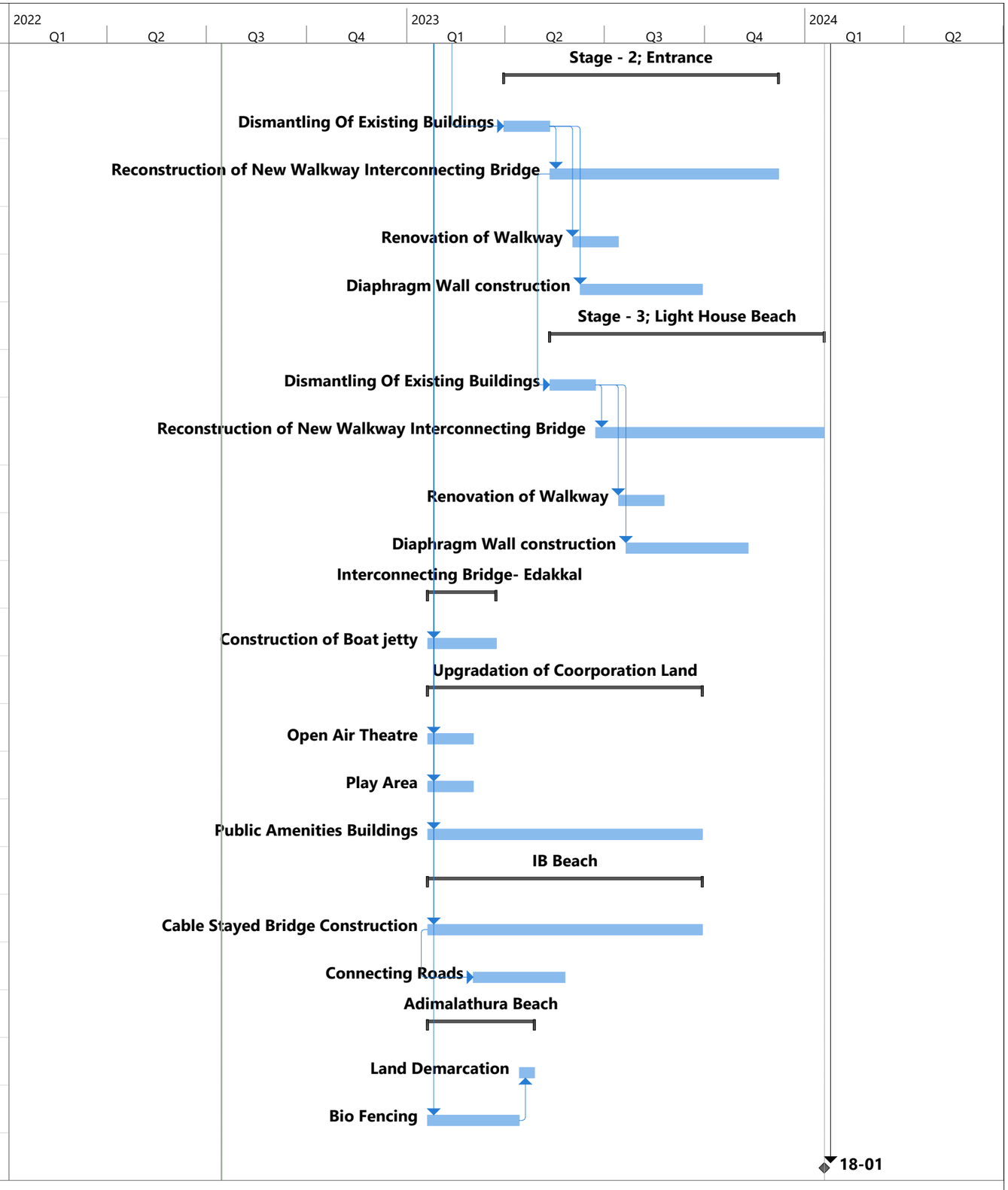
01

Project Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Kovalam Project**	**395 days**	**15-07-22**	**18-01-24**	
2		**Pre Construction Activities**	**90 days**	**15-07-22**	**17-11-22**	
3		Issuing of AS	1 day	15-07-22	15-07-22	
4		Issuing of TS	1 day	08-08-22	08-08-22	3FS+15 days
5		Publishing of Tender Notice	1 day	23-08-22	23-08-22	4FS+10 days
6		Technical Bid Opening	1 day	05-10-22	05-10-22	5FS+30 days
7		Finncial Bid Opening	1 day	17-10-22	17-10-22	6FS+7 days
8		Issuing Letter of Acceptance	1 day	25-10-22	25-10-22	7FS+5 days
9		Signing of Agreement with Contractor	1 day	09-11-22	09-11-22	8FS+10 days
10		Site Handover	1 day	17-11-22	17-11-22	9FS+5 days
11		**Contract**	**305 days**	**18-11-22**	**18-01-24**	
12		Project Start	1 day	18-11-22	18-11-22	10
13		Mobilisation	10 days	21-11-22	02-12-22	12
14		**Preparatory Works**	**45 days**	**18-11-22**	**19-01-23**	
15		Site clearance	45 days	18-11-22	19-01-23	10
16		**Anantha Park**	**120 days**	**20-01-23**	**06-07-23**	
17		Rehabilitation of Existing Buildings	50 days	20-01-23	30-03-23	15
18		Landscape Works	60 days	14-04-23	06-07-23	17FS+10 days
19		**Walkway**	**260 days**	**20-01-23**	**18-01-24**	
20		**Stage - I; Silent Valley- Hawa Beach**	**200 days**	**20-01-23**	**26-10-23**	
21		Dismantling Of Existing Structures	30 days	20-01-23	02-03-23	15
22		Reconstruction of New Walkway Interconnecting	150 days	17-02-23	14-09-23	21SS+20 days
23		Renovation of Walkway	30 days	15-09-23	26-10-23	22
24		Diaphragm Wall construction	80 days	03-03-23	22-06-23	22SS+10 days



ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
25		**Stage - 2; Entrance**	**180 days**	**31-03-23**	**07-12-23**	
26		Dismantling Of Existing Buildings	30 days	31-03-23	11-05-23	22SS+30 days
27		Reconstruction of New Walkway Interconnecting	150 days	12-05-23	07-12-23	26
28		Renovation of Walkway	30 days	02-06-23	13-07-23	26FS+15 days
29		Diaphragm Wall construction	80 days	09-06-23	28-09-23	26FS+20 days
30		**Stage - 3; Light House Beach**	**180 days**	**12-05-23**	**18-01-24**	
31		Dismantling Of Existing Buildings	30 days	12-05-23	22-06-23	27SS
32		Reconstruction of New Walkway Interconnecting	150 days	23-06-23	18-01-24	31
33		Renovation of Walkway	30 days	14-07-23	24-08-23	31FS+15 days
34		Diaphragm Wall construction	80 days	21-07-23	09-11-23	31FS+20 days
35		**Interconnecting Bridge- Edakkal**	**45 days**	**20-01-23**	**23-03-23**	
36		Construction of Boat jetty	45 days	20-01-23	23-03-23	15
37		**Upgradation of Coorporation Land**	**180 days**	**20-01-23**	**28-09-23**	
38		Open Air Theatre	30 days	20-01-23	02-03-23	15
39		Play Area	30 days	20-01-23	02-03-23	15
40		Public Amenities Buildings	180 days	20-01-23	28-09-23	15
41		**IB Beach**	**180 days**	**20-01-23**	**28-09-23**	
42		Cable Stayed Bridge Construction	180 days	20-01-23	28-09-23	15
43		Connecting Roads	60 days	03-03-23	25-05-23	42SS+30 days
44		**Adimalathura Beach**	**70 days**	**20-01-23**	**27-04-23**	
45		Land Demarcation	10 days	14-04-23	27-04-23	46
46		Bio Fencing	60 days	20-01-23	13-04-23	15
47		Project Finish	0 days	18-01-24	18-01-24	11



Annexure

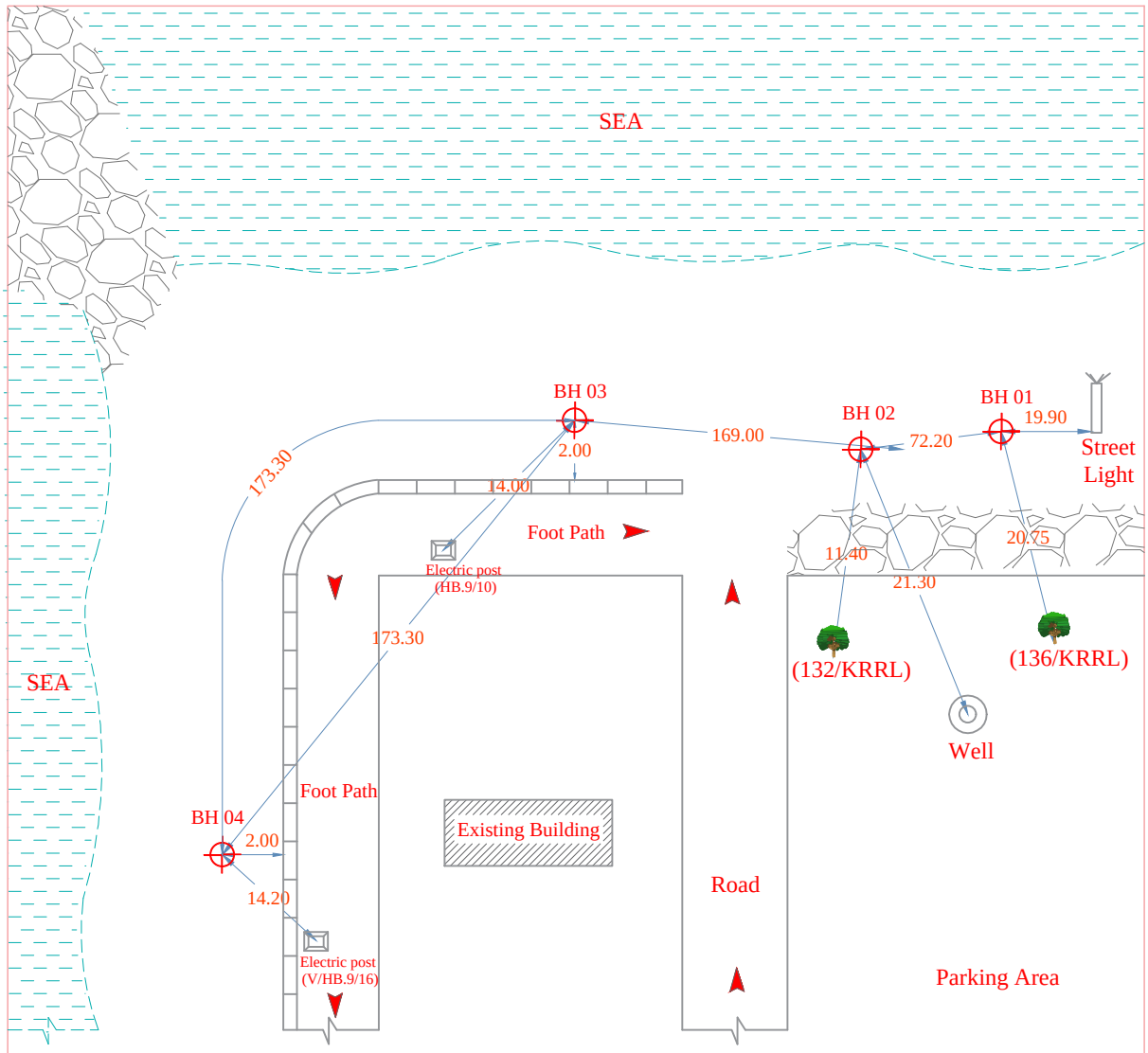
02

Bore log Datasheet

GEOTECHNICAL INVESTIGATION WORK FOR THE PROPOSED PATHWAY AT KOVALAM

BOREHOLE LOCATIONS (NOT TO SCALE)

ALL DIMENSIONS ARE IN METRES



BORE LOG SHEET

Project :

Geotechnical Investigation Work for the Proposed Pathway at Kovalam

Client	: *KIIFB*	Drilling Start Date	: *26/06/2022*
Location	: *Kovalam*	Drilling End Date	: *26/06/2022*
Bore Hole No	: *BH01*	Ground Water Level	: *Ground Level*
Drilling Method	: *Rotary Drilling*	Termination Depth	: *10.00m*

DEPTH (m)	PROFILE	DESCRIPTION OF STRATA	THICKNESS OF STRATA	DEPTH (m)	TEST DEPTH	BLOWS / 15 cm			SPT (N)	REMARKS
						15 cm	30 cm	45 cm		
		Silty Sand (Yellow and Black)	2.00	1.00	1.00 - 1.45	11	22	28	>50	SPT Rebound Balance 2cm
2.00				2.00	2.00 - 2.45	25	38	12	>50	SPT Rebound Balance 13cm
3.00		Silty Sand with Shell Particles (Yellow)	1.00	3.00	3.00 - 3.45	20	29	21	>50	SPT Rebound Balance 7cm
4.00		Silty Sand (Yellow)	1.00	4.00	4.00 - 4.45	23	40	10	>50	SPT Rebound Balance 14cm
		Sandy Clay (Brown)	2.00	5.00	5.00 - 5.45	6	2	2	4	
6.00				6.00	6.00 - 6.45	4	3	4	7	
		Sitff Clay with Sand (Grey and White)	4.00	7.50	7.50 - 7.95	4	7	7	14	
				9.00	9.00 - 9.45	11	10	9	19	
10.00				10.00	10.00 - 10.45	10	12	12	24	

The Borehole was Terminated at 10.00m Depth

BORE LOG SHEET

Project :

Geotechnical Investigation Work for the Proposed Pathway at Kovalam

Client	: *KIIFB*	Drilling Start Date	: *27/06/2022*
Location	: *Kovalam*	Drilling End Date	: *27/06/2022*
Bore Hole No	: *BH02*	Ground Water Level	: *Ground Level*
Drilling Method	: *Rotary Drilling*	Termination Depth	: *10.00m*

DEPTH (m)	PROFILE	DESCRIPTION OF STRATA	THICKNESS OF STRATA	DEPTH (m)	TEST DEPTH	BLOWS / 15 cm			SPT (N)	REMARKS
						15 cm	30 cm	45 cm		
1.00		Silty Sand (Yellow and Black)	1.00	1.00	1.00 - 1.45	6	7	9	16	
				2.00	2.00 - 2.45	30	40	10	>50	SPT Rebound Balance 10cm
		Silty Sand with Shell Particles (Yellow)	3.00	3.00	3.00 - 3.45	19	46	4	>50	SPT Rebound Balance 14cm
4.00				4.00	4.00 - 4.45	36	50	-	>50	SPT Rebound Balance 19cm
5.00		Sandy Clay (Brown)	1.00	5.00	5.00 - 5.45	2	2	2	4	
				6.00	6.00 - 6.45	2	3	4	7	
		Sitff Clay with Sand (Yellow and Grey)	5.00	7.50	7.50 - 7.95	12	10	26	36	
				9.00	9.00 - 9.45	13	15	16	31	
10.00				10.00	10.00 - 10.45	27	50	-	>50	SPT Rebound Balance 17cm

The Borehole was Terminated at 10.00m Depth

BORE LOG SHEET

Project :

Geotechnical Investigation Work for the Proposed Pathway at Kovalam

Client	: *KIIFB*	Drilling Start Date	: *29/06/2022*
Location	: *Kovalam*	Drilling End Date	: *29/06/2022*
Bore Hole No	: *BH03*	Ground Water Level	: *Ground Level*
Drilling Method	: *Rotary Drilling*	Termination Depth	: *4.00m*

DEPTH (m)	PROFILE	DESCRIPTION OF STRATA	THICKNESS OF STRATA	DEPTH (m)	TEST DEPTH	BLOWS / 15 cm			SPT (N)	REMARKS
						15 cm	30 cm	45 cm		
		Silty Sand (Black and Yellow)	2.00	1.00	1.00 - 1.45	4	8	14	22	
2.00				2.00	2.00 - 2.45	50	-	-	>50	No Sample SPT Rebound Balance 23cm
		Silty Sand (Yellow)	2.00	3.00	3.00 - 3.45	29	40	10	>50	DC Bit Balance 12cm
4.00				4.00						

Borehole was terminated at 4.00m due to the presence of Rock

BORE LOG SHEET

Project :

Geotechnical Investigation Work for the Proposed Pathway at Kovalam

Client	: *KIIFB*	Drilling Start Date	: *30/06/2022*
Location	: *Kovalam*	Drilling End Date	: *30/06/2022*
Bore Hole No	: *BH04*	Ground Water Level	: *Ground Level*
Drilling Method	: *Rotary Drilling*	Termination Depth	: *10.00m*

DEPTH (m)	PROFILE	DESCRIPTION OF STRATA	THICKNESS OF STRATA	DEPTH (m)	TEST DEPTH	BLOWS / 15 cm			SPT (N)	REMARKS
						15 cm	30 cm	45 cm		
		Silty Sand (Black)	2.50	1.00	1.00 - 1.45	9	21	29	>50	
				2.00	2.00 - 2.45	23	50	-	>50	Balance 17cm
2.50				3.00	3.00 - 3.45	13	24	26	>50	Balance 4cm
		Silty Sand (Yellow)	2.00	4.00	4.00 - 4.45	26	40	10	>50	Balance 13cm
4.50				5.00	5.00 - 5.45	15	25	22	47	
		Sandy Clay (Black)	1.50	6.00	6.00 - 6.45	10	16	22	38	
6.00				7.50	7.50 - 7.95	8	18	25	43	
		Silty Sand with Clay (Grey)	4.00	9.00	9.00 - 9.45	23	40	10	>50	SPT Rebound Balance 13cm
10.00				10.00	10.00 - 10.45	32	50	-	>50	Balance 16cm

Borehole was terminated at 10.00m

BORE LOG SHEET

Project :

Geotechnical Investigation Work for the Proposed G+2 Building at Kovalam

Client	: *KIIFB*	Drilling Start Date	: *01/07/2022*
Location	: *Kovalam*	Drilling End Date	: *04/07/2022*
Bore Hole No	: *BH05*	Ground Water Level	: *0.90m*
Drilling Method	: *Rotary Drilling*	Termination Depth	: *16.00m*

DEPTH (m)	PROFILE	DESCRIPTION OF STRATA	THICKNESS OF STRATA	DEPTH (m)	TEST DEPTH	BLOWS / 15 cm			SPT (N)	REMARKS
						15 cm	30 cm	45 cm		
2.50		Silty Sand (Black)	2.50	1.00	1.00 - 1.45	5	7	9	16	
				2.00	2.00 - 2.45	7	9	16	25	
3.50		Silty Sand (Yellow and Black)	1.00	3.00	3.00 - 3.45	27	30	20	>50	Balance 7cm
				4.00	4.00 - 4.45	10	17	19	36	
5.50		Silty Sand (Black)	2.00	5.00	5.00 - 5.45	5	3	3	6	
				6.00	6.00 - 6.45	2	4	4	8	
8.00		Sandy Clay (Grey)	2.50	7.50	7.50 - 7.95	2	2	1	3	
10.00		Sandy Clay with shell particles (Grey)	2.00	9.00	9.00 - 9.45	2	2	2	4	
				10.50	10.50 - 10.95	2	1	1	2	
13.50		Sandy Clay (Grey)	3.50	13.00	13.00 - 13.45	1	0	1	1	
15.00		Sand (Black)	1.50	15.00	15.00 - 15.45	32	50	-	>50	Balance 16cm
16.00		Sandy Clay (Grey)	1.00	16.00	16.00 - 16.45	2	5	13	18	

Borehole was terminated at 16.00m Depth

BORE LOG SHEET

Project :

Geotechnical Investigation Work for the Proposed G+2 Building at Kovalam

Client	: *KIIFB*	Drilling Start Date	: *04/07/2022*
Location	: *Kovalam*	Drilling End Date	: *04/07/2022*
Bore Hole No	: *BH06*	Ground Water Level	: *0.90m*
Drilling Method	: *Rotary Drilling*	Termination Depth	: *10.50m*

DEPTH (m)	PROFILE	DESCRIPTION OF STRATA	THICKNESS OF STRATA	DEPTH (m)	TEST DEPTH	BLOWS / 15 cm			SPT (N)	REMARKS
						15 cm	30 cm	45 cm		
		Silty Sand (Grey)	3.50	1.00	1.00 - 1.45	4	7	9	16	
				2.00	2.00 - 2.45	7	9	14	23	
				3.00	3.00 - 3.45	15	11	10	21	
3.50				4.00	4.00 - 4.45	11	17	19	36	
		Decayed Wood (Black)	2.00	5.00	5.00 - 5.45	17	20	22	42	
5.50				6.00	6.00 - 6.45	27	50	-	>50	Balance 17cm
6.50		Clayey Sand (Grey)	1.00	7.50	7.50 - 7.95	32	50	-	>50	Balance 22cm
		Sand (Grey)	4.00	9.00	9.00 - 9.45	23	32	18	>50	Balance 5cm
10.50				10.50	10.50 - 10.95	12	23	27	>50	

Borehole was terminated at 10.50m Depth

ABSCES
WE BELIEVE IN QUALITY

CLIENT:	KIIFB	No. of Boreholes:	6
SITE:	Kovalam	Date of Lab Testing:	11-07-2022 to 12-07-2022

BH	DEPTH (m)	SPT Value (N)	SOIL TEXTURE	I.S Classification	GRAIN SIZE ANALYSIS					NMC %	ATTERBERGS LIMIT (%)		
					Gravel %	SAND %			Clay % + Silt %		LL	PL	PI
						Coarse	Medium	Fine					
I	1.00	>50	Silty Sand	SM	0.0	0.2	64.9	13.9	21.1	15.4			
I	2.00	>50	Silty Sand	SM									
I	3.00	>50	Silty Sand	SM	0.8	1.3	60.2	21.8	15.8	16.1			
I	4.00	>50	Silty Sand	SM	0.4	0.3	60.4	15.7	23.2	18.6			
I	5.00	4	Sandy Clay	CI	1.5	0.4	37.4	8.4	52.3	23.4	66	37	29
I	6.00	7	Sandy Clay	CI									
I	7.50	14	Clayey Sand	SC	0.6	6.5	41.1	5.8	46.0	15.9			
I	9.00	19	Sandy Clay	CI									
I	10.00	24	Sandy Clay	CI	0.0	0.3	38.3	8.7	52.6	17.1			
II	1.00	16	Silty Sand	SM									
II	2.00	>50	Silty Sand	SM	0.0	0.2	59.4	14.0	26.4	23.9			
II	3.00	>50	Silty Sand	SM	0.0	0.6	59.1	19.5	20.7	15.2			
II	4.00	>50	Silty Sand	SM									
II	5.00	4	Sandy Clay	CI	0.0	0.1	52.7	11.8	35.4	14.0	69	39	30
II	6.00	7	Clayey Sand	SC	0.1	0.2	58.7	4.5	36.5	14.0			
II	7.50	36	Clayey Sand	SC									
II	9.00	31	Clayey Sand	SC	0.0	0.2	44.8	10.5	44.6	14.3			
II	10.00	>50	Clayey Sand	SC									

ABSCES
WE BELIEVE IN QUALITY

CLIENT:		KIIFB					No. of Boreholes:			6			
SITE:		Kovalam					Date of Lab Testing:			11-07-2022 to 12-07-2022			
BH	DEPTH (m)	SPT Value (N)	SOIL TEXTURE	I.S Classification	GRAIN SIZE ANALYSIS					NMC %	ATTERBERGS LIMIT (%)		
					Gravel %	SAND %			Clay % + Silt %		LL	PL	PI
						Coarse	Medium	Fine					
III	1.00	22	Silty Sand	SM	0.0	0.2	68.8	14.0	17.0	20.8			
III	2.00	>50	Silty Sand	SM									
III	3.00	>50	Silty Sand	SM	0.0	0.2	63.0	12.8	24.1	15.4			
III	4.00		Silty Sand	SM									
IV	1.00	>50	Silty Sand	SM	0.0	0.0	52.7	31.1	16.2	9.1			
IV	2.00	>50	Silty Sand	SM									
IV	3.00	>50	Silty Sand	SM									
IV	4.00	>50	Silty Sand	SM	0.0	0.6	69.9	12.9	16.5	15.8			
IV	5.00	47	Clayey Sand	SC	0.0	0.1	62.6	13.5	23.9	16.0			
IV	6.00	38	Clayey Sand	SC									
IV	7.50	43	Clayey Sand	SC	0.2	0.2	62.3	18.2	19.2	17.0			
IV	9.00	>50	Clayey Sand	SC									
IV	10.00	>50	Clayey Sand	SC	0.0	0.7	49.9	26.4	23.0	19.0			
V	1.00	16	Silty Sand	SM	0.0	0.0	49.7	28.8	21.4	14.3			
V	2.00	25	Silty Sand	SM									
V	3.00	>50	Silty Sand	SM	0.1	0.1	50.1	29.2	20.5	13.6			
V	4.00	36	Silty Sand	SM									
V	5.00	6	Silty Sand	SM									

ABSCES
WE BELIEVE IN QUALITY

CLIENT:	KIIFB									No. of Boreholes:	6		
SITE:	Kovalam									Date of Lab Testing:	11-07-2022 to 12-07-2022		
BH	DEPTH (m)	SPT Value (N)	SOIL TEXTURE	I.S Classification	GRAIN SIZE ANALYSIS					NMC %	ATTERBERGS LIMIT (%)		
					Gravel %	SAND %			Clay % + Silt %		LL	PL	PI
						Coarse	Medium	Fine					
V	6.00	8	Clayey Sand	SC									
V	7.50	3	Clayey Sand	SC	0.0	0.2	49.2	24.0	26.7	16.7			
V	9.00	4	Clayey Sand	SC	1.1	0.5	43.1	17.6	37.6	24.5			
V	10.50	2	Clayey Sand	SC									
V	13.00	1	Clayey Sand	SC									
V	15.00	>50	Silty Sand	SM	0.0	0.2	41.6	38.9	19.3	17.9			
V	16.00	18	Clayey Sand	SC									
VI	1.00	16	Silty Sand	SM	0.0	0.2	50.3	30.9	18.6	8.2			
VI	2.00	23	Silty Sand	SM									
VI	3.00	21	Silty Sand	SM	0.0	0.1	54.0	26.4	19.4	19.2			
VI	4.00	36	Silty Sand	SM									
VI	5.00	42	Decayed Wood										
VI	6.00	>50	Clayey Sand	SC									
VI	7.50	>50	Silty Sand	SM	0.0	0.0	53.5	19.9	26.5	20.5			
VI	9.00	>50	Silty Sand	SM									
VI	10.50	>50	Silty Sand	SM									

DR. K. BALAN
Geotechnical/Geosynthetic Engineering Consultant
Former Professor in Civil Engineering
College of Engineering Trivandrum
Mob:9497265869; Email: drkbalan@gmail.com

Sameeram
Kunnumpuram Road
Chellamangalam
Chempazhanthy P O
Thiruvananthapuram 695587

05-07-2022

Footpath along the beach in Kovalam and Provision of diagphram wall for sea protection – Interim Report

INTRODUCTION:

KIIFB has a proposal to construct a footpath along the boundary area of Kovalam beach. Also, to have a diaphragm wall to protect the footpath from erosion of beach due to high waves. Altogether four bore holes were taken along the proposed and existing foot path area, with two bore holes in the parking area behind Leela Hotel (proposed footpath) and two bore holes in the existing footpath area. Bore holes 1 and 2 were taken in the proposed footpath area in the parking area coming behind Hotel Leela. Bore holes 2 and 3 were taken in the existing footpath area on the right side of the road to Hawa beach.

BORE LOGS AND DESCRIPTION

The bore logs of all the four bore holes are given in Annexure 1.

The bore hole locations are given in Annexure 2.

In the proposed footpath area, behind Hotel Leela, BH1 and BH2 represents the soil profile. Upto 4.00 m depth the soil consists of dense silty sand or and silty sand with shell particles. In this stretch a soft clay layer is existing from 4.50 to 6.00 m. There after medium to dense clay with sand is available.

BH3 and BH4 belongs to the existing footpath area. In BH3, the bore hole was terminated at 4.00 m depth owing to the presence of rock. Upto 4.00 m depth dense sand is available. In BH4 very dense silty sand is available upto 10.00 m depth.

BH5 and BH6 are taken in the proposed G+2 building area. BH5 shows very dense silty sand upto 4.50 m depth, with an N value of 16 at 1.00m depth and 25 at 2.00 m depth. From 5.00 m depth onwards very soft sandy clay is existing upto 10.00 m depth.

BH6 also has the same profile as that of BH5 upto 5.00 m and below 5.00 m fine sand in a dense state is available for 10.00 m depth.

RECOMMENDATIONS

It is assumed that the proposed footpath is 1.50 m above the existing ground level. The footpath foundation can be placed at a depth of 1.00 m or 2.00 m below existing ground level, considering the scouring effect of the waves during monsoon season. The safe bearing capacity of the soil at various bore hole locations and depth are given below.

Bore Hole #	SBC @1.50 m Depth in kN/m2	SBC @ 2.00 m Depth in kN/m2	Remarks
1	220	250	While selecting the depth of foundation of footpath, scour depth due to high waves during monsoon season may be considered.
2	150	250	
3	200	250	
4	220	250	

In BH5 and BH6 the following safe bearing capacity can be taken for shallow foundation.

Bore Hole #	SBC @1.50 m Depth in kN/m2	SBC @ 2.00 m Depth in kN/m2	Remarks
5	120	180	Strip raft foundation will be ideal rather than isolated column footing as very loose soil is available in BH5 from 4.50 m depth
6	120	180	

A diaphragm wall is considered in front of the footpath in the seaward side, all along the footpath length on either side of the entry road to protect it from high waves of the sea especially during monsoon. A diaphragm wall projecting 1.50 m above ground level (to be in level with the footpath) and penetrating the ground for about 3.00 to 3.50 m is recommended. Structural design of the diaphragm wall is given in Annexure 3. Rubble packing as an additional protection measure can be adopted for erosion control of soil from behind the footpath if necessary.

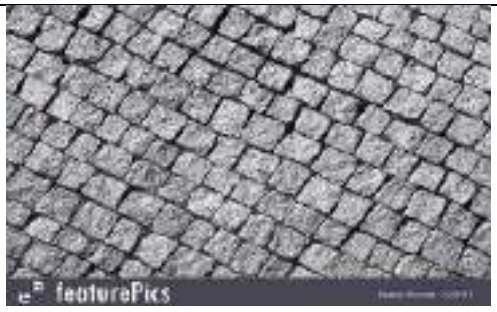
All the above recommendations are made based on the bore log charts and also the laboratory testing of soil samples collected during subsoil investigation. If any variation in soil profile is observed at the site during execution, fresh recommendations may be obtained from the undersigned of from a qualified geotechnical engineer.

Dr. K. Balan
05-07-2022

Annexure

03

List of Materials

Sl no	Item	Size	Reference
Walkway			
1	Interlock Tile	60mm thick	  
	Cobblestone	10x10x10 cm	
	Flamed Granite stone	60x30x5 cm	
	Tactile tile	30 x30 cm	

2	Handrail	Cast iron	
		Stainless steel (304 grade)	
3	Seating	Finished granite	
4	Pillar	Stone	 
5	Stone pergola	Stone	

6	Bollard	Stone	
7	Light bollard	Stone with LED	
8	Plant	Cupressus macrocarpa	
9	Plant	Chembakam (Magnolia champaca)	

10	Plant	Frangipani (Plumeria)	
11	Plant	Coleus (Coleus scutellarioides)/ Flame nettle	
12	Plant	Plantain lily(Hosta)	
13	Plant	Elephant ear (Caladium)	

14	Plant	Oleander (Nerium oleander) Arali	
15	Plant	Bamboo plants (Bambusa vulgaris)	
16	Plant	Iththiyaath (Ficus Benjamina)	
17	Plant	Palm tree(Arecaceae)	

18	Plant	Red palm (Cyrtostachys renda)	
19	Plant	Yellow palm (Dypsis lutescens)	
20	Plant	Coconut tree (Cocos nucifera)	

21	Plant	Peace Lilly(Spathiphyllum)	
22	Plant	Chethi (Ixora)	
23	Plant	Spider lilly white (Hymenocallis carolinia)	

24	Plant	Rhapis palm (Rhapis excelsa)	
25	Plant	Manjakolambi (Allamanda)	
26	Plant	Alocasia	

27	Plant	Beauty star	
28	Plant	Bird of paradise	
29	Plant	bougainvillea dwarf	

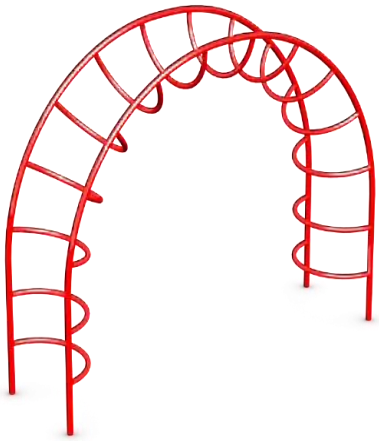
30	Plant	Nandyarvattam (Crape jasmine)	
31	Plant	golden yellow heliconia	
Entrance			
32	Flooring	Terracotta tile	
33	Flooring	6-8mm thick tile	

34	Arch grill	Cast iron	
35	Ferrocement pot		  

36	Pebble stones		 
37	Grass	Turf grass	
38	Grass	Mexican grass	

39	Grass	Buffalo grass	
40	Grass	Pearl grass	
41	Bamboo fencing		 

Play Equipment				
42	Wave slide			
43	Roller slide			
44	Rocker duck			
45	Orbit swing			

46	Arc climber		
47	Merry go round		
48	swing		
Gym Equipment			

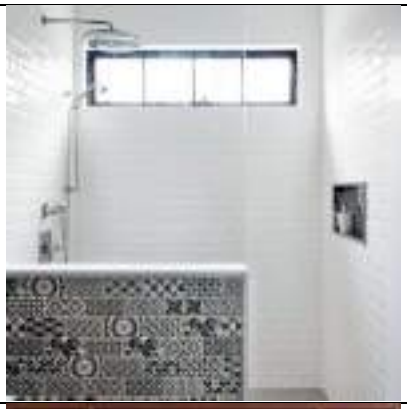
49	Chest press			
50	Back pull-down machine			
51	Seated cycle machine			
52	Leg press			

53	Health walker		
Gazebo			
55	Roofing	Clay flat tile	
Buildings			
56	Floor tiles	Porcelain tiles	

57	Flooring	Ceramic tiles	
58	Flooring	Marble stone	
59	Flooring	Granite stone	
60	Flooring	Antiskid bathroom tiles	

61	Ceiling	ACP ceiling	
62	Ceiling	Clay tile ceiling	
63	Ceiling	Gypsum ceiling	
64	Window	Teak wood	

65	Window	White UPVC window	
66	Window	Aluminium Window	
67	Ventilator	Exhaust fan ventilator	
68	Ventilator	Small window ventilator	

69	Ventilator	Half panel ventilator	
70	Door	Wooden door	 
71	Door	Steel door	

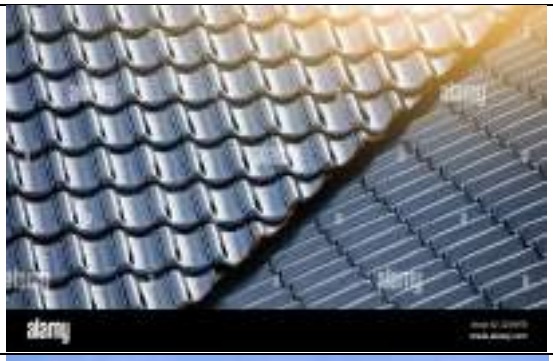
72	Door	Aluminium sliding door	
73	Door	Wooden sliding door	
74	Door	Plastic bathroom door	
75	Door	Fibre reinforced bathroom door	

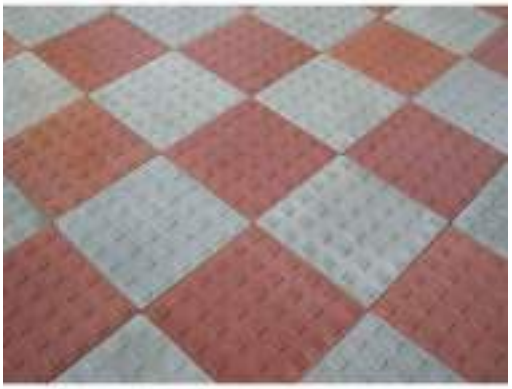
76	Door	PVC bathroom door		
77	Cladding	Stone cladding		
78	Cladding	White quartz stack stone cladding		
79	Cladding	Smokey quartz stackstone cladding		

80	Wall tile	Wooden wall tile	
81	Wall tile	Pickett tiles	
82	Wall tile	Raku tiles	
83	Wall tile	Troverta tiles	

84	Wall tile	Craquelure tiles	
85	Wash basin		
86	Water closet		
87	Shower	Wall mounted	

88	Shower	Rain shower	
89	Urinals		
90	Bib cock	Brass bathroom tape	

91	Roofing tiles	Clay roof tiles	
92	Roofing tiles	Ceramic roof tile	
93	Roofing tiles	Mangalore roof tiles	
94	Roofing tiles	Composite synthetic resin roof tiles	

95	Roofing tiles	Plastic light weight roof tile	
Parking			
96	Parking area tile	40x40	
97	Kerb stone	M30 Grade	
98	Signages	Exit	

			 RESTRICTED AREA DO NOT ENTER  HELP SUPPORT SERVICE GUIDANCE ASSISTANCE ADVICE  Drinking Water  FIRST AID FIRST AID KIT LOCATED HERE

Annexure

04

Drawings

The Drawings are attached as a separate document.

Annexure

05

Estimate

Estimate Report

This project envisages to develop Kovalam and beaches adjacent to Kovalam. The project is proposed to be completed in two phases. Phase 1 includes the Infrastructural development at light house beach and Hawa Beach; the renovation of the Anantha Park at Hawa beach; Development of Corporation land; Developing the Connectivity to Corporation Land; Developing an access to IB Beach; Land demarcation at the adjacent beaches, i.e., IB Beach and Adimalathura beach; Shore protection of Kovalam beach; Land acquisition of Coconut Plantation Land and the Land acquisition for providing direct access to the Corporation Land.

Phase 2 involves the further development of IB Beach and Adimalathura beach, and the development of Coconut Plantation Land.

Costing of Phase 1 is prepared based on CPWD DSR 2018 with a cost index for Trivandrum (35.59%) and Market Rates.

A. Civil Part

1. **Anantha Park:** Renovation of existing building, Landscaping etc proposed. Structural elements of building are changed in connection with matching the thematic representation of art cafe. The surrounding landscapes are provided. Existing Interlocks are replaced with cobble stone. Total cost of renovating Anantha Park and Landscaping becomes ₹ 3,42,20,000.00, which is inclusive of GST.

2. **Walkway**: The existing walkway is proposed to renovate, and a diaphragm wall is to construct to protect the walkway from the effect of extreme waves. Underground cabling along the renovated walkway and gazebos in beach are provided. The proposal includes Anantha Park, main entrance of hawa beach is also proposed in the concept. The total cost of renovating the walkway becomes ₹ 21,59,40,000.00, which is inclusive of GST.

3. **Corporation Land**: Construction of Administration block (Controlling officer room, First aid room, CCTV room), Refreshment block, OAT, Children Play area, resting places and landscaped areas. Total cost of constructing corporation land and Landscaping becomes ₹ 3,36,30,000.00, which is inclusive of GST.

4. **Edakallu Rock**: Interconnecting bridge between the two rocks and boat jetty for water sports activities. Total cost of construction becomes ₹ 3,50,00,000.00(Lumpsum) which is inclusive of GST.

5. **Cable stayed bridge**: Construction of cable stayed bride with glass topping for the connectivity proposal of IB Beach. Total cost of construction becomes ₹ 8,50,00,000.00, (Lumpsum) which is inclusive of GST.

6. **STP**: Construction of Sewage Treatment Plant. Total cost of construction becomes ₹ 50,00,000.00, (Lumpsum) which is inclusive of GST.

7. **Adimalathura**: Construction of boundary demarcation along with bio fencing material in phase 1. Total cost of construction becomes ₹ 1,00,00,000.00, (Lumpsum) which is inclusive of GST.

B. Electrical Part

The Kovalam Beach development project includes the infrastructure development to improve the facilities. It consists of walkway, Anantha Park, Land development, Toilet Blocks, Connecting bridge in between IB and Edakallu Rock. Total Electrical estimated amount is 7,26,50,52.00/- which is inclusive of GST.

C. Firefighting

Administrative Building, Anantha Park and Toilet Blocks: Protection of firefighting system is provided for the administrative block for providing the safety of equipment as well as for the tourists. The system consisting of Fire terrace pump, fire extinguisher, Manual FACP, Down corner pipe etc. Total cost for firefighting is 8,50,000.00/-, which is inclusive of GST.

D. Land Acquisition

Corporation Land and Coconut Plantation: Total cost of acquiring the land is 40,00,00,000.00(Lumpsum).

GENERAL ABSTRACT		
SL No.	**Description**	**Amount**
A	**Civil**	**₹ 41,87,90,000.00**
1	Anantha Park	₹ 3,06,80,000.00
2	Walkway	₹ 21,77,10,000.00
3	Corporation Land Development	₹ 3,54,00,000.00
4	Edakallu rock	₹ 3,50,00,000.00
5	Cable Stayed Bridge	₹ 8,50,00,000.00
6	STP	₹ 50,00,000.00
7	Adimalathura	₹ 1,00,00,000.00
B	**Electrical**	**₹ 7,26,50,452.00**
C	**Fire-fighting**	**₹ 8,50,000.00**
Total		**₹ 49,22,90,452.00**
	Centage +PMC (7%)	**₹ 3,44,60,331.64**
D	**Land Acquisition**	**₹ 40,00,00,000.00**
Unforeseen Contingency		**₹ 32,49,216.36**
Total		**₹ 93,00,00,000.00**
INR 93.00 Crores		
Rupees ninety crores only		

Note: Project cost inclusive of GST

Estimate – Part A (Civil)

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1	**ANANTHA PARK**				
1.01	2.31: Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared	1000	sqm	14.78	14,780.00
1.02	2.32:Clearing grass and removal of the rubbish up to a distance of 50 m outside the periphery of the area cleared.	500	sqm	7.53	3,765.00
1.03	2.33.1 : Felling trees of the girth (measured at a height of 1 m above ground level) including cutting of trunks and branches, removing the roots and stacking of serviceable material and disposal of unserviceable material. Beyound 30 cm girth up to and including 60 cm girth	30	each	447.99	13,439.70
1.04	50.2.33.5 : Cutting branches of trees overhanging above any structures of girth between 40cm to 60cm including stacking of serviceable materials and disposal of unserviceable material, cost of labour, hire charges of rope and pully etc without making any damages to nearby structures etc complete.	30	each	307.38	9,221.40
1.05	15.2.2 : Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge. Nominal concrete 1:4:8 leaner mix (including equivalent design mix)	5	cum	1262.82	6,314.10
1.06	15.3 : Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.	5	cum	2983.59	14,917.95
1.07	15.4 : Demolishing R.B. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charge.	4	cum	2668.68	10,674.72
1.08	15.7.4 : Demolishing brick work manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charge. In cement mortar	10	cum	1730.20	17,302.00
1.09	15.12.1 : Dismantling doors, windows and clerestory windows (steel or wood) shutter including chowkhats, architrave, holdfasts etc. complete and stacking within 50 metres lead: Of area 3 sq. metres and below	5	each	323.11	1,615.55
1.10	15.12.2 : Of area beyond 3 sq. metres	4	each	442.16	1,768.64
1.11	15.13.1 : Taking out doors, windows and clerestory window shutters (steel or wood) including stacking within 50 metres lead: Of area 3 sq. metes and below	5	each	125.42	627.10
1.12	15.13.2 : Taking out doors, windows and clerestory window shutters (steel or wood) including stacking within 50 metres lead: Of area beyond 3 sq. metres	4	each	165.62	662.48
1.13	15.17.2 : Dismantling steel work in single sections including dismembering and stacking within 50 metes lead in: Channels, angles, tees and flats	50	kg	1.97	98.50
1.14	15.18 : Dismantling steel work in built up sections in angles, tees, flats and channels including all gusset plates,boltd, nuts, cutting rivets, welding etc. including dismembering and stacking within 50 metres lead.	150	kg	4.88	732.00

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.15	15.19 : Dismantling steel work manually / by mechanical means in built up sections without dismembering and stacking within 50 metres lead as per directions of Engineer -in-Charge.	400	kg	3.25	1,300.00
1.16	15.23.1 : Dismantling tile work in floors and roofs laid in cement mortar including stacking material within 50 metres lead. For thickness of tiles 10 mm to 25 mm	650	sqm	64.61	41,996.50
1.17	15.28.1 : Dismantling roofing including ridges, hips, velleys and gutters etc., and stacking the material within 50 metres lead of : G.S. Sheet	50	sqm	143.45	7,172.50
1.18	15.25 : Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	600	sqm	165.2	99,120.00
1.19	15.6 : Disposal of building rubbish/ malba/ similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond 50 m initial lead, for all leads including all lifts involved	100	cum	163.45	16,345.00
1.20	2.6.1 : Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil	80	cum	214.03	17,122.40
1.21	2.8.1 : Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil	30	cum	296.94	8,908.20
1.22	2.9.1 : Excavation work by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soils as directed, within a lead of 50 m. Ordinary rock	10	cum	527.51	5,275.10
1.23	4.1.8 : Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 nominal size)	20	cum	6814.89	1,36,297.80
1.24	4.3.1 : Centering and shuttering including strutting, propping etc. and removal of form work for: Foundations, footings, bases for columns	25	sqm	335.31	8,382.75
1.25	2.25 : Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	110	cum	258.57	28,442.70
1.26	60.7.2 : DR PACKING Under foundation - Dry stone packing under foundation with good quality blasted rubble including conveyance of material and labour charges etc. complete as per direction of departmental officers at site.	15	cum	2606.45	39,096.75

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.27	60.7.1 : DRY RUBBLE MASONRY _ Dry rubble without concrete levelling course masonry with good quality blasted rubble including packing to compactness to lines and levels cost and conveyance of all materials labour charges etc. complete as per direction of Departmental officers at site	40	cum	3491.49	1,39,659.60
1.28	12.48 : Providing & fixing on roof pressed clay tile (Mangalore tile) of 20 mm nominal thickness and of approved size and as per approved pattern on steel frame work complete (steel frame work to be paid separately)	650	sqm	381.82	2,48,183.00
1.29	12.49 : Providing & laying on roof pressed clay tile ridge (Mangalore tile) of 20 mm thickness and of approved pattern on steel frame work complete (steel frame work to be paid separately).	90	m	85.01	7,650.90
1.30	10.2 : Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	220	kg	119.79	26,353.80
1.31	10.25.1 : Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. In stringers, treads,landings etc. of stair cases, including use of chequered plate wherever required, all complete	45000	kg	110.23	49,60,350.00
1.32	10.16.3 : Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete. Electric resistance or induction butt welded tubes	450	kg	152.27	68,521.50
1.33	10.19 : Providing and fixing mild steel round holding down bolts with nuts and washer plates complete.	300	kg	98.64	29,592.00
1.34	13.52.1 : Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work	215	sqm	223.32	48,013.80
1.35	50.6.1.5 : Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete	15	cum	6644.12	99,661.80
1.36	13.2.1 : 15 mm cement plaster on the rough side of single or half brick wall of mix: 1:4 (1 cement :4 fine sand)	450	sqm	362.43	1,63,093.50
1.37	13.16.1 : 6 mm cement plaster of mix: 1:3 (1 cement : 3 fine sand)	294	sqm	267.59	78,671.46
1.38	13.43.1 : Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface: Water thinnable cement primer	250	sqm	70.64	17,660.00
1.39	13.44.1 : Finishing walls with water proofing cement paint of required shade: New work (Two or more coats applied @ 3.84 kg/10 sqm)	100	sqm	107.39	10,739.00

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.40	13.45.1 : Finishing walls with textured exterior pint of required shade: New work (Two or more coats applied @ 3.28 ltr/ 10 sqm) over and including priming coat of exterior primer applied @ 2.20 kg/ 10 sqm	50	sqm	273.08	13,654.00
1.41	13.46.1 : Finishing walls with Acrylic Smooth exterior paint of required shade: New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)	500	sqm	193.89	96,945.00
1.42	5.33.1 : Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	20	cum	9413.54	1,88,270.80
1.43	5.33.2 : Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level	15	cum	11065.64	1,65,984.60
1.44	5.34.1 : Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	35	cum	82.10	2,873.50
1.45	5.3 : Reinforced cement concrete work in beams, suspended floors, roofs, having slope up to 150 landings, balconies, shelves, chajjas, lintels, bands, plain window sills, staircases and spiral stair cases up to floor five level excluding the cost of centering, shuttering, finishing and reinforcement, with1:1.5:3 (1 cement : 1.5 coarse sand (Zone III) : 3 graded stone aggregate 20 mm nominal size).	2	cum	11492.88	22,985.76
1.46	5.9.3 : Centering and shuttering including strutting, etc. and removal of form for: Suspended floors, roofs, landings, balconies and access platform	10	sqm	815.78	8,157.80
1.47	5.9.5 : Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers	200	sqm	649.82	1,29,964.00

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.48	5.9.6 : Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts	200	sqm	863.64	1,72,728.00
1.49	5.22.6 : Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more	1000	kg	98.30	98,300.00
1.50	od113943/2022_2023 : Supplying and fixing granite stone architectural bollards of size 150 mm dia height 1100 mm fixed in cement concrete 1:2:4 ,900 mm above ground , with suitable light fixtures 10-15 W 3000 K IP65 with suitable protection cover for the light (the size ,finish and designs of bollards to be approved by engineer in charge)	75	each	50000.00	37,50,000.00
1.51	Supplying and fixing of DUST BIN. External bin made of FRP material moulded with 3mm with Granite finish, Inner liner of FRP material to facilitate removal of garbage, Top lid made of FRP with 3mm thick. Chain to tie top cover with body of garbage bin. Approximately 3 feet or nearby height.	10	each	9437.19	94,371.90
1.52	Supply and fixing in position Granite stone Pergola Beam Smooth finish of size 6"x 4"x 10' or nearest size as approved by engineer in charge including cost , transportation charges and installation labour charges.(Including transportation ,loading and unloading charges)	16	each	11585.96	1,85,375.36
1.53	Supplying and fixing in position granite stone decorative pillar of size60x60x300CM or nearest size as approved by engineer in charge including cost , transportation charges and installation labour charges.(Including transportation ,loading and unloading charges)	4	each	132598.30	5,30,393.20
1.54	Construction of granite stone kerb with top and bottom width 250 and 250 mm respectively, 300 mm high, with chisel cut/gang saw cut bevelled edgeon M-10 grade foundation 150 mm thick, foundation having 50 mm projection beyond kerb stone, kerb stone laid with kerb laying machine, foundation concrete laid manually, all complete as per clause 409	350	m	1012.61	3,54,413.50
1.55	Supplying and fixing granite stone slab 150 mm thick with inscription writting in recessed style inluding conveying and errecting in position on cement concrete base as per direction of Engineer in Charge.(the quality of granite slab to be approved by the Engineer in charge).The cost of foundation to be paid seperately.	25	sqm	789.58	19,739.50
1.56	Providing and fixing 10x10x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 75mm thick compacted bed of 6mm aggregate, compacting and proper embedding/ laying of cobble stone into the aggregate bedding layer through vibratory compaction by using plate vibrator, filling the joints with m sand finishing and sweeping extra sand . complete as per direction of engineer-in-charge	250	sqm	1409.09	3,52,272.50
1.57	Providing and fixing 30x30 x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 75 mm thick 6 mm aggregate joints filled with red earth, sand and manure planting doob grass, watering etc. , including rubbing, curing, etc. complete at all levels. complete as per direction of engineer- in charge	750	sqm	3049.48	22,87,110.00

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.58	Supplying and Fixing Granite bench of size 1.5m long , 45cm high and 70cm width with back support including conveying labour charges etc complete	25	each	20907.00	5,22,675.00
1.59	Special type red colour Exposed Laterite cladding for super structure wall including all cost, labour charges etc. complete	200	sqm	4033.40	8,06,680.00
1.60	"Providing & laying on Ceiling pressed clay tile (Mangalore tile) of 20mm thickness and of approved pattern on steel frame work complete (steel frame work to be paid separately).	600	sqm	3361.26	20,16,756.00
1.61	Providing and fixing superior quality granite finished wall cladding as approved by Engineer -in-Charge, in walls over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3 kg per sqm, to be finished completely as per the architectural drawings	100	sqm	1968.19	1,96,819.00
1.62	Providing and laying flamed finish Granite stone flooring in required design and patterns, in linear as well as curvillinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-incharge. a. Flamed finish granite stone slab Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.	100	sqm	3705.14	3,70,514.00
1.63	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20 mm thick cement mortar 1:4(1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. Size - 400mm X 400 mm or nearest size	650	sqm	762.85	4,95,852.50
1.64	15.25 : Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	500	sqm	165.2	82,600.00
1.65	Toughened Glass Pargola: Providing and fixing pargola using 12 mm toughened glass .Glass to be fixed using 304grade SS patch fittings (Dorma Crown/Equivalent). Use silicon sealant wherever necessary. Including cost and conveyance charges of all materials, labour charges etc.	30	sqm	5870.08	1,76,102.40
1.66	9.1.1 : Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for separately). Second class teak wood	0.5	cum	153237.78	76,618.89
1.67	9.4.1: Extra for additional labour for circular works, such as in frames of fan light: Second class teak wood	0.5	cum	15323.57	7,661.79

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.68	9.5.1.1: Providing and fixing panelled or panelled and glazed shutters for shutters for doors, windows and clerestory windows, including ISI marked M.S. pressed butt hinges bright finished of required size with necessery screws, excluding panelling which will be paid for separately, all complete as per direction of Engineer - in-charge. Second class teak wood Providing and fixing panelled or panelled and glazed shutters for doors, windows and clerestory windows fixing with butt hinges of required size with necessary screws, excluding panelling which will be paid for separately, all complete as per direction of Engineer-in-charge. (Note:- Butt hinges and necessary screws shall be paid separately) Second class teak wood 35 mm thick shutters	50	sqm	4253.25	2,12,662.50
1.69	9.126.1: Providing and fixing 12 mm thick panelling or panelling and glazing in panelled or panelled and glazed shutters for doors, windows and clerestory windows (area of opening for panel inserts excluding portion inside grooves or rebates to be measured). Panelling for panelled and glazed shutters 25 mm to 40 mm thick. Marine plywood conformingto IS : 710	50	sqm	2360.28	1,18,014.00
1.70	9.55.1: Providing and fixing ISI marked M.S. pressed butt hinges bright finished with necessary screws etc, complete: 125x65x2.12 mm	75	no.	54.44	4,083.00
1.71	Wall pannelling with laminate finish: Providing & fixing Wall panelling(Upto Height as per architect approved drawing. Frame work to be finished using 19 mm ply (IS 303 Grade Ecotec BWR/Equivalent).9 mm plywood (IS 303 Grade Ecotec BWR/Equivalent) to be fixed over the frame work. Finish the exterior part of the panelling using 1 mm laminate (Century/Greenlam/Equivalent) as shown in the drawing. Finish the panelling with necessary projections, grooves, electrical/Window openinings if any. Including cost and conveyance of all materials labour charges etc. complete as per drawing	80	sqm	5226.75	4,18,140.00
1.72	Landscaping and Art Works		LS		50,00,000.00
1.73	Unforseen works if any		LS		6,17,752.31
	TOTAL				**2,60,00,000.00**
	Adding GST 18%				46,80,000.00
	TOTAL				**3,06,80,000.00**
					Rupees Three Crore Six Lakhs Eighty Thousand Only

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.00	**WALKWAY**				
2.01	15.2.1 : Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge. Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix)	10	cum	2045.12	20,451.20
2.02	15.2.2 : Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge. Nominal concrete 1:4:8 leaner mix (including equivalent design mix)	10	cum	1262.82	12,628.20
2.03	15.3 : Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge	50	cum	2983.59	1,49,179.50
2.04	15.23.1 : Dismantling tile work in floors and roofs laid in cement mortar including stacking material within 50 metres lead. For thickness of tiles 10 mm to 25 mm	2000	sqm	64.61	1,29,217.27
2.05	15.23.2: Dismantling tile work in floors and roofs laid in cement mortar including stacking material within 50 metres lead. For thickness of tiles above 25 mm and up to 40 mm	500	sqm	100.88	50,439.48
2.06	15.25 : Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	500	sqm	223.99	1,11,997.34
2.07	15.7.4 : Demolishing brick work manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charge. In cement mortar	30	cum	1730.2	51,906.00
2.08	15.12.1 : Dismantling doors, windows and clerestory windows (steel or wood) shutter including chowkhats, architrave, holdfasts etc. complete and stacking within 50 metres lead: Of area 3 sq. metres and below	3	each	323.11	969.33
2.09	15.13.1 : Taking out doors, windows and clerestory window shutters (steel or wood) including stacking within 50 metres lead: Of area 3 sq. metes and below	1	each	125.42	125.42
2.10	15.18 : Dismantling steel work in built up sections in angles, tees, flats and channels including all gusset plates,boltd, nuts, cutting rivets, welding etc. including dismembering and stacking within 50 metres lead.	100	kg	4.88	488.00
2.11	15.31 : Dismantling tiled roofing with battens, boarding etc. complete including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	10	sqm	176.54	1,765.40
2.12	15.44.1 : Dismantling G.I. pipes (external work) including excavation and refilling trenches after taking out the pipes, manually / by mechanical means including stacking of pipes within 50 metres lead as per direction of Engineer- in- Charges: 15 mm to 40 mm nominal bore	100	metre	127.32	12,732.00
2.13	15.48 : Taking out C.I cover with frame from R.C.C. top slab of manholes of various sizes including demolishing of R.C.C. work manually / by mechanical means and stacking of useful materials near the site and disposal of unserviceable materials with 50 metres lead as per direction of Engineer -in- Charge	20	each	589	11,780.00
2.14	15.59 : Dismantling of flexible pavement (bituminous courses) by mechanical means and disposal of dismantled material up to a lead of 1 kilo metre, as per direction of Engineer-in-charge.	10	cum	378.09	3,780.90

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.15	od113817/2022_2023 : Dismantling (taking out from the ground) if necessary all sizes of XLPE/Pilca/PVC cables, without damaging the cable by excavation in all type of area (all type of soil) with refilling the excavated trenches as per standards and directions of the engineer in charge . The rate is inclusive of handing over of the dismantled cable of the utility store if not relayed to the store of the utility agency (including transportation). The rate is excluding earth work excavation	100	metre	666.49	66,649.00
2.16	od113818/2022_2023 : Dismantling of existing light/electric poles and fitting whether required without damage and transportation and stacking of all materials to respective store of concerned department as per the instruction from engineer in charge.	30	each	424.14	12,724.20
2.17	2.32 : Clearing grass and removal of the rubbish up to a distance of 50 m outside the periphery of the area cleared	50	sqm	7.53	376.50
2.18	2.31 : Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared	50	sqm	14.78	739.00
2.19	15.9.2 : Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in- Charges: In cement mortar	40	cum	2064.97	82,598.80
2.20	15.60 : Disposal of building rubbish/ malba/ similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond 50 m initial lead, for all leads including all lifts involved	150	cum	163.45	24,517.50
2.21	2.8.1 : Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil	19250	cum	296.94	57,16,095.00
2.22	2.26.1 : Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil	14000	cum	106.37	14,89,180.00
2.23	2.18.1 : Close timbering over areas including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered): Depth not exceeding 1.5 m	4200	sqm	136.88	5,74,896.00
2.24	2.18.2 : Close timbering over areas including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered): Depth exceeding 1.5 m but exceeding 3 m	2100	sqm	152.74	3,20,754.00
2.25	2.18.3 : Close timbering over areas including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered): Depth exceeding 3 m but not exceeding 4.5 m	2100	sqm	169.42	3,55,782.00
2.26	50.2.3.1 : Pumping or Bailing out water and removing slush etc by using pump set including cost of labour, oil hire charges of pumpset, etc complete	750	hour	284.6	2,13,450.00
2.27	2.25 : Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	10000	cum	258.57	25,85,700.00

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.28	50.2.33.5 : Cutting branches of trees overhanging above any structures of girth between 40cm to 60cm including stacking of serviceable materials and disposal of unserviceable material, cost of labour, hire charges of rope and pully etc without making any damages to nearby structures etc complete.	10	each	307.38	3,073.80
2.29	65.18 : Supplying blasted rock from approved quarry to sorting site by lorry/ tipper, and sorting the stones into 10kg to 200kg category stones of approved quality having specific gravity ranging from 2.65 to 2.8 for forming the core of rubble mound breakwater inclusive of cost of stones, hire of lorries and machineries, labour charges required at quarry and at sorting place and measurements of categorized stones after proper sorting are taken on weigh bridge installed at site at the cost of the contractor with approved software having printouts using contractors supplied papers, stationeries and conveyed to the approved alignment of the breakwater and rehandling and forming the core of the break water to the lines and levels as per the approved drawings and inspecting the profile once in a week with tolerance of +/- 20cm in final levels including all cost and labour charges, hire and operational charges of light crane and cost of spalls/ quarry muck and labour for forming the roadway for movement of lorries/ tippers / cranes etc including all incidental charges etc complete as per the direction of departmental officers at site Thiruvananthapuram District	10710	tonne	751.86	80,52,420.60
2.30	4.1.3: Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	1200	cum	7990.86	95,89,032.00
2.31	4.1.4 : Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4)1 cement : 2 coarse sand : 4 graded stone aggregate 40 mm nominal size)	140	cum	7863.27	11,00,857.80
2.32	4.3.1: Centering and shuttering including strutting, propping etc. and removal of form work for: Foundations, footings, bases for columns	350	sqm	335.31	1,17,358.50
2.33	5.9.2: Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	15000	sqm	717.2	1,07,58,000.00
2.34	5.9.5 : Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers	27	sqm	649.82	17,545.14
2.35	5.9.6: Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts	50	sqm	863.64	43,182.00
2.36	5.22.6: Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more	530000	kg	98.3	5,20,99,000.00

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.37	5.33.1 : Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	6500	cum	9413.54	6,11,88,010.00
2.38	5.33.2 : Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level	35	cum	11065.64	3,87,297.40
2.39	5.34.2: Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-35 grade concrete instead of M-25 grade BMC/RMC. (Note: Cement content considered in M-35 is @ 350 Kg/cum).	6535	cum	164.18	10,72,916.30
2.40	50.6.1.4: Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for foundation and plinth with thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete	175	cum	5950.3	10,41,302.50
2.41	50.6.1.5 : Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete	10	cum	6644.12	66,441.20
2.42	4.10: Providing and laying damp-proof course 40 mm thick with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm nominal size).	200	sqm	409.48	81,896.00
2.43	13.2.1: 15 mm cement plaster on the rough side of single or half brick wall of mix: 1:4 (1 cement :4 fine sand)	1800	sqm	362.43	6,52,374.00
2.44	13.16.1 : 6 mm cement plaster of mix: 1:3 (1 cement : 3 fine sand)	50	sqm	267.59	13,379.50
2.45	13.43.1: Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface: Water thinnable cement primer	888	sqm	70.64	62,728.32
2.46	13.45.1: Finishing walls with textured exterior pint of required shade: New work (Two or more coats applied @ 3.28 ltr/ 10 sqm) over and including priming coat of exterior primer applied @ 2.20 kg/ 10 sqm	888	sqm	273.08	2,42,495.04
2.47	11.16.3: Precast terrazo tiles 22 mm thick with graded marble chips of size upto 12mm, laid in floors, and landings, jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing complete, on 20 mm thick bed of cement mortar 1:4 (1 cement : 4 coarse sand) : Dark shade pigment using ordinary cement	4480	sqm	1350.14	60,48,627.20

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.48	11.22.1.1 : Tile work in skirting, risers of steps and dado upto 2 m height, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with grey cement slurry @ 3.3 kg/sqm, including pointing in white cement mixed with pigment of matching shade complete. Marble tiles (polished) Raj Nagar 8 mm thick	24	sqm	1459.08	35,017.92
2.49	11.47.2 : Providing and laying Vitrified tiles in different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS : 15622, of approved brand & manufacturer,in all colours and shade, in skirting, riser of steps, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately). Size of Tile 600x600 mm	16	sqm	2041.04	32,656.64
2.50	11.48.2 : Grouting the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg). including filling /grouting and finishing complete as per direction of Engineer-in-charge. Size of Tile 600x600 mm	10	sqm	284.2	2,842.00
2.51	od113926/2022_2023 Supplying and laying 300x300x60 mm tactile concrete tile over CM 1: 10 , 50 mm thick including cost and conveyance of all material, curing, labour etc	420	sqm	1187.05	4,98,561.00
2.52	od115716/2022_2023 : Providing and fixing of 20mm thick machine cut, flamed finish, shell white colour Granite for wall cladding and similar locations, of size 60x45cm, laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, etc. complete at all levels. Area of slab over 0.50 sqm	250	sqm	3986.12	9,96,530.00
2.53	8.2.2.1: Providing and fixing 18 mm thick gang saw cut, mirror, polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations, of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. Granite of any colour and shade Area of slab upto 0.50 sqm	1000	sqm	4964.22	49,64,220.00
2.54	8.3.2: Providing edge moulding to 18 mm thick marble stone counters, vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer -in-Charge. Granite work	2800	metre	442.84	12,39,952.00

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.55	12.53: Providing and Fixing 15 mm densified tegular edged eco friendly light weight calcium silicate false ceiling tiles of approved texture spintone /cosmos /Hexa or equivalent of size 595x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanised steel sections (galvanising @ 120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross "T" of size 24x28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main 'T' of size 24 x 28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main'T' at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross 'T' of length 600 mm and size 24x28 mm made of 0.33 mm thick (minimum) sheet to be inter locked at middle of the 1200x600 mm panel to from grid of size 600x600 mm, resting on periphery walls/partitions on a Perimeter wall angle pre-coated steel of size (24x24x3000 mm made of 0.40 mm thick (minimum) sheet with the help of rawl plugs at 450 mm centre to centre with 25 mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges calicum silicate ceiling tiles of approved texture (Spintone / Cosmos/hexa) in the grid, including cutting / making opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever require. Main 'T' runners to be suspended from ceiling using G.I slotted cleats of size 25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm G.I. adjustable rods with galvanised steel level clips of size of 85x30x0.8 mm, spaced at 1200mm centre to centre along main 'T' bottom exposed with 24 mm of all T- sections shall be pre-painted with polyster baked paint, for all heights, as per specifications,	16	sqm	1935.07	30,961.12
2.56	10.2 : Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	750	kg	119.79	89,842.50
2.57	10.28 : Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)	250	kg	677.34	1,69,335.00
2.58	Providing and fixing wooden railing made of teak wood, anjili wood etc., including fixing, grinding, polishing and making curvature (wherever required) and fitting the same with necessary nuts and bolts complete as per approval of Engineer-in-charge,	15	cum	11400	1,71,000.00
2.59	12.48 : Providing & fixing on roof pressed clay tile (Mangalore tile) of 20 mm nominal thickness and of approved size and as per approved pattern on steel frame work complete (steel frame work to be paid separately)	75	sqm	381.82	28,636.50
2.60	12.49 : Providing & laying on roof pressed clay tile ridge (Mangalore tile) of 20 mm thickness and of approved pattern on steel frame work complete (steel frame work to be paid separately).	35	metre	85.01	2,975.35
2.61	od113939/2022_2023 Supplying and fixing in position granite bench with back rest and two granite slab support ,fixed on ground with CC M15 (the quality of bench to be approved by Engineer in charge)with seat size 1500x450x75mm and leg size 450x75x600mm,Smooth and box cut granite required	5	no	13357.25	66,786.25

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.62	Supplying and fixing in position granite stone decorative pillar of size 14" dia of height up to 20' or nearest size as approved by engineer in charge including cost , transportation charges and installation labour charges.(Including transportation ,loading and unloading charges)	4	no	36006.5	1,44,026.00
2.63	Supply and fixing in position Granite stone Pergola Beam Smooth finish of size 6"x 4"x 11' or nearest size as approved by engineer in charge including cost , transportation charges and installation labour charges.(Including transportation ,loading and unloading charges)	40	no	12805.54	5,12,221.60
2.64	Supply and fixing in position Granite stone Smooth Pergola Pillar of size 6"x6"x9' or nearest size as approved by engineer in charge including cost , transportation charges and installation labour charges.(Including transportation ,loading and unloading charges)	80	no	13655.28	10,92,422.40
2.65	od113943/2022_2023 : Supplying and fixing granite stone architectural bollards of size 150 mm dia height 1100 mm fixed in cement concrete 1:2:4 ,900 mm above ground , with suitable light fixtures 10-15 W 3000 K IP65 with suitable protection cover for the light (the size ,finish and designs of bollards to be approved by engineer in charge)	100	each	45000	45,00,000.00
2.66	Wall pannelling with laminate finish: Providing & fixing Wall panelling(Upto Height as per architect approved drawing. Frame work to be finished using 19 mm ply (IS 303 Grade Ecotec BWR/Equivalent).9 mm plywood (IS 303 Grade Ecotec BWR/Equivalent) to be fixed over the frame work. Finish the exterior part of the panelling using 1 mm laminate (Century/Greenlam/Equivalent) as shown in the drawing. Finish the panelling with necessary projections, grooves, electrical/Window openinings if any. Including cost and conveyance of all materials labour charges etc. complete as per drawing	120	sqm	5226.75	6,27,210.00
2.67	Providing and fixing 2x2x3 m Vendor Kiosk as per the Architectural detail drawing all complete as per the instruction of Engineer in charge	10	no	198008.22	19,80,082.20
2.68	Providing and laying at or near ground level granite stone kerb stone of ,30x15x30 cm in position to the required line, level and curvature jointed with cement mortar 1:3 (1 cement : 3 coarse sand) , including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5 mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). (kerb stone shall be approved by Engineer-in-Charge)	150	metre	238.64	35,796.00
2.69	Grassing with 'Pearl' grass including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn free from weeds and fit for moving including supplying good earth if needed	30	sqm	1624.71	48,741.30
2.70	Supplying and fixing of DUST BIN. External bin made of FRP material moulded with 3mm with Granite finish, Inner liner of FRP material to facilitate removal of garbage, Top lid made of FRP with 3mm thick. Chain to tie top cover with body of garbage bin. Approximately 3 feet or nearby height.	25	no	9437.19	2,35,929.75

SL NO	ITEM DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.71	11.55.1 : Providing and laying flamed finish Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge : Flamed finish granite stone slab Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent	75	sqm	2915.05	2,18,628.75
2.72	4.5.1 : Providing and fixing up to floor five level precast cement concrete string or lacing courses, copings, bed plates, anchor blocks, plain window sills, shelves, louvers, steps, stair cases, etc. including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 coarse sand), cost of required centering, shuttering complete. 1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	5	cum	10049.66	50,248.30
2.73	19.36.4: Providing and laying Non Pressure NP-4 class (Heavy duty) R.C.C. pipes including collars/spigot jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete. 1000 mm dia RCC pipes.(Laying by mannual/machenical means)	200	/m	9492.18	18,98,436.00
2.74	Unforseen works if any		LS		1,88,082.08
	TOTAL				**18,45,00,000.00**
	Adding GST 18%				3,32,10,000.00
	TOTAL				**21,77,10,000.00**
	Rupees Twenty One Crore Seventy Seven Lakhs Ten Thousand Only				

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.00	**CORPORATION LAND**				
3.01	2.31: Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared	2794	sqm	14.78	41,295.32
3.02	2.8.1 : Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil	500	cum	296.94	1,48,470.00
3.03	2.26.1 : Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil	100	cum	106.37	10,637.00
3.04	2.10.1.1 : Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil. and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: All kinds of soil Pipes, cables etc, not exceeding 80 mm dia	100	metre	262.5	26,250.00
3.05	50.2.3.1 : Pumping or Bailing out water and removing slush etc by using pump set including cost of labour, oil hire charges of pumpset, etc complete	300	hour	284.6	85,380.00
3.06	4.1.3 : Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	27	cum	7990.86	2,15,753.22
3.07	4.3.1 : Centering and shuttering including strutting, propping etc. and removal of form work for: Foundations, footings, bases for columns	30	sqm	335.31	10,059.30
3.08	5.9.1 : Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete	150	sqm	335.31	50,296.50
3.09	5.9.3 : Centering and shuttering including strutting, etc. and removal of form for: Suspended floors, roofs, landings, balconies and access platform	450	sqm	815.78	3,67,101.00
3.10	5.9.5 : Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers	450	sqm	649.82	2,92,419.00
3.11	5.9.6 : Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts	350	sqm	863.64	3,02,274.00

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.12	5.9.7 : Centering and shuttering including strutting, etc. and removal of form for: Stairs, (excluding landings) except spiral - staircases)	30	sqm	732.52	21,975.60
3.13	5.22.6 : Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more	27000	kilogram	98.3	26,54,100.00
3.14	5.33.1 : Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	130	cum	9413.54	12,23,760.20
3.15	5.33.2 : Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level	150	cum	11065.64	16,59,846.00
3.16	5.34.2 : Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-35 grade concrete instead of M-25 grade BMC/RMC. (Note: Cement content considered in M-35 is @ 350 Kg/cum).	260	cum	164.18	42,686.80
3.17	2.25 : Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m	250	cum	258.57	64,642.50
3.18	2.34.1 : Supplying chemical emulsion in sealed containers including delivery as specified. Chlorpyriphos / Lindane emulsifiable concentrate of 20%	700	Litre	236.4	1,65,480.00

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.19	2.35.3.1 : Diluting and injecting chemical emulsion for POST -CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion): Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1:2 (1 cement : 2 coarse sand) to match the existing floor: With Chlorpyriphos/Lindane E.C. 20% with 1% concentration	300	sqm	267.25	80,175.00
3.20	50.6.1.4 : Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for foundation and plinth with thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete	650	cum	5950.3	38,67,695.00
3.21	50.6.1.5 : Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete	400	cum	6644.12	26,57,648.00
3.22	4.11 : Providing and laying damp-proof course 50 mm thick with cement concrete 1:2:4(1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	65	sqm	493.07	32,049.55
3.23	13.2.1 : 15 mm cement plaster on the rough side of single or half brick wall of mix: 1:4 (1 cement :4 fine sand)	3000	sqm	362.43	10,87,290.00
3.24	13.16.1 : 6 mm cement plaster of mix: 1:3 (1 cement : 3 fine sand)	600	sqm	267.59	1,60,554.00
3.25	11.22.1.1 : Tile work in skirting, risers of steps and dado upto 2 m height, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with grey cement slurry @ 3.3 kg/sqm, including pointing in white cement mixed with pigment of matching shade complete. Marble tiles (polished) Raj Nagar 8 mm thick	950	sqm	1459.08	13,86,126.00
3.26	11.43 : Fixing glazed/ Ceramic/ Vitrified floor tiles with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS : 15477, in average 3 mm thickness	450	sqm	691.17	3,11,026.50
3.27	11.47.2 : Providing and laying Vitrified tiles in different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS : 15622, of approved brand & manufacturer,in all colours and shade, in skirting, riser of steps, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately). Size of Tile 600x600 mm	150	sqm	2041.04	3,06,156.00

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.28	11.48.2 : Grouting the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg). including filling /grouting and finishing complete as per direction of Engineer-in-charge. Size of Tile 600x600 mm	450	sqm	284.2	1,27,890.00
3.29	od114617/2022_2023 Providing and laying Antiskid Ceramic floor tiles 300x300x7 mm of Ist quality conforming to IS : 15622 of approved make,shade,and pattern laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand) and jointed with grey cement slurry @ 3.3 kg/sqm including pointing the joints with white cement and matching pigment etc.including cost and conveyance of all materials,labour charges,lead,lift etc, complete as directed by the Engineer-in-Charge at all levels.	300	sqm	1091.04	3,27,312.00
3.30	13.43.1 : Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface: Water thinnable cement primer	3000	sqm	70.64	2,11,920.00
3.31	13.46.1 : Finishing walls with Acrylic Smooth exterior paint of required shade: New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)	550	sqm	193.89	1,06,639.50
3.32	13.83.2: Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile including applying additional coats wherever required to achieve even shade and colour. Two coats	2450	sqm	134.1	3,28,545.00
3.33	10.26.1: Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying priming coat of approves steel primer. M.S. tube	100	kg	171.45	17,145.00
3.34	10.28: Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)	500	kg	677.34	3,38,670.00
3.35	12.48: Providing & fixing on roof pressed clay tile (Mangalore tile) of 20 mm nominal thickness and of approved size and as per approved pattern on steel frame work complete (steel frame work to be paid separately)	400	sqm	381.82	1,52,728.00

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.36	12.49: Providing & laying on roof pressed clay tile ridge (Mangalore tile) of 20 mm thickness and of approved pattern on steel frame work complete (steel frame work to be paid separately).	135	metre	85.01	11,476.35
3.37	10.2: Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	6500	kg	119.79	7,78,635.00
3.38	10.16.1: Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete. Hot finished welded type tubes	500	kg	168.81	84,405.00
3.39	12.53: Providing and Fixing 15 mm densified tegular edged eco friendly light weight calcium silicate false ceiling tiles of approved texture spintone /cosmos /Hexa or equivalent of size 595x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanised steel sections (galvanising @ 120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross "T" of size 24x28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main 'T' of size 24 x 28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main'T' at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross 'T' of length 600 mm and size 24x28 mm made of 0.33 mm thick (minimum) sheet to be inter locked at middle of the 1200x600 mm panel to from grid of size 600x600 mm, resting on periphery walls/partitions on a Perimeter wall angle pre-coated steel of size (24x24x3000 mm made of 0.40 mm thick (minimum) sheet with the help of rawl plugs at 450 mm centre to centre with 25 mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges calicum silicate ceiling tiles of approved texture (Spintone / Cosmos/hexa) in the grid, including cutting / making opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever require. Main 'T' runners to be suspended from ceiling	400	sqm	1935.07	7,74,028.00
3.40	Supplying and laying interlocking tile 100 mm or nearest size thickness, minimum strength M 40 including providing a layer of 6 mm aggregate for 5 cm thickness, then laying interlock cobbles in lines and levels as per the directions of the departmental officers at site inclusive of all cost & conveyance charges etc.; complete.	30	sqm	1136.56	34,096.80
3.41	Providing and fixing 60x60x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 75mm thick compacted bed of 6mm aggregate, compacting and proper embedding/ laying of cobble stone into the aggregate bedding layer through vibratory compaction by using plate vibrator, filling the joints with m sand finishing and sweeping extra sand . complete as per direction of engineer-in-charge	30	sqm	2336.54	70,096.20

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.42	Providing and fixing 30x30x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 75mm thick compacted bed of 6mm aggregate, compacting and proper embedding/ laying of cobble stone into the aggregate bedding layer through vibratory compaction by using plate vibrator, filling the joints with m sand finishing and sweeping extra sand . complete as per direction of engineer-in-charge	30	sqm	2439.8	73,194.00
3.43	Providing and fixing 80x120x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 75mm thick compacted bed of 6mm aggregate, compacting and proper embedding/ laying of cobble stone into the aggregate bedding layer through vibratory compaction by using plate vibrator, filling the joints with m sand finishing and sweeping extra sand . complete as per direction of engineer-in-charge	30	sqm	2190.78	65,723.40
3.44	Providing and fixing 10x10x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 75mm thick compacted bed of 6mm aggregate, compacting and proper embedding/ laying of cobble stone into the aggregate bedding layer through vibratory compaction by using plate vibrator, filling the joints with m sand finishing and sweeping extra sand . complete as per direction of engineer-in-charge	100	sqm	1409.09	1,40,909.00
3.45	Providing and laying factory made antiskid stone finish , Cement Concrete cobble blocks in footpath, parks, lawns, drive ways or light traffic parking etc, of required strength, of 60mm thickness & size/ shape of 100x100 mm , made by table vibratory method and PU coated, laid in required colour & pattern over 50mm thick compacted bed of 6 mm aggregate, compacting and proper embedding/laying of inter locking paver blocks into the aggregate bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge. Cobble block of M-35 grade with approved colour, design & pattern.	30	sqm	1379.16	41,374.80
3.46	Providing and fixing 30x30 x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 75 mm thick 6 mm aggregate joints filled with red earth, sand and manure planting doob grass, watering etc. , including rubbing, curing, etc. complete at all levels. complete as per direction of engineer- in charge	250	sqm	3049.48	7,62,370.00
3.47	Grassing with 'Pearl' grass including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn free from weeds and fit for moving including supplying good earth if needed. In rows 7.5 cm apart in either direction	150	sqm	1624.71	2,43,706.50

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.48	Providing & laying buffallo grass turf with existing ground prepared with proper level and ramming with tools wooden the the surface smoothen and light watering the same, with sprinkler and maintenance for 30 days or more till the grass established properly as per direction of officer in charge	150	sqm	83.28	12,492.00
3.49	Supplying and fixing granite stone architectural bollards of size 150 mm dia height 1100 mm fixed in cement concrete 1:2:4 ,900 mm above ground , with suitable light fixtures 10-15 W 3000 K IP65 with suitable protection cover for the light (the size ,finish and designs of bollards to be approved by engineer in charge)	75	each	22500	16,87,500.00
3.50	Supplying and fixing of DUST BIN. External bin made of FRP material moulded with 3mm with Granite finish, Inner liner of FRP material to facilitate removal of garbage, Top lid made of FRP with 3mm thick. Chain to tie top cover with body of garbage bin. Approximately 3 feet or nearby height.	5	no	9437.19	47,185.95
3.51	Supplying and fixing and painting of ferro cement(casted with 6mm steel reinforcement) planter boxes filled with soil mixed with manure, sludges, etc and planting of shurbs and flowering plants. With pot sizes : 62cm x56cm x34 cm, 75cm x 50cm x 34cm, 80cm x 81cm x 51cm	50	each	9466.23	4,73,311.50
3.52	Planting permanent hedges including digging of trenches, 60 cm wide and 45 cm deep, refilling the excavated earth mixed with farmyard manure, supplied at the rate of 4.65 Cum per 100 Metres and supplying and planting hedge plants at 30 cm apart.- Rhoeo Plant and Ornamental Peanut	50	RM	416.15	20,807.50
3.53	Planting permanent hedges including digging of trenches, 60 cm wide and 45 cm deep, refilling the excavated earth mixed with farmyard manure, supplied at the rate of 4.65 Cum per 100 Metres and supplying and planting hedge plants at 30 cm apart. - Wantering Jew Plants	50	RM	780.53	39,026.50
3.54	Planting permanent hedges including digging of trenches, 60 cm wide and 45 cm deep, refilling the excavated earth mixed with farmyard manure, supplied at the rate of 4.65 Cum per 100 Metres and supplying and planting hedge plants at 30 cm apart.Maintenance of hedge for one year - Lorapetalum Plants (Red	50	RM	910.62	45,531.00
3.55	8.2.2.1 : Providing and fixing 18 mm thick gang saw cut, mirror, polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations, of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. Granite of any colour and shade Area of slab upto 0.50 sqm	50	sqm	4964.22	2,48,211.00

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.56	23.1.1.1 : Boring / drilling bore well of required dia for casing / strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/ bore log, including hire & running charges of all equipments, tools plants & machineries required for the job, all complete as per direction of Engineer - in- Charge, upto 90 metre depth below ground level. All types of soil 300 mm dia	90	metre	603.04	54,273.60
3.57	Supplying and fixing of Ventilator of size 45cm x 45cm as per instruction of engineer in charge including frames and shutters, excluding grills; including cost of conveyance material labour etc. complete	28	each	1500	42,000.00
3.58	Supplying and fixing of door of size 100cm x 210cm as per instruction of engineer in charge including frames and shutters, excluding grills; including cost of conveyance material labour etc. complete	54	each	4000	2,16,000.00
3.59	Supply and fixing of Windows W3 150cm x 150cm with frame and shutters as per instruction of engineer in charge; including cost of conveyance, material, labour, etc. complete	27	each	6000	1,62,000.00
3.60	Supplying and fixing in position granite bench with back rest and two granite slab support ,fixed on ground with CC M15 (the quality of bench to be approved by Engineer in charge)with seat size 1500x450x75mm and leg size 450x75x600mm,Smooth and box cut granite required	10	no	13357.25	1,33,572.50
3.61	Special type red colour Exposed Laterite cladding for super structure wall including all cost, labour charges etc. complete	600	sqm	4033.4	24,20,040.00
3.62	Supply and fixing of Play Equipment		LS		2,50,000.00
3.63	Supply and fixing of Gym Equipment		LS		2,50,000.00

SL NO	ITEM DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
3.64	22.23.2 : Providing and applying integral crystalline slurry of hydrophilic in nature forwaterproofing treatment to the RCC structures like retaining walls of the basement,water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels/ subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 partsintegral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 partsintegral crystalline slurry : 1 part water) for horizontal surfaces and applying thesame from negative (internal) side with the help of synthetic fiber brush. The materialshall meet the requirements as specified in ACI-212-3R-2010 i.e by reducingpermeability of concrete by more than 90% compared with control concrete as perDIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystallineslurry shall be capable of self-healing of cracks up to a width of 0.50mm. The workshall be carried out all complete as per specification and the direction of the engineerin-charge. The product performance shall carry guarantee for 10 years against anyleakage.For horizontal surface one coat @1.10 kg per sqm.	150	sqm	439.51	65,926.50
3.65	Plumbing and Sanitory Works		LS		15,00,000.00
3.66	Unforseen Works if any		LS		3,70,110.91
	TOTAL				**3,00,00,000.00**
	Adding GST 18%				**54,00,000.00**
	TOTAL				**3,54,00,000.00**
					Rupees Three Crore Fifty Four Lakhs only

Estimate – Part B (Electrical)

KOVALAM BEACH DEVELOPMENT - ESTIMATE						
Sl. No	**DSR. No**	**Description**	**Unit**	**Qty**	**Rate in Rs**	**Amount in Rs**
	LIGHT FIXTURES					
1	MR	**Post top light Module**:Supply and installation of Upright LED fixture with frosted screen, wattage (25W-40W) power module LED,upper square frame in single piece made of die cast aluminum using pressure die-casting process, with a decorative element which is also made of die cast aluminium using pressure die-casting process, fixed on the top,in single piece, made of die cast aluminum using pressure die-casting process with a four-armed bracket with flange, which is also made of die cast aluminum using pressure die-casting process, fixed at the bottom.Frosted Screen made of polymethylmethacrylate (PMMA) molded in a single piece using Injection molding process. Screen's Impact resistance: IK06.Pure polyester powder coating in Standard Grey/Black Colour. LED Module IP Rating - IP 66.LED Chips of CREE/NICHIA/OSRAM/LUMILEDS make with Individual LED's Minimum Luminous Flux (lm) - 110lm/w shall be used- same should be supported by LED manufacturer's tech sheet . Colour Rendering Index: Ra > 70. Electronic Power Supply for LED Module, which offers Protection against Short Circuit, Over- Voltage & Over- Current, with in-built surge protection a minimum of 4kV (an additional surge protection device of 10kV also provided in-built the fixture). Optics with refractive lens in PMMA which should offer all the Type II,III,IV & V distribution and the type of optics will be decided by the client engineer as per the respective project field requirements. LED Module Transparent screen in Tempered Glass(IK 08). LED Lifetime @L70>50,000hours@Ts 85°C.Overall system efficiency of 120lm/W at correlated colour temperature (CCT) of 3000K , colour rendering index (CRI) >70. The Light fixture shall be in compliance with IEC 60598-2-3; IEC 60598-1(Supporting Test Report from UL Authorized Laboratory should be submitted). Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	90	39446	35,50,140.00
2	MR	**Decorative Pole**:3M to 3.5M height Pole made of complete cast iron decorative components where the internal fabricated pole is Made in combination of mild steel pipe sections & covered on the outside by decorative cast iron base and columns. A provision for mounting speaker and CCTV considered in every poles. .Entire Cast Iron Design Pole shall be made to provide pleasing aesthetics as approved by Concerned Engineer in-charge. After Fabrication, Entire Pole is hot dip galvanized(60 microns Minimum) for the effective corrosion resistance . The hot dip Galvanised pole should be provided with an inbuilt junction box to fix MCB, at the bottom - the inbuilt box should have a flush door of suitable size. The decorative pedastal to be mounted on a suitable size steel plate. This mounting steel plate along with foundation bolts of suitable size to be used for ensuring firm grouting into the specially designed RCC foundation. Cast Iron Parts are painted in 3 layer coating in which 1st layer with etch primer(Minimm 70 micron), 2nd layer with epoxy primer(minimum 180 Micron) & 3rd final layer with Polyurathine(PU) Paint (minimum 60 Micron) as per IS 12944 for C5 M class Customised Metallic Grey/ Black. Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	90	40728	36,65,520.00
3	MR	**Bollard:**SITC of the Bollard suitable for on ground installation,10-15w 3000K IP 65 is made of 3mm thick(minimum) extruded aluminium pipe.It's screen made of acrylic with high impact resistance,in single piece. Pure polyester powder coating in Grey Colour,to provide higher corrosion resistance. IP Rating - IP 65. Height – 1000mm, Dia - 127mm LED Module on Printed Circuit Board with metal core plate.Colour Rendering Index: Ra > 70.Electronic Power Supply for LED Module, which offers Protection against Short Circuit, Over- Voltage & Over- Current. Estimated LED Lifetime L80 @50,000 hours minimum. Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	25	22281	5,57,025.00

4	MR	SITC of Bullet shaped LED Bollard of system wattage 15W, BIS certified with a pressure die cast aluminium base and a protector made of separate IP66 optical & control gear compartments, impact resistance of IK10 made out of robust constrction,suitable for surface mounting. Supplied pre cable (0.5m) for easy installation.Excellent photometry to maximise the spacing between the bollards. Suitable for on-ground mounting . System power of 15W, correlated colour temperature (CCT) of 3000K, colour rendering index (CRI) >70 and L70 rated lifetime of 50,000 hours. Electrical Class I, rated voltage 240Vac,Power Factor ≥ 0.95. Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	10	22281	2,22,810.00
5	MR	**SPOT Light** : SITC of 12W High efficiency LED landscape luminaires with high efficiency LED driver, designed to provide directional spot light. The luminaiare is made up of pressure die cast aluminium housing and with flat glass protector. The luminare characterized by high luminous efficiency with luminaire efficacy of 70Lm/W. Ingress protection IP 66 to prevent from dust & moisture. Also can change/adjust luminaire at desired angle. Colour Rendering Index(CCT) 3000K. Ambient temperature ranges: -10 to +40°C a with interenal surge protection of 4kV, CRI > 80.Power Factor >0.90, THD<15%, >30000 hours @L70. Rated voltage 240Vac, 50Hz. Design should be submitted for approval from concerned engineer-in charge.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	50	3223	1,61,150.00
6	MR	SITC of **projector light** 25 to 35W,DMX compatiable,RGBW, the housing in light weight, made of high strength die cast aluminium and coated by static powder making it weather resistant.Protection screen in ultra white tempered glass with high impact resistance . High precision dial ensures precision angle adjustment.Premium thermal management by high heat conductivity aluminum alloy and thermal fins. Pure Polyester powder coating in Standard Grey Colour. Precise structure and multi-protection silicon rubber seal guarantees the fixture IP66 rated. Power LED Module with high efficacy LED's, on Printed Circuit Board with metal core plate. Electronic Power Supply for LED Module,which offers Protection against Short Circuit, Over- Voltage & Over- Current, with in-built surge protection. Light fixture should be standard DMX512 protocol compatible, the DMX decoder function should be inbuilt the light fixture,Each light fixture should be invidually addressable & should be able to operate with any standard DMX512 equipment. Lens made of PC which should offer atleast 4different beam angles 9°/13°/25°/35°. Estimated LED Lifetime is L70-100,000 hours minimum. LM 80 report & TM 21 calculation should be submitted to support the same.The Light fixture shall be	Each	15	28395	4,25,925.00
7	MR	**Spot Light:** SITC of spot light (8W-10W),LED, 3000K NSL-12S -Body-Die-casting aluminium Body & screen made of tempered glass..Electronic Driver which offers Protection against Short Circuit, Over- Voltage & Over- Current, IP 65 protection,CRI > 70,voltage input AC100-264V. Estimated Lifetime-L70 @ 50,000hours minimum.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	50	10248	5,12,400.00

8	MR	SITC of Color changing **RGBW WALL WASHER & WALL GRAZER** , Length-1000 mm, enabled with high power LEDs & anti-aging and anti-UV high optical efficiency temperature -resistant lenses, standard DMX512/RDM protocol compatible, the DMX/RDM decoder function inbuilt and each light fixture should be invidually addressable & able to operate with any standard DMX512/RDM equipment, surface mounted Narrow/Medium/Wide/Elliptical beam luminaire suitable for outdoor applications of Façade Lighting, depending on design and site requirement, with Die-cast aluminium housing, powder-coated finish , Power consumption should be **18W** at steady state full intensity, Luminaire luminous flux range of 600- 630 Lm. Color rendering index CRI ≥ 80 for white LEDS's and power factor of complete luminaire ≥ 0.90, at full intensity. Luminaire should be provided with suitable integral/separate non-integral power supply unit. Lumen maintenance of at least L70@50,000 burning hours at 25°C.Ingress Protection ≥ IP 65. Impact resistance level ≥ IK 06. Adequate heat sink with proper thermal management shall be provided. Operating Temperature : -10°C to +50°C, Operating Humidity : 10%-90%. THD should be less than 10%. Housing to have adjustable base bracket for angle adjustment so that the light direction can be adjusted to illuminate desired structural elements. The fixtures proposed must have passed LM 79 & LM-80, Reports from NABL laboratory. Technical data should be submitted for approval from concerned engineer-in charge.	Each	45	22149	9,96,705.00
9	MR	SITC of Color changing **RGBW WALL WASHER & WALL GRAZER** , Length-1000 mm, enabled with high power LEDs & anti-aging and anti-UV high optical efficiency temperature -resistant lenses, standard DMX512/RDM protocol compatible, the DMX/RDM decoder function inbuilt and each light fixture should be invidually addressable & able to operate with any standard DMX512/RDM equipment, surface mounted Narrow/Medium/Wide/Elliptical beam luminaire suitable for outdoor applications of Façade Lighting, depending on design and site requirement, with Die-cast aluminium housing, powder-coated finish , Power consumption should be **36W** at steady state full intensity, Luminaire luminous flux range of 1200- 1260 Lm. Color rendering index CRI ≥ 80 for white LEDS's and power factor of complete luminaire ≥ 0.90, at full intensity. Luminaire should be provided with suitable integral/separate non-integral power supply unit. Lumen maintenance of at least L70@50,000 burning hours at 25°C. Ingress Protection ≥ IP 65. Impact resistance level ≥ IK 06. Adequate heat sink with proper thermal management shall be provided. Operating Temperature : -10°C to +50°C, Operating Humidity : 10%-90%. THD should be less than 10%. Housing to have adjustable base bracket for angle adjustment so that the light direction can be adjusted to illuminate desired structural elements. The fixtures proposed must have passed LM 79 & LM-80, Reports from NABL laboratory.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	20	41358	8,27,160.00

10	MR	SITC of Homogeneous Dot free 3D **LED Flexible(WW)** Linear Light with high quality circuit design for stable and reliable performance, surface material should be made of Silicon with aluminium extrusion linear profile and other connecting accessories, Surface mounted flexible linear light suitable for facade edge lighting, Symmetric distribution. luminaire should have diffuse silicone based cover for soft illumination. Linear luminaire should have lumen flux in range of 600-720 lm per meter, Rated input supply of DC 24V constant voltage with external LED Driver, External ballast as accessory must be provided separately, Output color should be in range of 2700-3000K color temperature, LED Make : Cree / Osram / Nichia / Lumileds,The luminaire should have versatile optics : 120°, Mean rated service life L70(tq 25 °C) = 50,000 h. Luminaire body of aluminium extrusion with aluminium components. With flush-fitting cover and integral LED unit. Colour of luminaire body Grey/Silver,highly weather resistant/ powder-coated. Ingress protection rating (DIN EN 60529): IP68, impact resistance level should be suitable to site condition. The LED system with control gear unit is suitable for operation on direct voltage supply grids. The luminaire should be provided with Electrical safety class I. Power Efficiency : >85%, Operating Temperature : -40°C to +55°C,Operating Humidity : 10%-90%, Housing to be supplied with completely customized and bendable channel	Meter	200	5307	10,61,400.00
11	MR	RGBW LED FLOOD LIGHT: SITC of Color changing RGBW FLOOD LIGHT, enabled with high power LEDs & anti-aging and anti-UV high optical efficiency temperature -resistant lenses, standard DMX512/RDM protocol compatible, the DMX/RDM decoder function inbuilt and each light fixture should be invidually addressable & able to operate with any standard DMX512/RDM equipment, surface mounted Narrow/Medium/Wide beam luminaire suitable for outdoor applications of Façade Lighting, depending on design and site requirement, with Die-cast aluminium housing, powder-coated finish , Power consumption should be **36W** at steady state full intensity, Luminaire luminous flux range of 1200- 1260 Lm. Color rendering index CRI ≥ 80 for white LEDS's and power factor of complete luminaire ≥ 0.90, at full intensity. Luminaire should be provided with suitable integral/separate non-integral power supply unit. Lumen maintenance of at least L70@50,000 burning hours at 25°C. Ingress Protection ≥ IP 65. Impact resistance level ≥ IK 06. Adequate heat sink with proper thermal management shall be provided. Operating Temperature : -10°C to +50°C,Operating Humidity : 10%-90%. THD should be less than 10%. Housing to have adjustable base bracket for angle adjustment sothat the light direction can be adjusted to illuminate desired structural elements. The fixtures proposed must have passed LM79 &	Each	15	35930	5,38,950.00
12	MR	RGBW LED FLOOD LIGHT: SITC of Color changing RGBW FLOOD LIGHT, enabled with high power LEDs & anti-aging and anti-UV high optical efficiency temperature -resistant lenses, standard DMX512/RDM protocol compatible, the DMX/RDM decoder function inbuilt and each light fixture should be invidually addressable & able to operate with any standard DMX512/RDM equipment, surface mounted Narrow/Medium/Wide beam luminaire suitable for outdoor applications of Façade Lighting, depending on design and site requirement, with Die-cast aluminium housing, powder-coated finish ,Power consumption should be **72W** at steady state full intensity, Luminaire luminous flux range of 2400- 2500 Lm. Color rendering index CRI ≥ 80 for white LEDS's and power factor of complete luminaire ≥ 0.90, at full intensity. Luminaire should be provided with suitable integral/separate non-integral power supply unit. Lumen maintenance of at least L70@50,000 burning hours at 25°C. Ingress Protection ≥ IP 65. Impact resistance level ≥ IK 06. Adequate heat sink with proper thermal management shall be provided. Operating Temperature : -10°C to +50°C,Operating Humidity : 10%-90%. THD should be less than 10%. Housing to have adjustable base bracket for angle adjustment sothat the light	Each	10	107879	10,78,790.00

13		Supply of Homogeneous Dot free **3D LED Flexible Linear Light** with high quality circuit design for stable and reliable performance, surface material should be made of Silicon with aluminium extrusion linear profile and other connecting accessories, Surface mounted flexible linear light suitable for facade edge lighting, Symmetric distribution. luminaire should have diffuse silicone based cover for soft illumination. Linear luminaire should have lumen flux in range of 400-450 lm per meter, Rated input supply of DC 24V constant voltage with external LED Driver, External ballast as accessory must be provided separately, Output color should be in range of RGBW-Digital, it should have 16-18 addressable pixel,luminaire should control through bluetooth/Wi -fi/DMX/RDM/Ethernet protocol. color temperature, LED Make : Cree / Osram / Nichia / Lumileds, The luminaire should have versatile optics : 120°, Mean rated service life L70(tq 25 °C) = 50,000 h. Luminaire body of aluminium extrusion with aluminium components. With flush-fitting cover and integral LED unit. Colour of luminaire body Grey/Silver,highly weather resistant/ powder-coated. Ingress protection rating (DIN EN 60529): IP68, impact resistance level should be suitable to site condition. The LED system with control gear unit is suitable for operation on direct voltage supply grids. The luminaire should be provided with Electrical safety class I, Power Efficiency : >85%, Operating Temperature : -40°C to	Meter	400	12,004.00	48,01,600.00
14	MR	**GOBO projector light**:SITC of 300W to 350W LED,IP 66, Gobo Projector:Body made of Diecast Magnesium/Aluminium alloy. Uses high power white LED Engine,Powerful close-range and long-range projection,Display-On board Control, Strobe,Rotating Gobo, Gobo-flow effect, Gobo shake, Bi-directional rotation color wheel,-directional rotation, Speed adjustable,Animation Wheel-Bi-directional rotation, Speed adjustable.Light fixture should be standard DMX512 with RDMcompatibleIn-Built Electronic Power Supply for LED Module,which offers Protection against Short Circuit, Over- Voltage & Over-Current, with in-built surge protection.IP rating-IP 66 minimum. IK 08 minimum.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	3	1028245	30,84,735.00
15	MR	SITC of 6M to 10M height post top Pole made of mild steel pipe sections with suitable fixing arrangement for gobo projector. This mounting steel plate along with foundation bolts of suitable size to be used for ensuring firm grouting into the specially designed RCC foundation. Entire pole & Bracket shall be made to provide pleasing aesthetics as approved by Concerned Engineer in-charge. After Fabrication, Entire Pole is hot dip galvanized(60 microns Minimum) for the effective corrosion resistance . The hot dip Galvanised pole should be provided with an inbuilt junction box to f MCB, at the bottom - the inbuilt box should have a flush door of suitable size. Pole & Cast iron parts are painted in 3 layer coating(coating thickness-100 microns minimum) in which 1st layer with etch primer, 2nd layer with epoxy primer & 3rd final layer with marine grade PU paint(IS 12944 for C5M class) in Grey,to provide higher corrsion resistance.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	3	38261	1,14,783.00
16	MR	SITC of 3M artifical Cherry Tree structure with LED Illumination, Input Voltage range should be : AC 110V/220V, Size of the Tree Structure should be minimum 3 Meters in height and 3M in width, Number of Leaf should be minimum 100 Nos and number of Cherry should be minimum 20 Nos, Color combination should be Pink, Black, Green & Red, Power Consumption of the tree Structure should not exeed to 100W, Safety class (EN 61140): III, ingress protection rating (DIN EN 60529): IP65, impact resistance level should be suitable to site condition.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	4	243886	9,75,544.00

17	MR	SITC of 3M artifical SELFIE POINT with LED Illumination, Input Voltage range should be : AC 110V/220V, Size of the SELFIE POINT structure should be minimum 1 Meters in height and 3M in width, Number of fings should be 2 Nos and number of supporting structure should be minimum 1 Nos, Color combination should be Red, Yellow, Green & Blue, Power Consumption of the Structure should not exeed to 100W, Safety class (EN 61140): III, ingress protection rating (DIN EN 60529): IP65, impact resistance level should be suitable to site condition.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	1	696267	6,96,267.00
18	MR	SITC of AC220V input, DMX main controller,System Support-15000 points in offline,Support -Swich Parallel supply,SD Card Storage,preset maximum 255 program files,main stream-32/64 bit,power usage-15 Watt automatic regular preset program play	Each	1	269471	2,69,471.00
19	MR	SITC of AC220V input, DMX sub-controller,O/P Support Standard-USITT DMX512-1990Universal Protocol & expand 512,Charateristics - Self adapting 1000m/100M.	Each	4	230975	9,23,900.00
20	MR	SITC of Spliter for communicate through fixtures.	Each	6	60000	3,60,000.00
21	MR	SITC of AC100~240V input, DC24V output, 200W, constant voltage power supply 24V models are suitable for general indoor and outdoor lighting project, including waterproof light strips/advertising light boxes or voltage sources with DMX control. Full power at 70~100% operation ,Wide input range 100-305V AC ,3 in 1 dimming function with isolation design. Surge protection: 6KV/4KV (10KV/6KV optional),Lifetime >50,000 hrs.	Each	100	5389	5,38,900.00
22	MR	Supply of 200W LED Flood light luminaire (IP66), BIS certified with a body of extruded anodised aluminium, integrated heat sink, a polycarbonate integrated lens protector (light transmittance >90%) with impact resistance of IK10 fixed to the housing and sealed by a rubber gasket to achieve an overall tightness of IP66, easy access driver (IP67) fitted on a bracket made of Cold-rolled steel sheet (SPCC). Mounting with different degrees of Inclination from -90° to +90° in step of 10°. Overall luminous efficiency of 120lm/W, correlated colour temperature (CCT) of 5700K colour rendering index (CRI) > 75 and L70 rated lifetime of 50,000 hours. Electrical Class I, rated voltage 240Vac,Power Factor ≥ 0.90, with BIS certified potted driver having surge protection of 5/10 kV.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	30	45036	13,51,080.00
23	MR	Supply of 20 m high mast system with head frame, galvanized lantern carriage.Mast shaft shall be in two sections, hot dip galvanized and suitable for wind velocity as per IS 875. It shall include 3 point suspension system with steel wire rope 6 mm dia (7/19 construction), trailing cable, double drum winch,galvanized latern carriage suitable for 6 luminaires symmetrically & its control gear boxes and lightning finial. The mast shall have an integral powertool installed inside the base compartment for its operation. .Supply of foundation bolts manufactured from special steel along with nuts, washers, anchor plates and templates.Supply ofLED type Single dome aviation obstruction light.Supply of control panel housing 32A single dial timer TPN MCB incomer, single dial timer contactor circuit for the automatic control of luminaries, outgoing terminals and control circuit for the power tool motor.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	5	495885	24,79,425.00

24	MR	Supply of Decorative classic LED street lantern of system wattage of 40W, BIS certified with a luminaire body made of cast and spun aluminium, permanently sealed optical block (IP66) with heat sink and PMMA protector (IK07) fitted with a Vent Plug pressure equalisation unit, fixed onto a hinged spun aluminium frame, control gear compartment accessed by loosening one screw for tool free opening and closing. Highly efficient temperature resistant lenses for symmetric light distribution with several optical options providing excellent photometry to optimally cater to different applications.Suitable for suspended mounting with ½" BSP threaded pipe. Overall system efficiency of 120lm/W at correlated colour temperature (CCT) of 3000K, colour rendering index (CRI) >70 and L70 rated lifetime of 50,000 hours. Electrical Class I, rated voltage 240Vac, Power Factor ≥ 0.95, with BIS certified potted driver having internal surge protection of 4/4 kV and an additional surge protection device (SPD) of 10/10 kV.Model and Technical data sheet with drawings should be submitted for approval from engineer-in charge.	Each	3	24297	72,891.00
25		**FEEDER PILLARS**				
26	MR	**Main feedreer pillar**:SITC of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. Incomer - 400A FP MCCB 25kA - 2 Nos,400A FP MCCB 25kA (Bus Coupler)-1No,Digital Multifunction Meter - 2 Set,SPD-2Nos. Outgoing - 160A FP MCCB 25kA - 4 Nos,125A FP MCCB 25kA - 1 No,100A FP MCCB 25kA - 7 Nos,63A FP MCCB 25kA - 1 No,50A FP MCCB 25kA - 6 Nos	Each	1	1331551	13,31,551.00
27	MR	**Feeder Pillar 1 & 2** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 160A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** - 63A FP MCCB ISO - 1 No,80A FP MCB ISO - 1 No,25A FP MCB ISO - 2 Nos,25A DP MCB ISO - 4 Nos.	Each	2	262507	5,25,014.00

28	MR	**Feeder Pillar 3 & 8** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 100A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -63A FP MCCB ISO - 1 No,25A FP MCB ISO - 1 No,25A DP MCB ISO - 10 Nos.	Each	2	236466	4,72,932.00
29	MR	**Feeder Pillar 5** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 100A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -63A FP MCCB ISO - 1 No,50A FP MCB ISO - 1 No,25A DP MCB ISO - 10 Nos.	Each	1	236123	2,36,123.00
30	MR	**Feeder Pillar 6** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 160A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -125A FP MCCB ISO - 1 No,80A FP MCCB ISO - 1 No,63A FP MCCB ISO - 1 No.25A FP MCCB ISO - 1 No, 25A DP MCB ISO - 10 Nos.	Each	1	318220	3,18,220.00
31	MR	**Feeder Pillar 7** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 125A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -80A FP MCCB ISO - 1 No,63A FP MCCB ISO - 1 No.25A FP MCCB ISO - 1 No, 25A DP MCB ISO - 8 Nos.	Each	1	255654	2,55,654.00

32	MR	**Feeder Pillar 8** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 125A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -63A FP MCCB ISO - 1 No.25A FP MCB ISO - 1 No, 25A DP MCB ISO - 10 Nos.	Each	1	233382	2,33,382.00
33	MR	**Feeder Pillar 4 & 9** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 63A FP MCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -25A FP MCB ISO - 3 No, 25A DP MCB ISO - 9 Nos.	Each	2	233382	4,66,764.00
34	MR	**Feeder Pillar 10** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 160A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -63A 4P MCCB ISO -1No,50A 4P MCB ISO-1No, 25A FP MCB ISO -1 No, 25A DP MCB ISO - 4 Nos.	Each	1	246060	2,46,060.00
35	MR	**Feeder Pillar 11 & 12** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 100A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -63A 4P MCCB ISO -1No,25A FP MCB ISO -2 Nos, 25A DP MCB ISO -9 Nos.	Each	2	236466	4,72,932.00

36	MR	**Feeder Pillar 13 & 17** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 50A FP MCB ISO16kA - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -25A FP MCB ISO -3 Nos, 25A DP MCB ISO -6 Nos.	Each	2	193978	3,87,956.00
37	MR	**Feeder Pillar 14** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 100A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -63A 4P ISO MCCB -1No, 25A DP MCB ISO - 12 Nos.	Each	1	235986	2,35,986.00
38	MR	**Feeder Pillar 15** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 100A FP MCCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -63A 4P MCCB ISO -1No, 25A DP MCB ISO - 10 Nos.	Each	1	233382	2,33,382.00
39	MR	**Feeder Pillar 16** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 50A FP MCB ISO - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** -25A 4P MCB -3No, 25A DP MCB ISO - 4 Nos.	Each	1	207684	2,07,684.00

40		**OUTDOOR LIGHTING PANEL 1 & 2** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** -40A FP ISO - 1 No,40A FP Contactor - 1No,Digital Timer-1No **Outgoing** -16A SP MCB -4Nos	Each	2	65145	1,30,290.00
41		**Extrnal lighting control panel** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** -16A DP ISO - 1 No, Contactor - 1No,Digital Timer-1No **Outgoing** -6A SP MCB -4Nos	Each	1	51439	51,439.00
42		**LT CABLES**				
		Supply of the following size 1.1kV grade XLPE insulated PVC sheathed, armoured Aluminium / Copper conductor power cable confirming to IS 7098 (part 1) ammended upto date.				
42		4 C x 16 sq.mm Al	Meter	450	243.00	1,09,350.00
42		4 C x 10 sq.mm Al	Meter	1500	224.00	3,36,000.00
42		4 C x 6 sq.mm Al	Meter	750	191.00	1,43,250.00
42		3.5Cx185 sq.mm Al	Meter	3000	1,632.00	48,96,000.00
		END TERMINATION				
		Supplying and making end termination with brass double compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 kV grade as required				
	9.1.33	4 C x 16 sq.mm Al	Each	10	339.00	3,390.00
	9.1.32	4 C x 10 sq.mm Al	Each	20	297.00	5,940.00
		4 C x 6 sq.mm Al	Each	15	207.00	3,105.00
		3.5Cx185 sq.mm Al	Each	8	1,542.00	12,336.00
43		**Marine Cable**				
		SITC of A2XY Marine cable of XLPE aluminium cable.1100 volt, As per IS 8130 2013,IS: 7098 P-1,IS:8130,IS:5831,IS:3975,IS:10810 and class 2 grdae marine application cable with uptdate amendment and specified in the specification,laying through HDPE pipes,RCC cable trench, directly through through sea water and tray including testing and commisioning of the following size as per standards and direction by the enginneer in charge.				
43		3.5Cx95 sq.mm	Meter	500	1,279.00	6,39,500.00
44	7.5	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size in the existing RCC/ HUME/ METAL/HDPE pipe as required.				
44	7.5.1	Upto 35 sq. mm	Meter	2500	42.0329	1,05,082.25
45	7.1	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required.				
45	7.1.1	Upto 35 sq. mm	Meter	50	437.8588	21,892.94

45	7.1.2	Above 35 sq. mm and upto 95 sq. mm	Meter	50	319.9216	15,996.08
45	7.1.3	Above 95 sq. mm and upto 185 sq. mm	Meter	50	477.1712	23,858.56
45	7.1.4	Above 185 sq. mm and upto 400 sq. mm	Meter	3000	536.8176	16,10,452.80
46		**CABLE TRAY**				
		SITC of Galvnised Tray specifically for Outdoor Application having min 72 microns of Zinc coating for Ladder Cable Trays with Powder coated Over Head Hanger & Cantilever Support with suitablemounting achour fastners & mounting accessories as required confirming to IEC-61537. The Tray shall be galvanized for corrosion protection as per IS 277 .The trays should be tested for a safe working load as per the standard with a span distance of 2 meters and the deflection should be within the limits as per NEMA standards. The tray covers shall be snap fitted having min 1mm thickness for 750mm and more min 1.2mm thickness required. The ladders shall be designed with six-fold bends (rolled formed) in both the sides to ensure extra strength and two profile ribs to maximize its stability which leads to better load bearing capacity and the rungs shall be welded with robotic welding for uniform welding.The cable ladder should be tested for safe working load with a span distance of 2 Mtr and the deflection should be within the limits as per the NEMA standard. The cable ladder thickness must be minimum 1.6mm. The cable ladder shall be supplied in standard length of 3000 mm. The rung size shall be of 35x15mm size & the space between the rungs shall be 300mm				
46		1000mm Width x 75mm height	Meter	400	3,528.00	14,11,200.00
46		900mm Width x 50mm height	Meter	650	3,510.00	22,81,500.00
46		600mm Width x 50mm height	Meter	700	2,468.00	17,27,600.00
46		Wall bracket for 1000mmx75mm tray	Each	400	1,439.00	5,75,600.00
47		Wall bracket for 900mmx50mm tray	Each	650	1,118.00	7,26,700.00
47		Wall bracket for 600mmx50mm tray	Each	700	1,011.00	7,07,700.00
47		**Earthing**				
		Supply and laying the following sizes of round conductor on cable tray or wall surface, including necessary clamps (each clamp not exceeding 60 cm llength) and bolts etc as required for complete installation as instructed by engineer in charge/consultant.				
47		Copper wire No.10 SWG	Meter	1800	141.00	2,53,800.00
47	5.8	Supplying and laying 25 mm X 5 mm copper strip at 0.50 metre below ground as strip earth electrode, including connection/ terminating with nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of brass nut bolt & spring washer spaced at 50mm)	Meter	350	1,156.58	4,04,803.95
47	5.14	Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.	Meter	650	1,368.10	8,89,267.02
47	5.2	Providing and fixing earth bus of 50 mm X 5 mm copper strip on surface for connections etc. as required.	Meter	50	2,500.28	1,25,013.98
48		SITC of maintenance free Earthing system comprises of molecularly bonded copper of 99.9% purity on low carbon steel of min 3048mm length (10 feet), having a diameter of 20mm with copper bonding thickness of 250 microns as per UL 467. The Rod has to be either continuous or with self-coupling peg & bore arrangement with fault current withstand capability of 30 KA rms value for 1 second and I peak of 76 KA. The rod must be having corrosion test, peel off test for uniform coating, 180 degree bend test with out peeloff of copper bonding. Exothermic welded Clamp for clamping as suggested as per NBC 2016. Ordinary Stainless steel/Copper alloy universal clamps are not recommended. For self coupling peg & bore arrangement rod needs Impact point on the bottom rod for easy insertion. Earth enhancing mineral compound is used for improving the soil conductivity. The material shall be mineral inert to sub soil and shall not pollute the environment and non corrosive to earth rod. The material should have a resistivity less than 0.2 Ωm. It should be free from hazardous substances. The mineral compound is required to have minimum 17.5 Kg of the total composite. The compound should be chemically inert and needs to submit Govt approved Indian labs test certificate. Concrete Earth electrode inspection chamber with weight bearing capacity of 30KN. The dimension shall be 320mmx 320mmx 190mm. Govt approved Indian labs test certificate required	Each	15	33,675.00	5,05,125.00
48		**Solar**				

		SITC of 5kW PV ongrid solar system.450Wp monoperc or high efficiency Mono-crystalline Half-cut PERC Silicon Module solar PV module. It should be durable in the most extreme conditions such as high voltages, severe salt mist and high humidity conditions.0 to + 5W Positive Power Tolerance,Peak Power Watts PMAX shall be 535 Wp.Environmental protection rating: IP65, The FRP mounting structure shall be proided as per standards and direction by the enginneer in charge.	Kw	5	70000	350000
TOTAL						**5,29,56,404.00**

KOVALAM BEACH DEVELOPMENT						
Sl No.	**Code**	**Description of Item**	**Qty**	**Unit**	**Rate**	**Amount (Rs.)**
ELECTRIFICATION						
ADMIN BLOCK						
1.00	1.8.3	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit,with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.	62	Point	1,310.00	81,220.00
2.00	1.55.1	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required.	15	Point	628.00	9,420.00
3.00	1.14	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required.				-
3.10	1.14.1	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire	1000	Meter	198.00	1,98,000.00
3.20	1.14.2	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire	500	Meter	226.00	1,13,000.00
3.30	1.14.3	2 x 4 sq.mm +1 x 4 sq.mm earth wire	200	Meter	271.00	54,200.00
3.40	1.14.4	2 X 6 sq. mm + 1 X 6 sq. mm earth wire	100	Meter	338.00	33,800.00
4.00	1.21	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.				
4.10	1.21.1	20 mm	850	Meter	198.00	1,68,300.00
4.20	1.21.2	25 mm	550	Meter	224.00	1,23,200.00
4.30	1.21.3	32 mm	150	Meter	275.00	41,250.00
5.00	1.25	Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required	9	Each	464.00	4,176.00
6.00	1.26	Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required	20	Each	45.00	900.00
7.00		Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on surface/recess for modular switches etc as required as instructed by engineer in charge				
7.10	MR	1 or 2 Module (75 mmX75 mm)	15	Each	216.00	3,240.00
7.20	MR	3 Module (100 mmX75 mm)	12	Each	216.00	2,592.00
7.30	MR	4 Module (125 mmX75 mm)	2	Each	248.00	496.00
7.40	MR	6 Module (200 mmX75 mm)	12	Each	320.00	3,840.00
7.50	MR	8 Module (125 mmX125 mm)		Each	355.00	-
7.60	MR	12 Module (172 mmX224 mm)	5	Each	474.00	2,370.00
8.00		Supplying and fixing following Modular base & cover plate on existing modular boxes etc. as required.				
8.10	MR	1 or 2 Module	15	Each	301.00	4,515.00
8.20	MR	3 Module	12	Each	312.00	3,744.00
8.30	MR	4 Module	2	Each	326.00	652.00
8.40	MR	6 Module	12	Each	492.00	5,904.00

8.50	MR	8 Module		Each	525.00	-
8.60	MR	12 Module	5	Each	734.00	3,670.00
9.00	1.24	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
9.10	1.24.1	5/6 A switch	102	Each	115.00	11,730.00
9.20	1.24.3	15/16 A switch	3	Each	179.00	537.00
9.30	MR	20A switch	4	Each	354.00	1,416.00
9.40	1.24.4	3 pin 5/6 A socket outlet	29	Each	151.00	4,379.00
9.50	1.24.5	15/16 A socket outlet	3	Each	237.00	711.00
9.60	MR	20A socket outlet	4	Each	460.00	1,840.00
9.70	1.24.6	Telephone socket outlet	2	Each	61.00	122.00
9.80	1.24.7	TV antenna socket outlet Each	1	Each	161.00	161.00
10.00	MR	Supplying and fixing of modular type data networking (CAT-6A) socket outlet on the existing modular plate & switch box including connections but excluding modular plate etc. as required.	5	Each	515.00	2,575.00
11.00	1.33	Supply and fixing 3 pin, 6A ceiling rose on the existing junction box / wooden block including connection etc as required.	90	Each	88.00	7,920.00
12.00	1.44	Installation, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable etc. as required.	9	Each	232.00	2,088.00
13.00	1.50.1	Installation of exhaust fan upto 450mm in the existing opening, including making good the damage, connection, testing, commissioning etc. as required.	9	Each	492.00	4,428.00
		MCB, SWITCHGEARS & DBs				-
14.00	2.30	Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator)				-
14.10	2.3.2	8 Way Double Door	1	Each	2,386.00	2,386.00
15.00		Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/ Isolator)				-
15.10	2.5.1	4 Way Double Door	2	Each	15,944.00	31,888.00
16.00		Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/ Isolator)				-
16.10	MR	6 Way Double Door	1	Each	19,112.00	19,112.00
17.00		Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/ Isolator)				-
17.10	MR	8 Way Double Door	1	Each	20,868.00	20,868.00

18.00		Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 A, tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (provision for MCCB as incomer & MCB as outgoings) as required. (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.)				-
18.10	MR	12 Way Double Door	1	Each	37,491.00	37,491.00
19.00	2.10	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				-
19.10	2.10.1	Single pole	72	Each	270.00	19,440.00
20.00	2.11	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required.	15	Each	11.00	165.00
		EARTHING				-
21.00		Supply and laying the following sizes of round conductor on cable tray or wall surface, including necessary clamps (each clamp not exceeding 60 cm llength) and bolts etc as required for complete installation as instructed by engineer in charge/consultant.				
1.00	MR	Copper wire No.10 SWG	800	Meter	141.00	1,12,800.00
1.10	MR	SITC of maintenance free Earthing system comprises of molecularly bonded copper of 99.9% purity on low carbon steel of min 3048mm length (10 feet), having a diameter of 20mm with copper bonding thickness of 250 microns as per UL 467. The Rod has to be either continuous or with self-coupling peg & bore arrangement with fault current withstand capability of 30 KA rms value for 1 second and I peak of 76 KA. The rod must be having corrosion test, peel off test for uniform coating, 180 degree bend test with out peeloff of copper bonding. Exothermic welded Clamp for clamping as suggested as per NBC 2016. Ordinary Stainless steel/Copper alloy universal clamps are not recommended. For self coupling peg & bore arrangement rod needs Impact point on the bottom rod for easy insertion. Earth enhancing mineral compound is used for improving the soil conductivity. The material shall be mineral inert to sub soil and shall not pollute the environment and non corrosive to earth rod. The material should have a resistivity less than 0.2 Ωm. It should be free from hazardous substances. The mineral compound is required to have minimum 17.5 Kg of the total composite. The compound should be chemically inert and needs to submit Govt approved Indian labs test certificate. Concrete Earth electrode inspection chamber with weight bearing capacity of 30KN. The dimension shall be 320mmx 320mmx 190mm. Govt approved Indian labs test certificate required	3	Each	33,675.00	1,01,025.00
22.00		**MV CABLE LAYING**				-
2.00	7.7	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required				-

23.00	7.1.1	Upto 35 sq. mm	20	Meter	438.00	8,760.00
3.00		Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size on wall surface as required.				
24.00	7.7.1	Upto 35 sq. mm (clamped with 1mm thick saddle)	50	Meter	53.00	2,650.00
4.00		Supplying, fixing, testing and commissioning following four pole and double pole , 415 volts and 240 volts, residual current circuit breaker with overload protection (RCBO) of the following rating and sensitivity current in the existing MCB SPN and TPN horizontal/vertical DB's complete with connections, etc. as required and instructed by engineer in charge/consultant.				-
25.00	MR	40A 100mA FP RCBO	2	Each	5,381.00	10,762.00
5.00	MR	32A 30mA FP RCBO	2	Each	4,961.00	9,922.00
26.00	MR	25A 30mA DP RCBO	1	Each	3,427.00	3,427.00
6.00		**ISOLATOR FOR DB & VDB:**				-
27.00		Supply, fixing, testing and commisioning of following rating and pole Isolator in existing Seven Segment Distribution Board, tier DBs and Vertical distribution board with spredear links, terminal connections and all accesories as required making all necessary connections etc as required and instructed by engineer in charge/consultant.				-
7.00	MR	63A FP Isolator	1	Each	1,339.00	1,339.00
28.00	MR	25A FP Isolator	1	Each	1,275.00	1,275.00
8.00	MR	25A TP Isolator	1	Each	1,116.00	1,116.00
29.00	MR	25A DP Isolator	2	Each	692.00	1,384.00
9.00		**MCB**				-
30.00		Supply, installation, testing and commisioning of following rating TP C curve MCB, 10kA as per IS/IEC 60898-12002 in the existing MCB VDB including all connections and iterconnections as required and as instructed by engineer in charge/consultant.				-
10.00	MR	40A TP MCB	2	Each	1,812.00	3,624.00
31.00	MR	32A TP MCB	8	Each	1,385.00	11,080.00
11.00	MR	25A SP MCB	1	Each	524.00	524.00
32.00	MR	16A SP MCB	2	Each	524.00	1,048.00
12.00		**LT CABLE SUPPLY**				-
33.00		Supply of the following size 1.1kV grade XLPE insulated PVC sheathed, armoured Aluminium / Copper conductor power cable confirming to IS 7098 (part 1) ammended upto date.				-
13.00	MR	3.5cx35sq.mm Al Cable	70	Rmt	325.00	22,750.00
34.00	MR	4cx16sq.mm Al Cable	50	Rmt	215.00	10,750.00
14.00	MR	4cx10sq.mm Al Cable	50	Rmt	182.00	9,100.00
35.00	MR	4cx6sq.mm Al Cable	50	Rmt	155.00	7,750.00
15.00	MR	2C x 4 Sqmm Al Cable	30	Rmt	96.00	2,880.00
36.00	MR	2C x 4 Sqmm Cu Flexible	15	Rmt	310.00	4,650.00
16.00		Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size on wall surface as required.				-
37.00	7.7.1	Upto 35 sq. mm	265	Rmt	53.00	14,045.00
		END TERMINATION				-

38.00		Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 kV grade as required				-
38.10	9.1.21	3.5cx35sq.mm Al Cable	4	Each	407.00	1,628.00
38.20	9.1.33	4cx16sq.mm Al Cable	4	Each	339.00	1,356.00
38.30	9.1.32	4cx10sq.mm Al Cable	4	Each	297.00	1,188.00
38.40	MR	4cx6sq.mm Al Cable	4	Each	232.00	928.00
38.40	MR	2C x 4 Sqmm Al Cable	2	Each	170.00	340.00
38.50	MR	2C x 4 Sqmm Cu Flexible	4	Each	191.00	764.00
		Mainswitch				-
39.00	MR	Supplying and fixing of 63A 4P MCB with suitable sheet steel enclosure	1	Each	2,286.00	2,286.00
39.10	MR	Supplying and fixing of 63A 4P COS with suitable sheet steel enclosure	1	Each	9,647.00	9,647.00
		Meterbox & KWh Meter				-
40.00	MR	Supplying and fixing of meter box suitable for three phase kWh meter, 415 V, on surface/ recess, complete with testing and commissioning etc. as required.	1	Each	2,272.00	2,272.00
41.00	MR	Suplly and fixing of three phase kWh meter,415V on exiting meter boxcomplete with all testing and commsioning etc as required.	1	Each	4,394.00	4,394.00
42.00		**LIGHT & FAN FIXTURES**				-
42.10	MR	Supply of recessed LED Luminaire with a nominal system lumen output of 3300 lumens and a minimum system efficacy of 85 lm/W. The luminaire shall have a rated system lifetime of 50,000 burning hours at L70. The luminaire should have a color temperature of 6500K and CRI > 80. The luminaire shall meet IP65 rating with THD<10% and PF>0.9. The luminaire housing should made of powder coated CRCA sheet steel with toughened glass front cover. The total power consumption should not exceed 36W (including driver). The driver shall comply to IEC 60598, IEC 62384 , IEC 61347-2-13, IEC 61547, EMI- CISPR15 standards.	2	Each	8093.00	16,186.00
42.20	MR	Supply of surface mounted LED Downlighter with a nominal system lumen output of 2000 lumens and a minimum system efficacy of 111 lm/W. Luminaire wattage should not exceed 18W. The luminaire should have a color temperature of 6500K and CRI>80. Diffuser material should be of PolyCarbonate. Driver of the luminaire shall have THD<10% and PF > 0.9. Luminaire height should not be more than 26mm. The driver shall comply to IEC 62384 , IEC 61347-2-13, IEC 61547, EMI- CISPR15 standards-18W	23	Each	3441.00	79,143.00
42.30	MR	Supply of linear & compact surface and wall mounted 28W LED batten with polycarbonate housing & integrated,with size in mm suitable to use as mirror light with all accessories as required.	16	Each	7448.00	1,19,168.00

42.40	MR	Supply of round surface mounted LED designer Downlighter with a nominal system lumen output of 1200 lumens and a minimum system efficiancy >100 lm/W. The luminaire shall have a rated system lifetime of 30,000 burning hours at L70. The luminaire should have a color temperature of 6500K and CRI>80. The luminaire shall meet IP20 rating with THD<10% and PF > 0.9. The luminaire housing should made of plastic with a polycarbonate reflector and a high quality diffuser. The total power consumption should not exceed 12W (including driver).The luminaire and driver must be BIS aprroved.	13	Each	1869.00	24,297.00
42.50	MR	Supply of ceiling fan of 1200mm sweep, including the down rod of standard length (upto 30 cm.) of (havels make, ES 50 Premium White or CG make, Riveria or equivalent).	9	Each	2,258.00	20,322.00
42.60	MR	Supply of 450mm sweep wall fan on surface including mouting and providing all accessories required for complete installation, testing, commisioning etc as required complete (Havells Airboll Hi-Speed or equivalent)	9	Each	1,532.00	13,788.00
		INVERTER				-
43.00	MR	Supply, installation testing and commissioning of 1kVA single phase input single phase output inverter system with 240 min backup, 12V, 2 Numbers 150Ah SMF batteries with powder coated rack including all accessories, cabling etc as required.	1	each	35,000.00	35,000.00
44.00		**TELEPHONE AND DATA SYSTEM**				-
44.10	MR	Supply, Installation, Testing and Commissioning of Mororised Varifocal Bullet Camera with below specifications as minimum and all the necessary accessories - 2.8/3.6mm - 9/12mm Motorised Lens - 4MP Resolution - H.264/H.265 Compression - IR Distance 50 Meter or Higher - 802.3af Poe Support - IP67, IK10 Rating - Marine/ Corrosion Proof Rated - SD Card Support for 64GB Storage - WDR - Minimum 3 Streams or better	5	Each	148120	7,40,600.00
44.20	MR	Supply, Installation, Testing and Commissioning of CAT-6A cable with necessasary end termination for connectivity between data switches and with require all accessories to finish the job.	75	Rmt	95.00	7,125.00
44.30	MR	Supplying & fixing of Patch panel for LAN cabling - 16 Port 10/100 patch panel.	1	Each	7,506.00	7,506.00
44.40	MR	Supplying and fixing of Network switch 16 port 10/100/1000 switch.	1	Each	2,224.00	2,224.00
44.50	MR	Supplying and fiXing of switch mounting rack with power manager and cable manager. 6U with 450mm depth.	1	Each	4,448.00	4,448.00
44.60	MR	Supplying and drawing PVC flexible telephone unarmoured tinned copper cable - 2 Pair	70	Meter	14.00	980.00
44.70	MR	Supply, laying, testing and comissioning of 10 pair with 0.5 mm dia jelly filled telephone armoure cable with all require accessories.	60	Meter	170.00	10,200.00

44.80	MR	Supply, installation, testing and commissioning of 10 pair telephone krone with box and all required accessories and componanats to finish the job.	1	Each	191.00	191.00
44.90	MR	Supply and fixing of CAT-6A patch card 1mtr length with necessary tags as required.	2	Each	167.00	334.00
44.11	MR	Supply and fixing of CAT-6A patch card 3mtr length with necessary tags as required.	2	Each	348.00	696.00
45.00		**SAFETY ACCESSORIES**				-
45.10	MR	Supply and providing First Aid Box.	1	Each	900.00	900.00
45.20	MR	Supply and providing laminated First Aid chart duly framed and placed in a conspicuous location for clear vision.	1	Each	1,000.00	1,000.00
45.30	MR	Supply & fixing Laminated drawings of electrical lay out, schematic drawing etc on good frame work.	1	Each	1,725.00	1,725.00
46.00	MR	**UNFORESEEN**	1	LS	10,00,000.00	10,00,000.00
Electrical Total						**34,81,043.00**

KOVALAM BEACH DEVELOPMENT						
Sl No.	**Code**	**Description of Item**	**Qty**	**Unit**	**Rate**	**Amount (Rs.)**
ELECTRIFICATION						
TOILET BLOCK NEAR ADMIN						
1.00	1.8.3	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit,with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.	54	Point	1,310.00	70,740.00
2.00	1.55.1	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required.	36	Point	628.00	22,608.00
3.00	1.14	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required.				-
3.10	1.14.1	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire	500	Meter	198.00	99,000.00
3.20	1.14.2	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire	100	Meter	226.00	22,600.00
4.00	1.21	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.				
4.10	1.21.1	20 mm	550	Meter	198.00	1,08,900.00
4.20	1.21.2	25 mm	300	Meter	224.00	67,200.00
5.00	1.25	Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required	13	Each	464.00	6,032.00
6.00	1.26	Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required	1	Each	45.00	45.00
7.00		Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on surface/recess for modular switches etc as required as instructed by engineer in charge				
7.10	MR	1 or 2 Module (75 mmX75 mm)	27	Each	216.00	5,832.00
7.20	MR	3 Module (100 mmX75 mm)	6	Each	216.00	1,296.00
7.30	MR	4 Module (125 mmX75 mm)	1	Each	248.00	248.00
7.40	MR	6 Module (200 mmX75 mm)	8	Each	320.00	2,560.00
7.50	MR	8 Module (125 mmX125 mm)	4	Each	355.00	1,420.00
7.60	MR	12 Module (172 mmX224 mm)	1	Each	474.00	474.00

8.00		Supplying and fixing following Modular base & cover plate on existing modular boxes etc. as required.				
8.10	MR	1 or 2 Module	27	Each	301.00	8,127.00
8.20	MR	3 Module	6	Each	312.00	1,872.00
8.30	MR	4 Module	1	Each	326.00	326.00
8.40	MR	6 Module	8	Each	492.00	3,936.00
8.50	MR	8 Module	4	Each	525.00	2,100.00
8.60	MR	12 Module	1	Each	734.00	734.00
9.00	1.24	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
9.10	1.24.1	5/6 A switch	85	Each	115.00	9,775.00
9.20	1.24.4	3 pin 5/6 A socket outlet	2	Each	151.00	302.00
10.00	1.33	Supply and fixing 3 pin, 6A ceiling rose on the existing junction box / wooden block including connection etc as required.	133	Each	88.00	11,704.00
11.00	1.44	Installation, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable etc. as required.	13	Each	232.00	3,016.00
12.00	1.50.1	Installation of exhaust fan upto 450mm in the existing opening, including making good the damage, connection, testing, commissioning etc. as required.	13	Each	492.00	6,396.00
		MCB, SWITCHGEARS & DBs				-
13.00		Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/ Isolator)				-
13.10	MR	6 Way Double Door	1	Each	19,112.00	19,112.00
14.00		Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 A, tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (provision for MCCB as incomer & MCB as outgoings) as required. (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.)				-
14.10	MR	4 Way Double Door	1	Each	15,944.00	15,944.00
15.00	2.10	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, “C” curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				-
15.10	2.10.1	Single pole	25	Each	270.00	6,750.00

16.00	2.11	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required.	5	Each	11.00	55.00
		EARTHING				-
17.00		Supply and laying the following sizes of round conductor on cable tray or wall surface, including necessary clamps (each clamp not exceeding 60 cm llength) and bolts etc as required for complete installation as instructed by engineer in charge/consultant.				-
17.10	MR	Copper wire No.10 SWG	400	Meter	200.00	80,000.00
18.00	7.7	Supplying, fixing, testing and commissioning following four pole and double pole , 415 volts and 240 volts, residual current circuit breaker with overload protection (RCBO) of the following rating and sensitivity current in the existing MCB SPN and TPN horizontal/vertical DB's complete with connections, etc. as required and instructed by engineer in charge/consultant.				-
18.10	7.7.1	32A 30mA FP RCBO	2	Each	4,961.00	9,922.00
19.00		**LT CABLE SUPPLY**				-
		Supply of the following size 1.1kV grade XLPE insulated PVC sheathed, armoured Aluminium conductor power cable confirming to IS 7098 (part 1) ammended upto date.				-
19.10	MR	4x 10 sq mm	80	Rmt	182.00	14,560.00
		Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size on wall surface as required.				-
19.20	7.7.1	Upto 35 sq. mm	60	Rmt	53.00	3,180.00
		Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required				
19.30	7.7.1	Upto 35 sq. mm	20	Rmt	323.00	6,460.00
		END TERMINATION				-
20.00		Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 kV grade as required				-
20.10	9.1.32	4cx10sq.mm Al Cable	4	Each	297.00	1,188.00
21.00		**LIGHT & FAN FIXTURES**				-

21.10	MR	Supply of surface mounted LED Downlighter with a nominal system lumen output of 2000 lumens and a minimum system efficacy of 111 lm/W. Luminaire wattage should not exceed 18W. The luminaire should have a color temperature of 6500K and CRI>80. Diffuser material should be of PolyCarbonate. Driver of the luminaire shall have THD<10% and PF > 0.9. Luminaire height should not be more than 26mm. The driver shall comply to IEC 62384 , IEC 61347-2-13, IEC 61547, EMI- CISPR15 standards-18W	75	Each	3441.00	2,58,075.00
21.20	MR	Supply of round surface mounted LED designer Downlighter with a nominal system lumen output of 1200 lumens and a minimum system efficiancy >100 lm/W. The luminaire shall have a rated system lifetime of 30,000 burning hours at L70. The luminaire should have a color temperature of 6500K and CRI>80. The luminaire shall meet IP20 rating with THD<10% and PF > 0.9. The luminaire housing should made of plastic with a polycarbonate reflector and a high quality diffuser. The total power consumption should not exceed 12W (including driver).The luminaire and driver must be BIS aprroved.	34	Each	1869.00	63,546.00
21.30	MR	Supply ,testing 15 W LED surface/wall mounted luminaiore as walls cone with a color temperature of 4000 k THD<10% ,life of 50000 hours minimum system efficacy of 100 lumen/Watt	11	Each	3920.00	43,120.00
21.40	MR	Supply of ceiling fan of 1200mm sweep, including the down rod of standard length (upto 30 cm.) of (havels make, ES 50 Premium White or CG make, Riveria or equivalent).	13	Each	2,258.00	29,354.00
21.50	MR	Supply of 450mm sweep wall fan on surface including mouting and providing all accessories required for complete installation, testing, commisioning etc as required complete (Havells Airboll Hi-Speed or equivalent)	13	Each	1,532.00	19,916.00
Electrical Total						**10,28,425.00**

KOVALAM BEACH DEVELOPMENT						
Sl No.	**Code**	**Description of Item**	**QTY**	**Unit**	**Rate**	**Amount (Rs.)**
		ELECTRIFICATION				
ANANTHA PARK						
1.00	1.8.3	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit,with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.	38	Point	1,310.00	49,780.00
2.00	1.55.1	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required.	20	Point	628.00	12,560.00
3.00	1.14	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required.				-
3.10	1.14.1	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire	400	Meter	198.00	79,200.00
3.20	1.14.2	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire	200	Meter	226.00	45,200.00
3.30	1.14.3	2 x 4 sq.mm +1 x 4 sq.mm earth wire	150	Meter	271.00	40,650.00
3.40	1.14.4	2 X 6 sq. mm + 1 X 6 sq. mm earth wire	100	Meter	338.00	33,800.00
4.00	1.21	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.				
4.10	1.21.1	20 mm	600	Meter	198.00	1,18,800.00
4.20	1.21.2	25 mm	400	Meter	224.00	89,600.00
4.30	1.21.3	32 mm	250	Meter	275.00	68,750.00
5.00	1.25	Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required	6	Each	464.00	2,784.00
6.00	1.26	Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required	15	Each	45.00	675.00

7.00		Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on surface/recess for modular switches etc as required as instructed by engineer in charge				
7.10	MR	1 or 2 Module (75 mmX75 mm)	10	Each	216.00	2,160.00
7.20	MR	3 Module (100 mmX75 mm)	12	Each	216.00	2,592.00
7.30	MR	4 Module (125 mmX75 mm)	2	Each	248.00	496.00
7.40	MR	6 Module (200 mmX75 mm)	8	Each	320.00	2,560.00
7.50	MR	12 Module (172 mmX224 mm)	3	Each	474.00	1,422.00
8.00		Supplying and fixing following Modular base & cover plate on existing modular boxes etc. as required.				
8.10	MR	1 or 2 Module	10	Each	301.00	3,010.00
8.20	MR	3 Module	12	Each	312.00	3,744.00
8.30	MR	4 Module	2	Each	326.00	652.00
8.40	MR	6 Module	8	Each	492.00	3,936.00
8.50	MR	12 Module	3	Each	734.00	2,202.00
9.00	1.24	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
9.10	1.24.1	5/6 A switch	45	Each	115.00	5,175.00
9.20	1.24.3	15/16 A switch	3	Each	179.00	537.00
9.30	MR	20A switch	2	Each	354.00	708.00
9.40	1.24.4	3 pin 5/6 A socket outlet	18	Each	151.00	2,718.00
9.50	1.24.5	15/16 A socket outlet	2	Each	237.00	474.00
9.60	MR	20A socket outlet	2	Each	460.00	920.00
10.00	1.33	Supply and fixing 3 pin, 6A ceiling rose on the existing junction box / wooden block including connection etc as required.	77	Each	88.00	6,776.00
11.00	1.44	Installation, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable etc. as required.	6	Each	232.00	1,392.00
12.00	1.50.1	Installation of exhaust fan upto 450mm in the existing opening, including making good the damage, connection, testing, commissioning etc. as required.	5	Each	492.00	2,460.00
		MCB, SWITCHGEARS & DBs				-
13.00		Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/ Isolator)				-
13.10	MR	6 Way Double Door	4	Each	19,112.00	76,448.00

14.00	2.10	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				-
14.10	2.10.1	Single pole	60	Each	270.00	16,200.00
15.00	2.11	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required.	12	Each	11.00	132.00
16.00		Supplying, fixing, testing and commissioning following four pole and double pole , 415 volts and 240 volts, residual current circuit breaker with overload protection (RCBO) of the following rating and sensitivity current in the existing MCB SPN and TPN horizontal/vertical DB's complete with connections, etc. as required and instructed by engineer in charge/consultant.				-
16.10	MR	40A 100mA FP RCBO	2	Each	5,381.00	10,762.00
16.20	MR	32A 30mA FP RCBO	2	Each	4,961.00	9,922.00
		LT CABLE SUPPLY				-
17.00		Supply of the following size 1.1kV grade XLPE insulated PVC sheathed, armoured Aluminium conductor power cable confirming to IS 7098 (part 1) ammended upto date.				-
17.10	MR	3.5cx70sq.mm Al Cable	50	Rmt	580.00	29,000.00
17.20	MR	3.5cx35sq.mm Al Cable	30	Rmt	325.00	9,750.00
17.30	MR	4cx16sq.mm Al Cable	30	Rmt	215.00	6,450.00
17.40	MR	4cx10sq.mm Al Cable	25	Rmt	182.00	4,550.00
18.00		Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size				-
18.10	7.7.1	Upto 35 sq. mm	85	Rmt	53.00	4,505.00
18.20	7.7.2	Above 35 sq. mm and upto 95 sq. mm	50	Rmt	141.00	7,050.00
		END TERMINATION				-
19.00		Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable				-
19.10	9.1.21	3.5cx70sq.mm Al Cable	2	Each	499.00	998.00
19.20	9.1.21	3.5cx35sq.mm Al Cable	6	Each	407.00	2,442.00
19.30	9.1.33	4cx16sq.mm Al Cable	12	Each	339.00	4,068.00
19.40	9.1.32	4cx10sq.mm Al Cable	4	Each	297.00	1,188.00
20.00		**Mainswitch**				-
20.10	MR	Supplying and fixing of 63A 4P MCB with suitable sheet steel enclosure	1	Each	2,286.00	2,286.00
20.20	MR	Supplying and fixing of 63A 4P COS with suitable sheet steel enclosure	1	Each	9,647.00	9,647.00
21.00		**Meterbox & KWh Meter**				-
21.10	MR	Supplying and fixing meter box suitable for three phase kWh meter, 415 V, on surface/ recess, complete with testing and commissioning etc. as required.	1	Each	2,272.00	2,272.00

21.20	MR	Suplly and fixing of three phase kWh meter,415V on exiting meter boxcomplete with all testing and commsioning etc as required.	1	Each	4,394.00	4,394.00
22.00		**LIGHT & FAN FIXTURES**				-
22.10	MR	Supply of surface mounted LED Downlighter with a nominal system lumen output of 2000 lumens and a minimum system efficacy of 111 lm/W. Luminaire wattage should not exceed 18W. The luminaire should have a color temperature of 6500K and CRI>80. Diffuser material should be of PolyCarbonate. Driver of the luminaire shall have THD<10% and PF > 0.9. Luminaire height should not be more than 26mm. The driver shall comply to IEC 62384 , IEC 61347-2-13, IEC 61547, EMI-CISPR15 standards-18W	25	Each	3441.00	86,025.00
22.20	MR	Supply of linear & compact surface and wall mounted 28W LED batten with polycarbonate housing & integrated,with size in mm suitable to use as mirror light with all accessories as required.	10	Each	7448.00	74,480.00
22.30	MR	Supply of ceiling fan of 1200mm sweep, including the down rod of standard length (upto 30 cm.) of (havels make, ES 50 Premium White or CG make, Riveria or equivalent).	6	Each	2,258.00	13,548.00
22.40	MR	Supply of 450mm sweep wall fan on surface including mouting and providing all accessories required for complete installation, testing, commisioning etc as required complete (Havells Airboll Hi-Speed or equivalent)	5	Each	1,532.00	7,660.00

22.50	MR	SITC of maintenance free Earthing system comprises of molecularly bonded copper of 99.9% purity on low carbon steel of min 3048mm length (10 feet), having a diameter of 20mm with copper bonding thickness of 250 microns as per UL 467. The Rod has to be either continuous or with self-coupling peg & bore arrangement with fault current withstand capability of 30 KA rms value for 1 second and I peak of 76 KA. The rod must be having corrosion test, peel off test for uniform coating, 180 degree bend test with out peeloff of copper bonding. Exothermic welded Clamp for clamping as suggested as per NBC 2016. Ordinary Stainless steel/Copper alloy universal clamps are not recommended. For self coupling peg & bore arrangement rod needs Impact point on the bottom rod for easy insertion. Earth enhancing mineral compound is used for improving the soil conductivity. The material shall be mineral inert to sub soil and shall not pollute the environment and non corrosive to earth rod. The material should have a resistivity less than 0.2 Ωm. It should be free from hazardous substances. The mineral compound is required to have minimum 17.5	2	Each	33,675.00	67,350.00
		INVERTER				-
23.00	MR	Supply, installation testing and commissioning of 1kVA single phase input single phase output inverter system with 240 min backup, 12V, 2 Numbers 150Ah SMF batteries with powder coated rack including all accessories, cabling etc as required.	1	each	35,000.00	35,000.00

24.00	MR	**LT Panel** : Supply of Non-Metallic Power distribution board with made of thermoplastic Polycarbonate (PC) material and should have Degree of Ingress Protection IP 65 in accordance with IEC 60529. The Panel shall be suitable to perform under ambient temperature of -35 degC up to +80 degC. The Panel shall be halogen & silicon free and shall be fire retardant & self-extinguishing the combustion behaviour shall be in accordance with VDE 0471 / UL 94 for 960 degC. The Panel shall be UV resistance according to UL 746.The manufacturer should submit all the test certificates in accordance with IEC 61439, Routine test report must be made with – High voltage test, Insulation resistance test, Functional Test. Glow Wire Test certificate shall be submitted. The Wall/Floor mounting materials should be made of Hot Dip Galvanized materials and thickness shall be not less than 2mm. **Incomer** - 100A FP MCCB 16kA - 1 No,Indication lamps - 1 Set,SPD-1No. **Outgoing** - 63A FP MCB 10kA -3 Nos,40A FP MCB 10kA - 4 Nos	1	each	1,90,000.00	1,90,000.00
Electrical Total						**12,61,860.00**

KOVALAM BEACH DEVELOPMENT						
Sl No.	**Code**	**Description of Item**	**Qty**	**Unit**	**Rate**	**Amount (Rs.)**
ELECTRIFICATION						
TOILET BLOCK						
1.00	1.8.3	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit,with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.	40	Point	1,310.00	52,400.00
2.00	1.55.1	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required.	3	Point	628.00	1,884.00
3.00	1.14	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required.				-
3.10	1.14.1	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire	300	Meter	198.00	59,400.00
4.00	1.21	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.				
4.10	1.21.1	20 mm	250	Meter	198.00	49,500.00
5.00	1.25	Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required	1	Each	45.00	45.00
6.00	1.26	Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on surface/recess for modular switches etc as required as instructed by engineer in charge				
6.10	MR	1 or 2 Module (75 mmX75 mm)	7	Each	216.00	1,512.00
6.20	MR	3 Module (100 mmX75 mm)	3	Each	216.00	648.00
6.30	MR	4 Module (125 mmX75 mm)	1	Each	248.00	248.00
6.40	MR	6 Module (200 mmX75 mm)	2	Each	320.00	640.00

7.00		Supplying and fixing following Modular base & cover plate on existing modular boxes etc. as required.				
7.10	MR	1 or 2 Module	7	Each	301.00	2,107.00
7.20	MR	3 Module	3	Each	312.00	936.00
7.30	MR	4 Module	1	Each	326.00	326.00
7.40	MR	6 Module	2	Each	492.00	984.00
8.00	1.24	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
8.10	1.24.1	5/6 A switch	30	Each	115.00	3,450.00
9.00	1.33	Supply and fixing 3 pin, 6A ceiling rose on the existing junction box / wooden block including connection etc as required.	36	Each	88.00	3,168.00
9.10	1.50.1	Installation of exhaust fan upto 450mm in the existing opening, including making good the damage, connection, testing, commissioning etc. as required.	12	Each	492.00	5,904.00
		MCB, SWITCHGEARS & DBs				-
10.00		Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/ Isolator)				-
10.10	2.5.1	4 Way Double Door	1	Each	15,944.00	15,944.00
11.00		Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, “C” curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				-
11.10	2.10.1	Single pole	10	Each	270.00	2,700.00
12.00	2.11	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required.	2	Each	11.00	22.00
		EARTHING				-
13.00		Supply and laying the following sizes of round conductor on cable tray or wall surface, including necessary clamps (each clamp not exceeding 60 cm llength) and bolts etc as required for complete installation as instructed by engineer in charge/consultant.				-
13.10	MR	Copper wire No.10 SWG	300	Meter	141.00	42,300.00

14.00		Supplying, fixing, testing and commissioning following four pole and double pole , 415 volts and 240 volts, residual current circuit breaker with overload protection (RCBO) of the following rating and sensitivity current in the existing MCB SPN and TPN horizontal/vertical DB's complete with connections, etc. as required and instructed by engineer in charge/consultant.				-
14.10		32A 30mA FP RCBO	1	Each	4,961.00	4,961.00
		MV CABLE LAYING				-
15.00		Supply of the following size 1.1kV grade XLPE insulated PVC sheathed, armoured Aluminium conductor power cable confirming to IS 7098 (part 1) ammended upto date.				
15.10	MR	4x 16 sq mm	100	Meter	215	21,500.00
16.00	7.7	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size in the existing RCC/ HUME/ METAL/HDPE pipe as required.				-
16.10	7.1.1	Upto 35 sq. mm	80	Meter	42.03	3,362.40
17.00		Laying and fixing of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size on wall surface as required.				
17.10	7.7.1	Upto 35 sq. mm (clamped with 1mm thick saddle)	20	Meter	53.00	1,060.00
		Mainswitch				-
18.00	MR	32A 4P MCB	1	Each	2,082.00	2,082.00
		Meterbox & KWh Meter				-
19.00	MR	Supplying and fixing meter box suitable for three phase kWh meter, 415 V, on surface/ recess, complete with testing and commissioning etc. as required.	1	Each	2,272.00	2,272.00
20.00	MR	Suplly and fixing of three phase kWh meter,415V on exiting meter boxcomplete with all testing and commsioning etc as required.	1	Each	4,394.00	4,394.00
21.00		**LIGHT & FAN FIXTURES**				-

21.10	MR	Supply of surface mounted LED Downlighter with a nominal system lumen output of 2000 lumens and a minimum system efficacy of 111 lm/W. Luminaire wattage should not exceed 18W. The luminaire should have a color temperature of 6500K and CRI>80. Diffuser material should be of PolyCarbonate. Driver of the luminaire shall have THD<10% and PF > 0.9. Luminaire height should not be more than 26mm. The driver shall comply to IEC 62384 , IEC 61347-2-13, IEC 61547, EMI- CISPR15 standards-18W	9	Each	3441.00	30,969.00
21.20	MR	Supply of linear & compact surface and wall mounted 28W LED batten with polycarbonate housing & integrated,with size in mm suitable to use as mirror light with all accessories as required.	4	Each	7448.00	29,792.00
21.30	MR	Supply of round surface mounted LED designer Downlighter with a nominal system lumen output of 1200 lumens and a minimum system efficiancy >100 lm/W. The luminaire shall have a rated system lifetime of 30,000 burning hours at L70. The luminaire should have a color temperature of 6500K and CRI>80. The luminaire shall meet IP20 rating with THD<10% and PF > 0.9. The luminaire housing should made of plastic with a polycarbonate reflector and a high quality diffuser. The total power consumption should not exceed 12W (including driver).The luminaire and driver must be BIS aprroved.	20	Each	1869.00	37,380.00
21.40	MR	Supply ,testing 15 W LED surface/wall mounted luminaiore as walls cone with a color temperature of 4000 k THD<10% ,life of 50000 hours minimum system efficacy of 100 lumen/Watt	3	Each	3920.00	11,760.00
21.50	MR	Supply of 450mm sweep wall fan on surface including mouting and providing all accessories required for complete installation, testing, commisioning etc as required complete (Havells Airboll Hi-Speed or equivalent)	12	Each	1,532.00	18,384.00
Electrical Total						**4,12,034.00**

KOVALAM BEACH DEVELOPMENT - ESTIMATE						
Sl. No	**DSR. No**	**Description**	**Unit**	**Qty**	**Rate in Rs**	**Amount in Rs**
1		Supply, Installation, Testing and Commissioning of Mororised Varifocal Bullet Camera with below specifications as minimum and all the necessary accessories - 2.8/3.6mm - 9/12mm Motorised Lens - 4MP Resolution - H.264/H.265 Compression - IR Distance 50 Meter or Higher - 802.3af Poe Support - IP67, IK10 Rating - Marine/ Corrosion Proof Rated - SD Card Support for 64GB Storage - WDR - Minimum 3 Streams or better	Each	26	174781.6	45,44,321.60
2		Supply, Installation, Testing and Commissioning of PTZ Camera with below specifications as minimum and all the necessary accessories - 45X Optical Zoome - 4MP Resolution - H.264/H.265 Compression - IR Distance 200 Meter or Higher - 802.3af/at PoE Support - IP67, IK10 Rating - Marine/ Corrosion Proof Rated - SD Card Support for 64GB Storage - WDR - Minimum 3 Streams or better	Each	3	353528	1060584
3		Supply, Installation, Testing and Commissioning of IP Joystick with below specifications as minimum and all the necessary accessories - TCP/ IP Support	Each	1	114035.2	114035.2
4		Supply, Installation, Testing and Commissioning of LED Displays 43" for CCTV Monitoring with all the necessary wall mounting accessorie	Each	1	46388.16	46388.16
5		Supply Installation, Testing & Commissioning of of Horn Speakers with below specifications as minimum and all the necessary accessories - Horn/ Column - Rated / Maximum Power - 50 Watts - Outdoor Rated/ Corrossion Proof/ Rated	Each	26	36,238.98	942213.48
6		Supply, Installation, Testing & Commissioning of of IP Power Amplifier with below specifications as minimum and all the necessary accessories - Output Power (RMS)- 350 Watts - Line Inputs - Minimum 2 - Outputs - 70 V / 100 V and 8/4 ohm - 10/100 Mbps Network Interface	Each	5	86,481.02	432405.1

7		Supply, Installation, Testing & Commissioning of Paging/ Management Software with below specifications as minimum and all the necessary accessories. - TCP/ IP Support - SIP Support - Multizone Support	Each	1	67,005.12	67005.12
8		Supply, Installation, Testing & Commissioning of IP Call/ Paging station with below specifications as minimum and all the necessary accessories - Multi Zone Support - Touch Screen - TCP/IP Support	Each	1	1,01,895.36	101895.36
9		Supply, Installation, Testing & Commissioning of Network Audio Server with below specifications as minimum and all the necessary accessories - Multi Zone Support - TCP/IP Support - Rack Mount	Each	1	2,81,992.86	281992.86
10		Supply, Installation, Testing & Commissioning of Audio Player with below specifications as minimum and all the necessary accessories - DVD/ CD/ USB	Each	1	58,084.32	58084.32
11		Supply, Laying, Testing & Commissioning of Speaker Cable with below specifications as minimum and all the necessary accessories - 2C x 1.5 Sqmm - Armored - Underground	Meter	1560	218.30	340548
12		Supply, Installation,Testing & commissioning of 6 Core Fibre Cable Single Mode	Meter	4200	202.96	852432
13		Supply, Installation,Testing & commissioning of Fibre optic patch cords - 1 Meter	Each	34	2,082.70	70811.8
14		Supply, Installation,Testing & commissioning of 24 Port LIU, 19" rackmount, with adaptors, Swing-out splicetray in 1U Size. Should have front access for easy splice & patch management. Fuly loaded with SC SM Pigtails & adapters for all the cores.	Each	1	37,863.84	37863.84
15		Supply, Installation, Testing & Commissioning of CAT6 Patch Cord with Moulded boots Over-moulded boot at each end provide strain relief and maintains minimum bend radius of the cable.- 1 Meter.	Each	5	384.68	1923.4

16		Supply, Installation, Testing & Commissioning of 32U Network Rack with below specifications as minimum and all the necessary accessories - Height - 27U - Dimensions - 600 x 600 - Fan Units with 4 Fans - PDU 6 point - 1 Nos's - Mounting Hardware Kit (1 lot) - Tray - Front glass doors and back steel door and side panels.	Each	1	83,260.80	83260.8
17		Supply, Installation, Testing & Commissioning of 24 Port Core switch with 1G Uplink	Each	1	3,23,792.00	323792
18		Supply, Installation, Testing & Commissioning of Corrosion proof CAT6 Patch Cord 1 Meter	Each	29	384.68	11155.72
19		Supply, Installation, Testing & Commissioning of Media Coverter with Single Ethernet Output	Each	3	20,220.48	60661.44
20		Supply, Installation, Testing & Commissioning of Media Coverter with dual Ethernet Output	Each	13	11,299.68	1,46,895.84
21		Supply, Installation, Testing & Commissioning of Outdoor 6 Port Fiber Termination Box	Each	13	8,722.56	1,13,393.28
22		Supply, Installation, Testing & Commissioning of Outdoor Corrosion Proof Box + Power Socket 6/16A with accessories	Each	13	9,218.16	1,19,836.08
23		Supply, Installation, Testing & Commissioning of UPS with accessories - 2KVA - 30 Mins Backup - Accessories to Mount Battery	Each	1	62,115.20	62,115.20
GRAND TOTAL						**98,73,615.00**

KERALA STATE ELECTRICITY BOARD Ltd						
WORK ESTIMATE						
Name of Work: Supplying, installing piller box and laying LT UG cable and giving service connection						
			Ele.Sub Division: Vizhinjam			
SL No:	**KEY**	**PARTICULARS**	**UNIT**	**RATE**	**QTY**	**AMT**
1	1049	Supplying Aluminium aurmoured 3.5x150 sq mm UG Cable	M	535	2273	1216055
2	1051	Supplying Aluminium aurmoured 3.5x95 sq mm UG Cable	M	360	446	160560
3	1052	Supplying Aluminium aurmoured 3.5 x 50 sq mm UG Cable	M	216	182	39312
4	1053	Supplying Aluminium aurmoured 3.5x25 sq mm UG Cable	M	147	455	66885
5	1054	Supplying Aluminium aurmoured 3.5x6 sq mm UG Cable	M	76.57	4960	379787.2
6	1044	Supplying DB switch for service connection 2 way	E	254	120	30480
7	1045	Supplying DB switch for service connection 4 way	E	678	40	27120
8	1056	Supplying provision of Earthing material	E	2756	23	63388
9	1057	Supplying Earthwire	Kg	63	130	8190
10	1001	Loading & Unloading Materials (new)	E	100000	1	100000
11	1002	Transporting Materials (new)	E	150000	1	150000
12	1012	Laying LT Cable 3.5x150sq mm	M	321.56	1222	392946.32
13	1014	Laying LT Cable 3.5x95sq mm	M	308.59	446	137631.14
14	1015	Laying LT Cable 3.5x50sq mm	M	308.59	182	56163.38
15	1016	Laying LT Cable 3.5x25sq mm	M	297.05	455	135157.75
16	1017	Laying LT Cable 3.5x6sq mm	M	297.05	4960	1473368
17		Dismantling of pole/ street light standard/ strut embedded in cement concrete foundation etc. as required.	E	70	3011	210770
18	1033	Unforseen Items	1	75000	1	75000
			TOTAL			47,22,814.00

28W LED Post Top Light Fixture					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	30,000.00	33,600.00	Quotation from Neri+12% GST
Total Cost of material				33,600.00	
Cartage at 1% of cost of materials	1%			336.00	
Sub total				33,936.00	
Labour					
Electrician	0.2	Day	912.52	182.50	DSR 2018+CI (1.3559)
Technician	0.2	Day	912.52	182.50	DSR 2018+CI (1.3559)
Labour total				365.01	
Total Cost				34,301.01	
Overhead profit	15%			5,145.15	
Total				39,446.16	
Say				**39,446.00**	

Decoroative Pole.					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	29,500.00	34,810.00	Quotation from Neri+18% GST
Total Cost of material				34,810.00	
Cartage at 1% of cost of materials	1%			348.10	
Sub total				35,158.10	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				35,415.31	
Overhead profit	15%			5,312.30	
Total				40,727.61	
Say				**40,728.00**	

1M Bollard.					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	16,900.00	18,928.00	Quotation from Neri+12% GST
Total Cost of material				18,928.00	
Cartage at 1% of cost of materials	1%			189.28	
Sub total				19,117.28	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				19,374.49	
Overhead profit	15%			2,906.17	
Total				22,280.67	
Say				**22,281.00**	

Bullet Bollard.					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	16,900.00	18,928.00	Quotation from Kesselec+12% GST

Total Cost of material				18,928.00	
Cartage at 1% of cost of materials	1%			189.28	
Sub total				19,117.28	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				19,374.49	
Overhead profit	15%			2,906.17	
Total				22,280.67	
Say				**22,281.00**	

Spot Light					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	2,250.00	2,520.00	Quotation from Kesselec+12% GST
Total Cost of material				2,520.00	
Cartage at 1% of cost of materials	1%			25.20	
Sub total				2,545.20	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				2,802.41	
Overhead profit	15%			420.36	
Total				3,222.78	
Say				**3,223.00**	

Proojector Light (Warm White)					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	21,600.00	24,192.00	Quotation from Neri+12% GST
Total Cost of material				24,192.00	
Cartage at 1% of cost of materials	1%			241.92	
Sub total				24,433.92	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				24,691.13	
Overhead profit	15%			3,703.67	
Total				28,394.80	
Say				**28,395.00**	

Focus light					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	7,650.00	8,568.00	Quotation from Neri+12% GST
Total Cost of material				8,568.00	
Cartage at 1% of cost of materials	1%			85.68	
Sub total				8,653.68	

Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				8,910.89	
Overhead profit	15%			1,336.63	
Total				10,247.53	
Say				**10,248.00**	

Wall Wahser-18W					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	16,799.00	18,814.88	Quotation from Jagguar+12% GST
Total Cost of material				18,814.88	
Cartage at 1% of cost of materials	1%			188.15	
Sub total				19,003.03	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				19,260.24	
Overhead profit	15%			2,889.04	
Total				22,149.28	
Say				**22,149.00**	

Wall Wahser-36W					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	31,565.00	35,352.80	Quotation from Jagguar+12% GST
Total Cost of material				35,352.80	
Cartage at 1% of cost of materials	1%			353.53	
Sub total				35,706.33	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				35,963.54	
Overhead profit	15%			5,394.53	
Total				41,358.07	
Say				**41,358.00**	

LED linear flexible light					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	3,852.00	4,314.24	Quotation from Jaguar+12% GST
Total Cost of material				4,314.24	
Cartage at 1% of cost of materials	1%			43.14	
Sub total				4,357.38	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)

Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				4,614.60	
Overhead profit	15%			692.19	
Total				5,306.79	
Say				**5,307.00**	

LED linear flexible light- RGBW					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	9,000.00	10,080.00	Quotation from Jaguar+12% GST
Total Cost of material				10,080.00	
Cartage at 1% of cost of materials	1%			100.80	
Sub total				10,180.80	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				10,438.01	
Overhead profit	15%			1,565.70	
Total				12,003.72	
Say				**12,004.00**	

RGB flood light -36W					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	27,392.00	30,679.04	Quotation from Jaguar+12% GST
Total Cost of material				30,679.04	
Cartage at 1% of cost of materials	1%			306.79	
Sub total				30,985.83	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				31,243.04	
Overhead profit	15%			4,686.46	
Total				35,929.50	
Say				**35,930.00**	

RGB flood light -72W					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	82,700.00	92,624.00	Quotation from Jaguar+12% GST
Total Cost of material				92,624.00	
Cartage at 1% of cost of materials	1%			926.24	
Sub total				93,550.24	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	

Total Cost				93,807.45	
Overhead profit	15%			14,071.12	
Total				1,07,878.57	
Say				**1,07,879.00**	

GOBO projector light -300W to 350W					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	7,90,195.00	8,85,018.40	Quotation from Neri+12% GST
Total Cost of material				8,85,018.40	
Cartage at 1% of cost of materials	1%			8,850.18	
Sub total				8,93,868.58	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				8,94,125.80	
Overhead profit	15%			1,34,118.87	
Total				10,28,244.67	
Say				**10,28,245.00**	

GOBO projector light pole					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	27,700.00	32,686.00	Quotation from NERI+18% GST
Total Cost of material				32,686.00	
Cartage at 1% of cost of materials	1%			326.86	
Sub total				33,012.86	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				33,270.07	
Overhead profit	15%			4,990.51	
Total				38,260.59	
Say				**38,261.00**	

Artificial Cherry tree					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,87,250.00	2,09,720.00	Quotation from jaguar+12% GST
Total Cost of material				2,09,720.00	
Cartage at 1% of cost of materials	1%			2,097.20	
Sub total				2,11,817.20	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.81	165.96	DSR 2018+CI (1.3559)
Labour total				257.21	
Total Cost				2,12,074.41	
Overhead profit	15%			31,811.16	
Total				2,43,885.58	
Say				**2,43,886.00**	

Selfie point special lighting					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	5,35,000.00	5,99,200.00	Quotation from jaguar+12% GST
Total Cost of material				5,99,200.00	
Cartage at 1% of cost of materials	1%			5,992.00	
Sub total				6,05,192.00	
Labour					
Wireman	0.1	Day	912.52	91.25	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.63	165.93	DSR 2018+CI (1.3559)
Labour total				257.18	
Total Cost				6,05,449.18	
Overhead profit	15%			90,817.38	
Total				6,96,266.55	
Say				**6,96,267.00**	

DMX main controller					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,87,250.00	2,20,955.00	Quotation from Jaguar+18% GST
Total Cost of material				2,20,955.00	
Cartage at 1% of cost of materials	1%			2,209.55	
Sub total				2,23,164.55	
Labour					
Labour total	5%			11,158.23	
Total Cost				2,34,322.78	
Overhead profit	15%			35,148.42	
Total				2,69,471.19	
Say				**2,69,471.00**	

DMX Sub controller					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,60,500.00	1,89,390.00	Quotation from Jaguar+18% GST
Total Cost of material				1,89,390.00	
Cartage at 1% of cost of materials	1%			1,893.90	
Sub total				1,91,283.90	
Labour					
Labour total	5%			9,564.20	
Total Cost				2,00,848.10	
Overhead profit	15%			30,127.21	
Total				2,30,975.31	
Say				**2,30,975.00**	

Power supply for DMX control					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	3,745.00	4,419.10	Quotation from Jaguar+18% GST
Total Cost of material				4,419.10	
Cartage at 1% of cost of materials	1%			44.19	

Sub total				4,463.29	
Labour					
Labour total	5%			223.16	
Total Cost				4,686.46	
Overhead profit	15%			702.97	
Total				5,389.42	
Say				**5,389.00**	

Flood light for Higmast light					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	33,300.00	37,296.00	Quotation from Kesselec+12% GST
Total Cost of material				37,296.00	
Cartage at 1% of cost of materials	1%			372.96	
Sub total				37,668.96	
Labour					
Wireman	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Fitter grdae 2	0.7	Day	829.63	580.74	DSR 2018+CI (1.3559)
Labour total				1,493.06	
Total Cost				39,162.02	
Overhead profit	15%			5,874.30	
Total				45,036.32	
Say				**45,036.00**	

Highmast 20M Pole					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	3,60,000.00	4,24,800.00	Quotation from Kesselec+18% GST
Total Cost of material				4,24,800.00	
Cartage at 1% of cost of materials	1%			4,248.00	
Sub total				4,29,048.00	
Labour					
Wireman	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Fitter grdae 2	1.5	Day	829.63	1,244.44	DSR 2018+CI (1.3559)
Labour total				2,156.76	
Total Cost				4,31,204.76	
Overhead profit	15%			64,680.71	
Total				4,95,885.47	
Say				**4,95,885.00**	

Hanging light					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	18,450.00	20,664.00	Quotation from Kesselec+12% GST
Total Cost of material				20,664.00	
Cartage at 1% of cost of materials	1%			206.64	
Sub total				20,870.64	
Labour					
Wireman	0.1	Day	912.32	91.23	DSR 2018+CI (1.3559)
Fitter grdae 2	0.2	Day	829.63	165.93	DSR 2018+CI (1.3559)

Labour total				257.16	
Total Cost				21,127.80	
Overhead profit	15%			3,169.17	
Total				24,296.97	
Say				**24,297.00**	

Main Feeder pillar panel					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	9,70,000.00	11,44,600.00	Quotation from CAPE+18% GST
Total Cost of material				11,44,600.00	
Cartage at 1% of cost of materials	1%			11,446.00	
Sub total				11,56,046.00	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				11,57,870.66	
Overhead profit	15%			1,73,680.60	
Total				13,31,551.26	
Say				**13,31,551.00**	

Feeder pillar panel 1&2					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,90,000.00	2,24,200.00	Quotation from CAPE+18% GST
Total Cost of material				2,24,200.00	
Cartage at 1% of cost of materials	1%			2,242.00	
Sub total				2,26,442.00	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,28,266.66	
Overhead profit	15%			34,240.00	
Total				2,62,506.66	
Say				**2,62,507.00**	

Feeder pillar panel 3&8					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,71,000.00	2,01,780.00	Quotation from CAPE+18% GST
Total Cost of material				2,01,780.00	
Cartage at 1% of cost of materials	1%			2,017.80	
Sub total				2,03,797.80	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,05,622.46	
Overhead profit	15%			30,843.37	
Total				2,36,465.83	

Say				**2,36,466.00**	

Feeder pillar panel 5					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,70,750.00	2,01,485.00	Quotation from CAPE+18% GST
Total Cost of material				2,01,485.00	
Cartage at 1% of cost of materials	1%			2,014.85	
Sub total				2,03,499.85	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,05,324.51	
Overhead profit	15%			30,798.68	
Total				2,36,123.18	
Say				**2,36,123.00**	

Feeder pillar panel 6					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	2,30,650.00	2,72,167.00	Quotation from CAPE+18% GST
Total Cost of material				2,72,167.00	
Cartage at 1% of cost of materials	1%			2,721.67	
Sub total				2,74,888.67	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,76,713.33	
Overhead profit	15%			41,507.00	
Total				3,18,220.33	
Say				**3,18,220.00**	

Feeder pillar panel 7					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,85,000.00	2,18,300.00	Quotation from CAPE+18% GST
Total Cost of material				2,18,300.00	
Cartage at 1% of cost of materials	1%			2,183.00	
Sub total				2,20,483.00	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,22,307.66	
Overhead profit	15%			33,346.15	
Total				2,55,653.81	
Say				**2,55,654.00**	

Feeder pillar panel 8					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**

Unit rate	1	set	1,68,750.00	1,99,125.00	Quotation from CAPE+18% GST
Total Cost of material				1,99,125.00	
Cartage at 1% of cost of materials	1%			1,991.25	
Sub total				2,01,116.25	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,02,940.91	
Overhead profit	15%			30,441.14	
Total				2,33,382.04	
Say				**2,33,382.00**	

Feeder pillar panel 4 & 9					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,68,750.00	1,99,125.00	Quotation from CAPE+18% GST
Total Cost of material				1,99,125.00	
Cartage at 1% of cost of materials	1%			1,991.25	
Sub total				2,01,116.25	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,02,940.91	
Overhead profit	15%			30,441.14	
Total				2,33,382.04	
Say				**2,33,382.00**	

Feeder pillar panel 10					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,78,000.00	2,10,040.00	Quotation from CAPE+18% GST
Total Cost of material				2,10,040.00	
Cartage at 1% of cost of materials	1%			2,100.40	
Sub total				2,12,140.40	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,13,965.06	
Overhead profit	15%			32,094.76	
Total				2,46,059.82	
Say				**2,46,060.00**	

Feeder pillar panel 11 & 12					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,71,000.00	2,01,780.00	Quotation from CAPE+18% GST
Total Cost of material				2,01,780.00	

Cartage at 1% of cost of materials	1%			2,017.80	
Sub total				2,03,797.80	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,05,622.46	
Overhead profit	15%			30,843.37	
Total				2,36,465.83	
Say				**2,36,466.00**	

Feeder pillar panel 13 & 17					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,40,000.00	1,65,200.00	Quotation from CAPE+18% GST
Total Cost of material				1,65,200.00	
Cartage at 1% of cost of materials	1%			1,652.00	
Sub total				1,66,852.00	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				1,68,676.66	
Overhead profit	15%			25,301.50	
Total				1,93,978.16	
Say				**1,93,978.00**	

Feeder pillar panel 14					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,70,650.00	2,01,367.00	Quotation from CAPE+18% GST
Total Cost of material				2,01,367.00	
Cartage at 1% of cost of materials	1%			2,013.67	
Sub total				2,03,380.67	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,05,205.33	
Overhead profit	15%			30,780.80	
Total				2,35,986.13	
Say				**2,35,986.00**	

Feeder pillar panel 15					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,68,750.00	1,99,125.00	Quotation from CAPE+18% GST
Total Cost of material				1,99,125.00	
Cartage at 1% of cost of materials	1%			1,991.25	
Sub total				2,01,116.25	
Labour					

Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				2,02,940.91	
Overhead profit	15%			30,441.14	
Total				2,33,382.04	
Say				**2,33,382.00**	

Feeder pillar panel 15					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,50,000.00	1,77,000.00	Quotation from CAPE+18% GST
Total Cost of material				1,77,000.00	
Cartage at 1% of cost of materials	1%			1,770.00	
Sub total				1,78,770.00	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				1,80,594.66	
Overhead profit	15%			27,089.20	
Total				2,07,683.86	
Say				**2,07,684.00**	

Outdoor Lighting Panel 1 & 2					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	46,000.00	54,280.00	Quotation from CAPE+18% GST
Total Cost of material				54,280.00	
Cartage at 1% of cost of materials	1%			542.80	
Sub total				54,822.80	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)
Labour total				1,824.66	
Total Cost				56,647.46	
Overhead profit	15%			8,497.12	
Total				65,144.58	
Say				**65,145.00**	

External Lighting Control Panel					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	36,000.00	42,480.00	Quotation from CAPE+18% GST
Total Cost of material				42,480.00	
Cartage at 1% of cost of materials	1%			424.80	
Sub total				42,904.80	
Labour					
Wireman	1	Day	912.34	912.34	DSR 2018+CI (1.3559)
Electricaian	1	Day	912.32	912.32	DSR 2018+CI (1.3559)

Labour total				1,824.66	
Total Cost				44,729.46	
Overhead profit	15%			6,709.42	
Total				51,438.88	
Say				**51,439.00**	

4 C x 16 sq.mm					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	
Unit rate	1	M	169.95	200.54	Quotation from polycab+18% GST
Total Cost of material				200.54	
Cartage at 1% of cost of materials	1%			1.70	
Sub total				202.24	
Overhead profit @ 20 %				40.45	
Total				242.69	
Say				**243.00**	

4 C x 10 sq.mm					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	
Unit rate	1	M	157.00	185.26	Quotation from polycab+18% GST
Total Cost of material				185.26	
Cartage at 1% of cost of materials	1%			1.57	
Sub total				186.83	
Overhead profit @ 20 %				37.37	
Total				224.20	
Say				**224.00**	

4 C x 6 sq.mm					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	
Unit rate	1	M	133.80	157.88	Quotation from polycab+18% GST
Total Cost of material				157.88	
Cartage at 1% of cost of materials	1%			1.34	
Sub total				159.22	
Overhead profit @ 20 %				31.84	
Total				191.07	
Say				**191.00**	

3.5 C x 185 sq.mm					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	
Unit rate	1	M	1,143.00	1,348.74	PRICE from polycab PRICE LIST+18% GST (40 DISCOUNT ADDED)
Total Cost of material				1,348.74	
Cartage at 1% of cost of materials	1%			11.43	
Sub total				1,360.17	
Overhead profit @ 20 %				272.03	
Total				1,632.20	
Say				**1,632.00**	

4 C x 6 sq.mm cable termination					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	

Unit rate	1	M	145.00	171.10	PRICE from Dowels PRICE LIST+18% GST (40 DISCOUNT ADDED)
Total Cost of material				171.10	
Cartage at 1% of cost of materials	1%			1.45	
Sub total				172.55	
Overhead profit @ 20 %				34.51	
Total				207.06	
Say				**207.00**	

3.5 C x 185 sq.mm cable termination					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	
Unit rate	1	M	1,080.00	1,274.40	PRICE from Dowels PRICE LIST+18% GST (40 DISCOUNT ADDED)
Total Cost of material				1,274.40	
Cartage at 1% of cost of materials	1%			10.80	
Sub total				1,285.20	
Overhead profit @ 20 %				257.04	
Total				1,542.24	
Say				**1,542.00**	

1000x75 mm Cable Tray					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,980.00	2,336.40	Quotation from CAPE+18% GST
Total Cost of material				2,336.40	
Cartage at 1% of cost of materials	1%			23.36	
Sub total				2,359.76	
Labour					
30% of the material cost	30%			707.93	
Labour total				707.93	
Total Cost				3,067.69	
Overhead profit	15%			460.15	
Total				3,527.85	
Say				**3,528.00**	

900x50mm Cable Tray					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	1,970.00	2,324.60	Quotation from CAPE+18% GST
Total Cost of material				2,324.60	
Cartage at 1% of cost of materials	1%			23.25	
Sub total				2,347.85	
Labour					
30% of the material cost	30%			704.35	
Labour total				704.35	
Total Cost				3,052.20	
Overhead profit	15%			457.83	
Total				3,510.03	
Say				**3,510.00**	

600x50mm Cable Tray

	Quantity	Unit	Basisc Price	Rate include GST	Remarks
Unit rate	1	set	1,385.00	1,634.30	Quotation from CAPE+18% GST
Total Cost of material				1,634.30	
Cartage at 1% of cost of materials	1%			16.34	
Sub total				1,650.64	
Labour					
30% of the material cost	30%			495.19	
Labour total				495.19	
Total Cost				2,145.84	
Overhead profit	15%			321.88	
Total				2,467.71	
Say				**2,468.00**	

1000x75mm wall bracket					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	875.00	1,032.50	Quotation from CAPE+18% GST
Total Cost of material				1,032.50	
Cartage at 1% of cost of materials	1%			10.33	
Sub total				1,042.83	
Labour					
20% of the material cost	20%			208.57	
Labour total				208.57	
Total Cost				1,251.39	
Overhead profit	15%			187.71	
Total				1,439.10	
Say				**1,439.00**	

900x50mm wall bracket					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	680.00	802.40	Quotation from CAPE+18% GST
Total Cost of material				802.40	
Cartage at 1% of cost of materials	1%			8.02	
Sub total				810.42	
Labour					
20% of the material cost	20%			162.08	
Labour total				162.08	
Total Cost				972.51	
Overhead profit	15%			145.88	
Total				1,118.39	
Say				**1,118.00**	

600x50mm wall bracket					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	615.00	725.70	Quotation from CAPE+18% GST
Total Cost of material				725.70	
Cartage at 1% of cost of materials	1%			7.26	
Sub total				732.96	
Labour					
20% of the material cost	20%			146.59	
Labour total				146.59	
Total Cost				879.55	
Overhead profit	15%			131.93	
Total				1,011.48	

Say				**1,011.00**	

10SWG cu Earth wire					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	73.50	86.73	MR+18% GST
Total Cost of material				86.73	
Cartage at 1% of cost of materials	1%			0.87	
Sub total				87.60	
Labour					
40% of the material cost	40%			35.04	
Labour total				35.04	
Total Cost				122.64	
Overhead profit	15%			18.40	
Total				141.03	
Say				**141.00**	

Maintance free Chemical earthing					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	set	18,900.00	22,302.00	Quotation from CAPE+18% GST
Total Cost of material				22,302.00	
Cartage at 1% of cost of materials	1%			223.02	
Sub total				22,525.02	
Labour					
30% of the material cost	30%			6,757.51	
Labour total				6,757.51	
Total Cost				29,282.53	
Overhead profit	15%			4,392.38	
Total				33,674.90	
Say				**33,675.00**	

3.5Cx95 sq.mm Marine cable					
	Quantity	**Unit**	**Basisc Price**	**Rate include GST**	**Remarks**
Unit rate	1	Meter	725.00	855.50	Quotation from CAPE+18% GST
Total Cost of material				855.50	
Cartage at 1% of cost of materials	0%			-	
Sub total				855.50	
Labour					
30% of the material cost	30%			256.65	
Labour total				256.65	
Total Cost				1,112.15	
Overhead profit	15%			166.82	
Total				1,278.97	
Say				**1,279.00**	

Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on					
1/2 Module					
Basic price	Each	1	138.00	138.00	No: 53(Myrius) Cat No.6890 07
Cartage @ 1%		1%		1.38	
Sub total				139.38	
Discount		40%		55.75	
Total A				83.63	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				187.52	
Contractors Profit@ 15 %	15%			28.13	
Total of A+B+C				215.65	
Say				**216.00**	
Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on					
3 module					
Basic price	Each	1	138.00	138.00	Legrand Price List 2022 Page No: 53(Myrius)Cat No.6890 08
Cartage @ 1%		1%		1.38	
Sub total				139.38	
Discount		40%		55.75	
Total A				83.63	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				187.52	
Contractors Profit@ 15 %	15%			28.13	
Total of A+B+C				215.65	
Say				**216.00**	
Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on					
4 module					
Basic price	Each	1	184.00	184.00	Legrand Price List 2022 Page No: 53(Myrius)Cat No.6890 09
Cartage @ 1%		1%		1.84	
Sub total				185.84	
Discount		40%		74.34	
Total A				111.50	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				215.40	
Contractors Profit@ 15 %	15%			32.31	
Total of A+B+C			`	247.71	
Say				**248.00**	
Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on					
6 module					
Basic price	Each	1	288.00	288.00	Legrand Price List 2022 Page No: 53(Myrius)Cat No.6890 10
Cartage @ 1%		1%		2.88	
Sub total				290.88	
Discount		40%		116.35	
Total A				174.53	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate

Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				278.42	
Contractors Profit@ 15 %	15%			41.76	
Total of A+B+C				320.19	
Say				**320.00**	
Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on					
8 module					
Basic price	Each	1	338.00	338.00	Legrand Price List 2022 Page No: 53(Myrius)Cat No.6890 42
Cartage @ 1%		1%		3.38	
Sub total				341.38	
Discount		40%		136.55	
Total A				204.83	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				308.72	
Contractors Profit@ 15 %	15%			46.31	
Total of A+B+C				355.03	
Say				**355.00**	
Supplying and fixing following size/modules, PVC open surface box / recess boxes to be placed on					
12 module					
Basic price	Each	1	508.00	508.00	Legrand Price List 2022 Page No: 53(Myrius)Cat No.6890 11
Cartage @ 1%		1%		5.08	
Sub total				513.08	
Discount		40%		205.23	
Total A				307.85	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				411.74	
Contractors Profit@ 15 %	15%			61.76	
Total of A+B+C				473.51	
Say				**474.00**	
Supplying and fixing following Modular base & cover plate on existing modular PVC					
1 or 2 module					
Basic price	Each	1	260.00	260.00	Legrand Price List 2022 Page No: 52(Myrius)Cat No.6795 42
Cartage @ 1%		1%		2.60	
Sub total				262.60	
Discount		40%		105.04	
Total A				157.56	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				261.46	
Contractors Profit@ 15 %	15%			39.22	
Total of A+B+C				300.67	
Say				**301.00**	
Supplying and fixing following Modular base & cover plate on existing modular PVC					

3 module					
Basic price	Each	1	276.00	276.00	Legrand Price List 2022 Page No: 52(Myrius)Cat No.6795 43
Cartage @ 1%		1%		2.76	
Sub total				278.76	
Discount		40%		111.50	
Total A				167.26	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				271.15	
Contractors Profit@ 15 %	15%			40.67	
Total of A+B+C				311.82	
Say				**312.00**	
Supplying and fixing following Modular base & cover plate on existing modular PVC					
4 module					
Basic price	Each	1	296.00	296.00	Legrand Price List 2022 Page No: 52(Myrius)Cat No.6795 44
Cartage @ 1%		1%		2.96	
Sub total				298.96	
Discount		40%		119.58	
Total A				179.38	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				283.27	
Contractors Profit@ 15 %	15%			42.49	
Total of A+B+C				325.76	
Say				**326.00**	
Supplying and fixing following Modular base & cover plate on existing modular PVC					
6 module					
Basic price	Each	1	534.00	534.00	Legrand Price List 2022 Page No: 52(Myrius)Cat No.6795 46
Cartage @ 1%		1%		5.34	
Sub total				539.34	
Discount		40%		215.74	
Total A				323.60	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				427.50	
Contractors Profit@ 15 %	15%			64.12	
Total of A+B+C				491.62	
Say				**492.00**	
Supplying and fixing following Modular base & cover plate on existing modular PVC					
8 module					
Basic price	Each	1	582.00	582.00	Legrand Price List 2022 Page No: 52(Myrius)Cat No.6795 48
Cartage @ 1%		1%		5.82	

Sub total				587.82	
Discount		40%		235.13	
Total A				352.69	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				456.59	
Contractors Profit@ 15 %	15%			68.49	
Total of A+B+C				525.08	
Say				**525.00**	
Supplying and fixing following Modular base & cover plate on existing modular PVC					
12 module					
Basic price	Each	1	882.00	882.00	Legrand Price List 2022 Page No: 52(Myrius)Cat No.6795 52
Cartage @ 1%		1%		8.82	
Sub total				890.82	
Discount		40%		356.33	
Total A				534.49	
LABOUR					
Wireman	0.0625		912.52	57.03	DSR 2018 + CI Labour Rate
Khallasi	0.0625		749.81	46.86	DSR 2018 + CI Labour Rate
Total of B				103.90	
Total of A+B				638.39	
Contractors Profit@ 15 %	15%			95.76	
Total of A+B+C				734.15	
Say				**734.00**	
20 amp switch					
20A switch					
S.P. 20 amps, one way switch, modular type ISI marked.	Each	1	426.00	426.00	Legrand Price List 2022 Page No: 60(Myrius)Cat No.6730 11
Cartage @ 1%		1%		4.26	
Sub total				430.26	
Discount		40%		172.10	
Total A				258.16	
LABOUR					
Wireman	0.03		912.52	27.38	DSR 2018 + CI Labour Rate
Khallasi	0.03		749.81	22.49	DSR 2018 + CI Labour Rate
Total of B				49.87	
Total of A+B				308.03	
Contractors Profit@ 15 %	15%			46.20	
Total of A+B+C				354.23	
Say				**354.00**	
20A Socket outlet					
20 amps socket outlet, modular type ISI marked.	Each	1	578.00	578.00	Legrand Price List 2022 Page No: 48(Myrius)Cat No.6792 32
Cartage @ 1%		1%		5.78	
Sub total				583.78	
Discount		40%		233.51	
Total A				350.27	
LABOUR					
Wireman	0.03		912.52	27.38	DSR 2018 + CI Labour Rate
Khallasi	0.03		749.81	22.49	DSR 2018 + CI Labour Rate

Total of B				49.87	
Total of A+B				400.14	
Contractors Profit@ 15 %	15%			60.02	
Total of A+B+C				460.16	
Say				**460.00**	
Supplying and fixing of modular type data networking (CAT-6A) socket outlet on the existing modular					
Basic price	Set	1	684.00	684.00	Legrand Price List october 2021 Page No: 176(britzy Switches).
Cartage @ 1%		1%		6.84	
Sub total				690.84	
Discount		40%		276.34	
Total A				414.50	
LABOUR					
Wireman	0.02		912.52	18.25	DSR 2018 + CI Labour Rate
Khallasi	0.02		749.81	15.00	DSR 2018 + CI Labour Rate
Total of B				33.25	
Total of A+B				447.75	
Contractors Profit@ 15 %	15%			67.16	
Total of A+B+C				514.91	
Say				**515.00**	
4 way TPN MCB DB					
4 way (8+12), TPN, MCB DB, double door horizontal type.	Set	1	19,160.00	19,160.00	Legrand Price List 2022 Page No:12 Cat No5076 90
Steel fastener 6 mm X 75 mm	Each	4	5.50	22.00	
Cement, paint, sand etc.	LS	1	5.00	5.00	
Total Cost of maaterial				19,187.00	
Cartage @ 1%		1%		191.87	
Sub total				19,378.87	
Discount		30%		5,813.66	
Total A				13,565.21	
LABOUR					
Wireman	0.12		912.52	109.50	DSR 2018 + CI Labour Rate
Mason Grade 2	0.12		829.81	99.58	DSR 2018 + CI Labour Rate
Khallasi	0.12		749.81	89.98	DSR 2018 + CI Labour Rate
Total of B				299.06	
Total of A+B				13,864.27	
Contractors Profit@ 15 %	15%			2,079.64	
Total of A+B+C				15,943.91	
Say				**15,944.00**	
6 way TPN MCB DB					
6 way (8+18), TPN, MCB DB, double door horizontal type.	Set	1	23,056.00	23,056.00	Legrand Price List 2022 Page No:12 Cat No5076 91
Steel fastener 6 mm X 75 mm	Each	4	5.50	22.00	
Cement, paint, sand etc.	LS	1	5.00	5.00	
Total Cost of maaterial				23,083.00	
Cartage @ 1%		1%		230.83	
Sub total				23,313.83	
Discount		30%		6,994.15	
Total A				16,319.68	
LABOUR					
Wireman	0.12		912.52	109.50	DSR 2018 + CI Labour Rate
Mason Grade 2	0.12		829.81	99.58	DSR 2018 + CI Labour Rate
Khallasi	0.12		749.81	89.98	DSR 2018 + CI Labour Rate
Total of B				299.06	
Total of A+B				16,618.74	

Contractors Profit@ 15 %	15%			2,492.81	
Total of A+B+C				19,111.55	
Say				**19,112.00**	
8 way TPN MCB DB					
8 way (8+24), TPN, MCB DB, double door horizontal type.	Set	1	25,216.00	25,216.00	Legrand Price List 2022 Page No:12 Cat No5076 92
Steel fastener 6 mm X 75 mm	Each	4	5.50	22.00	
Cement, paint, sand etc.	LS	1	5.00	5.00	
Total Cost of maaterial				25,243.00	
Cartage @ 1%		1%		252.43	
Sub total				25,495.43	
Discount		30%		7,648.63	
Total A				17,846.80	
LABOUR					
Wireman	0.12		912.52	109.50	DSR 2018 + CI Labour Rate
Mason Grade 2	0.12		829.81	99.58	DSR 2018 + CI Labour Rate
Khallasi	0.12		749.81	89.98	DSR 2018 + CI Labour Rate
Total of B				299.06	
Total of A+B				18,145.86	
Contractors Profit@ 15 %	15%			2,721.88	
Total of A+B+C				20,867.74	
Say				**20,868.00**	
12 way VTPN DB					
8 way (8+24), TPN, MCB DB, double door vertical type.	Set	1	45,662.00	45,662.00	Legrand Price List 2022 Page No:12 Cat No5077 38
Steel fastener 6 mm X 75 mm	Each	4	5.50	22.00	
Cement, paint, sand etc.	LS	1	5.00	5.00	
Total Cost of maaterial				45,689.00	
Cartage @ 1%		1%		456.89	
Sub total				46,145.89	
Discount		30%		13,843.77	
Total A				32,302.12	
LABOUR					
Wireman	0.12		912.52	109.50	DSR 2018 + CI Labour Rate
Mason Grade 2	0.12		829.81	99.58	DSR 2018 + CI Labour Rate
Khallasi	0.12		749.81	89.98	DSR 2018 + CI Labour Rate
Total of B				299.06	
Total of A+B				32,601.18	
Contractors Profit@ 15 %	15%			4,890.18	
Total of A+B+C				37,491.36	
Say				**37,491.00**	
Supplying, fixing, testing and commissioning following four pole and double pole , 415 volts and 240					
32A 30mA 4P RCBO					
Basic price	Each	1	6,776.00	6,776.00	Legrand Price List 2022 Page No:6 Cat No 4113 67
Cartage @ 1%		1%		67.76	
Sub total				6,843.76	
Discount		40%		2,737.50	
Total A				4,106.26	

LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				4,314.05	
Contractors Profit@ 15 %	15%			647.11	
Total of A+B+C				4,961.15	
Say				**4,961.00**	
Supplying, fixing, testing and commissioning following four pole and double pole , 415 volts and 240					
40A 100mA 4P RCBO					
Basic price	Each	1	7,378.00	7,378.00	Legrand Price List 2022 Page No:6 Cat No 4113 73
Cartage @ 1%		1%		73.78	
Sub total				7,451.78	
Discount		40%		2,980.71	
Total A				4,471.07	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				4,678.86	
Contractors Profit@ 15 %	15%			701.83	
Total of A+B+C				5,380.69	
Say				**5,381.00**	
Supplying, fixing, testing and commissioning following four pole and double pole , 415 volts and 240					
25A 30mA 2P RCBO					
Basic price	Each	1	4,574.00	4,574.00	Legrand Price List 2022 Page No:6 Cat No 4113 25
Cartage @ 1%		1%		45.74	
Sub total				4,619.74	
Discount		40%		1,847.90	
Total A				2,771.84	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				2,979.64	
Contractors Profit@ 15 %	15%			446.95	
Total of A+B+C				3,426.58	
Say				**3,427.00**	
Supply, fixing, testing and commisioning of following rating and pole Isolator in existing Seven Segment					
63A FP Isolator					
Basic price	Each	1	1,578.00	1,578.00	Legrand Price List 2022 Page No:7 Cat No 4020 21
Cartage @ 1%		1%		15.78	
Sub total				1,593.78	
Discount		40%		637.51	
Total A				956.27	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				1,164.06	
Contractors Profit@ 15 %	15%			174.61	
Total of A+B+C				1,338.67	

Say				**1,339.00**	
25A 4P Isolator					
Basic price	Each	1	1,486.00	1,486.00	Legrand Price List 2022 Page No:7 Cat No 4020 20
Cartage @ 1%		1%		14.86	
Sub total				1,500.86	
Discount		40%		600.34	
Total A				900.52	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				1,108.31	
Contractors Profit@ 15 %	15%			166.25	
Total of A+B+C				1,274.55	
Say				**1,275.00**	
25A TP Isolator					
Basic price	Each	1	1,258.00	1,258.00	Legrand Price List 2022 Page No:7 Cat No 4020 14
Cartage @ 1%		1%		12.58	
Sub total				1,270.58	
Discount		40%		508.23	
Total A				762.35	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				970.14	
Contractors Profit@ 15 %	15%			145.52	
Total of A+B+C				1,115.66	
Say				**1,116.00**	
25A DP Isolator					
Basic price	Each	1	650.00	650.00	Legrand Price List 2022 Page No:7 Cat No 4020 08
Cartage @ 1%		1%		6.50	
Sub total				656.50	
Discount		40%		262.60	
Total A				393.90	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				601.69	
Contractors Profit@ 15 %	15%			90.25	
Total of A+B+C				691.95	
Say				**692.00**	
Supply and fixing of FP CRCA sheet steel powder coated enclosure on surface/recess along with					
40A TP MCB					
40A TP MCB	Each	1	2,102.00	2,102.00	Legrand Price List 2022 Page No:7 Cat No 4024 55
Cartage @ 1% of A+B		1%		21.02	
Sub total				2,123.02	
Discount		40%		849.21	
Total				1,273.81	
LABOUR					

Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.25		749.81	187.45	DSR 2018 + CI Labour Rate
Total				301.52	
Total (Supply and Labour)				1,575.33	
Contractors Profit@ 15 %	15%			236.30	
Total of A+B+C				1,811.63	
Say				**1,812.00**	
Supply and fixing of FP CRCA sheet steel powder coated enclosure on surface/recess along with					
32A TP MCB					
32A TP MCB	Each	1	1,490.00	1,490.00	Legrand Price List 2022 Page No:7 Cat No 4024 54
Cartage @ 1% of A+B		1%		14.90	
Sub total				1,504.90	
Discount		40%		601.96	
Total				902.94	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.25		749.81	187.45	DSR 2018 + CI Labour Rate
Total				301.52	
Total (Supply and Labour)				1,204.46	
Contractors Profit@ 15 %	15%			180.67	
Total of A+B+C				1,385.13	
Say				**1,385.00**	
Supply and fixing of FP CRCA sheet steel powder coated enclosure on surface/recess along with					
32A 4P MCB					
32A TP MCB	Each	1	2,490.00	2,490.00	Legrand Price List 2022 Page No:7 Cat No 4024 54
Cartage @ 1% of A+B		1%		24.90	
Sub total				2,514.90	
Discount		40%		1,005.96	
Total				1,508.94	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.25		749.81	187.45	DSR 2018 + CI Labour Rate
Total				301.52	
Total (Supply and Labour)				1,810.46	
Contractors Profit@ 15 %	15%			271.57	
Total of A+B+C				2,082.03	
Say				**2,082.00**	
16A SP MCB					
16A SP MCB	Each	1	254.00	254.00	Legrand Price List 2022 Page No:7 Cat No 4024 33
Cartage @ 1% of A+B		1%		2.54	
Sub total				256.54	
Discount		40%		102.62	
Total				153.92	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.25		749.81	187.45	DSR 2018 + CI Labour Rate
Total				301.52	
Total (Supply and Labour)				455.44	
Contractors Profit@ 15 %	15%			68.32	
Total of A+B+C				523.76	
Say				**524.00**	

Supply and fixing of FP CRCA sheet steel powder coated enclosure on surface/recess along with					
63A 4P MCB					
63A 4P MCB	Each	1	2,782.00	2,782.00	Legrand Price List 2022 Page No:7 Cat No 4024 66
Cartage @ 1% of A+B		1%		27.82	
Sub total				2,809.82	
Discount		40%		1,123.93	
Total				1,685.89	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.25		749.81	187.45	DSR 2018 + CI Labour Rate
Total				301.52	
Total (Supply and Labour)				1,987.41	
Contractors Profit@ 15 %	15%			298.11	
Total of A+B+C				2,285.52	
Say				**2,286.00**	
25A SP MCB					
25A SP MCB	Each	1	254.00	254.00	Legrand Price List 2022 Page No:7 Cat No 4024 35
Cartage @ 1% of A+B		1%		2.54	
Sub total				256.54	
Discount		40%		102.62	
Total				153.92	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.25		749.81	187.45	DSR 2018 + CI Labour Rate
Total				301.52	
Total (Supply and Labour)				455.44	
Contractors Profit@ 15 %	15%			68.32	
Total of A+B+C				523.76	
Say				**524.00**	
63A 4P COS					
Switch			**5360**		Havells Price List 2022 HSN Code:8536
Enclosure			**7985**		
63A 4P COS	Each	1	13,345.00	13,345.00	
Cartage @ 1% of A+B		1%		133.45	
Sub total				13,478.45	
Discount		40%		5,391.38	
Total				8,087.07	
LABOUR					
Wireman	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.25		749.81	187.45	DSR 2018 + CI Labour Rate
Total				301.52	
Total (Supply and Labour)				8,388.59	
Contractors Profit@ 15 %	15%			1,258.29	
Total of A+B+C				9,646.88	
Say				**9,647.00**	
Supply of the following size 1.1kV grade XLPE insulated PVC sheathed, armoured Aluminium conductor					
3.5cx70sq.mm Al Cable	1	M	832.00	832.00	Polycab January 2022
Total Cost of material				832.00	
Cartage at 1% of cost of	1%			8.32	
Sub total				840.32	

Discount	40%			336.13	
Total				504.19	
Overhead profit @ 15 %				75.63	
Total				579.82	
Say				**580.00**	
3.5cx35sq.mm Al Cable	1	M	467.00	467.00	Polycab January 2022
Total Cost of material				467.00	
Cartage at 1% of cost of	1%			4.67	
Sub total				471.67	
Discount	40%			188.67	
Total				283.00	
Overhead profit @ 15 %				42.45	
Total				325.45	
Say				**325.00**	
4cx16sq.mm Al Cable	1	M	309.00	309.00	Polycab January 2022
Total Cost of material				309.00	
Cartage at 1% of cost of	1%			3.09	
Sub total				312.09	
Discount	40%			124.84	
Total				187.25	
Overhead profit @ 15 %				28.09	
Total				215.34	
Say				**215.00**	
4cx10sq.mm Al Cable	1	M	261.00	261.00	Polycab January 2022
Total Cost of material				261.00	
Cartage at 1% of cost of	1%			2.61	
Sub total				263.61	
Discount	40%			105.44	
Total				158.17	
Overhead profit @ 15 %				23.72	
Total				181.89	
Say				**182.00**	
4cx6sq.mm Al Cable	1	M	223.00	223.00	Polycab January 2022
Total Cost of material				223.00	
Cartage at 1% of cost of	1%			2.23	
Sub total				225.23	
Discount	40%			90.09	
Total				135.14	
Overhead profit @ 15 %				20.27	
Total				155.41	
Say				**155.00**	
2cx4sq.mm Al Cable	1	M	138.00	138.00	Polycab January 2022
Total Cost of material				138.00	
Cartage at 1% of cost of	1%			1.38	
Sub total				139.38	
Discount	40%			55.75	
Total				83.63	
Overhead profit @ 15 %				12.54	
Total				96.17	
Say				**96.00**	

2C x 4 Sqmm Cu Flexible					
4C x 10 Sqmm Cu Flexible	1	M	267.00	267.00	Polycab January 2022
Total Cost of material				267.00	
Cartage at 1% of cost of	1%			2.67	
Sub total					
Discount	40%				
Total				269.67	
Overhead profit @ 15 %				40.45	
Total				310.12	
Say				**310.00**	
4C x 6 Sqmm Al cable					
Brass compression gland and	Set	1	152.00	152.00	MR
Cartage @ 1%		1%		1.52	
Sub total				153.52	
Discount	40%			61.41	
Total A				92.11	
LABOUR					
Cable jointer	0.125		124.89	15.61	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				109.34	
Total of A+B				201.45	
Contractors Profit@ 15 %	15%			30.22	
Total of A+B+C				231.67	
Say				**232.00**	
2C x 4 Sqmm Al cable					
Brass compression gland and	Set	1	76.00	76.00	MR
Cartage @ 1%		1%		0.76	
Sub total				76.76	
Discount	40%			30.70	
Total A				46.06	
LABOUR					
Cable jointer	0.125		62.45	7.81	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				101.53	
Total of A+B				147.59	
Contractors Profit@ 15 %	15%			22.14	
Total of A+B+C				169.73	
Say				**170.00**	
2C x 4 Sqmm Cu cable					
Brass compression gland and	Set	1	102.00	102.00	MR
Cartage @ 1%		1%		1.02	
Sub total				103.02	
Discount	40%			41.21	
Total A				61.81	
LABOUR					
Cable jointer	0.125		83.81	10.48	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				104.20	
Total of A+B				166.01	
Contractors Profit@ 15 %	15%			24.90	
Total of A+B+C				190.92	
Say				**191.00**	

Meter box					
Three phase meter box	Set	1	2,500.00	2,500.00	MR
Cartage @ 1%		1%		25.00	
Sub total				2,525.00	
Discount		30%		757.50	
Total A				1,767.50	
LABOUR					
Cable jointer	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				1,975.29	
Contractors Profit@ 15 %	15%			296.29	
Total of A+B+C				2,271.59	
Say				**2,272.00**	
KWh Meter					
Three phase meter	Set	1	5,110.00	5,110.00	MR-
Cartage @ 1%		1%		51.10	
Sub total				5,161.10	
Discount		30%		1,548.33	
Total A				3,612.77	
LABOUR					
Cable jointer	0.125		912.52	114.07	DSR 2018 + CI Labour Rate
Khallasi	0.125		749.81	93.73	DSR 2018 + CI Labour Rate
Total of B				207.79	
Total of A+B				3,820.56	
Contractors Profit@ 15 %	15%			573.08	
Total of A+B+C				4,393.65	
Say				**4,394.00**	
Supply of recessed LED Luminaire with a nominal system lumen output of 3300 lumens and a minimum					
Supply of fixture	1	E	9290.00	9290.00	Price from Wipro
Total Cost of material				9290.00	
Cartage at 1% of cost of	0.01			92.90	
Sub total				9382.90	
Discount	25%			2345.73	
Total				7037.18	
Add 15% for overhead and profit	0.15			1055.58	
Total				8092.75	
Say				**8,093.00**	
Supply of surface mounted LED Downlighter with a nominal system lumen output of 2000 lumens and a					
Supply of fixture	1	E	3950.00	3950.00	Price from Wipro
Total Cost of material				3950.00	
Cartage at 1% of cost of materials	0.01			39.50	
Sub total				3989.50	
Discount	25%			997.38	
Total				2992.13	
Add 15% for overhead and profit	0.15			448.82	
Total				3440.94	
Say				3441.00	
Supply of fixture	1	E	8550.00	8550.00	Price from Wipro
Total Cost of material				8550.00	
Cartage at 1% of cost of	0.01			85.50	
Sub total				8635.50	
Discount	25%			2158.88	

Total				6476.63	
Add 15% for overhead and profit	0.15			971.49	
Total				7448.12	
Say				7448.00	
Supply of round surface mounted LED designer Downlighter with a nominal system lumen output of					
Supply of fixture	1	E	2145.00	2145.00	Price from Wipro
Total Cost of material				2145.00	
Cartage at 1% of cost of	0.01			21.45	
Sub total				2166.45	
Discount	25%			541.61	
Total				1624.84	
Add 15% for overhead and profit	0.15			243.73	
Total				1868.56	
Say				1869.00	
Supply ,testing 15 W LED surface/wall mounted luminaiore as walls cone with a color temperature of					
Supply of fixture	1	E	4500.00	4500.00	MR
Total Cost of material				4500.00	
Cartage at 1% of cost of materials	0.01			45.00	
Sub total				4545.00	
Discount	25%			1136.25	
Total				3408.75	
Add 15% for overhead and profit	0.15			511.31	
Total				3920.06	
Say				3920.00	
Supply of ceiling fan of 1200mm sweep, including the down rod of standard length (upto 30 cm.) of					
Supply of ceiling fan	1	E	3,240.00	3,240.00	From Havells fans
Total Cost of material				3,240.00	
Cartage at 1% of cost of	1%			32.40	
Sub total				3272.40	
Discount	40%			1308.96	
Total				1,963.44	
Overhead profit @ 15 %				294.52	
Total				2,257.96	
Say				**2,258.00**	
Supply of 450mm sweep wall fan on surface including mouting and providing all accessories required					
Basic Price	1	E	2,199.00	2,199.00	MR
Total Cost of material				2,199.00	
Total Cost of material				2,199.00	
Cartage at 1% of cost of	1%			21.99	
Sub total				2220.99	
Discount	40%			888.40	
Total				1,332.59	
Add 15% for overhead and profit	15%			199.89	
Total				1,532.48	
Say				**1,532.00**	

Supply of 1kVA GXT MT+CX LB(1Phase to 1 Phase) UPS with battery bank and accessories for 60 mins					
UPS				16500	18% GST
Battery				3400	28% GST
Battery Rack				2750	18% GST
Basic Price	1	E	28,971.00	28,971.00	Quotation from Radha Electronics
Total Cost of material				28,971.00	

Total Cost of material				28,971.00	
Cartage at 1% of cost of	1%			289.71	
Sub total				29260.71	
Total				29,260.71	
Add 15% for overhead and profit	15%			4,389.11	
Total				33,649.82	
Say				**33,650.00**	

KOVALAM BEACH DEVELOPMENT PROJECT					
AC AND VENTILATION ESTIMATE					
Sl No	Item	Qty	Unit	Estimate	
				Rate	Price
1	Supply, installation testing and commissioning of **1.5 TR** minimum capacity **Hi wall Split air conditioning unit (Indoor and Outdoor Unit)** complete with suitable capacity drive motor, air cooled condenser with all accessories, hermetically sealed scroll/rotary compressor, outdoor unit and hi wall units for single phase 230 V supply minimum 5 star rated as per BEE and with suitable stabilizer with necessary supports vibration isolators suitable as required as per manufacturers recommendation, suitably sized copper refrigerant piping as per relevant ASHRAE Standards (both suction and liquid piping) including 19 mm thick closed cell nitrile rubber insulation as per specification interconnecting indoor & outdoor units with required pipe fittings and accessories like bends, tees, reducers, supports finished with 7 mils factory laminated treated fibre glass cloth, necessary power/control cabling, suitably supported on trays/ split clamps etc., CPVC condensate drain pipe (upto 5 m) 6kg/sq.cm of suitable dia connecting the drain pan of the indoor units to nearest drain point with U-trap, insulated with 9 mm thick closed cell nitrile rubber insulation, required pipe fittings and accessories like bends, tees, reducers, supports, clamps, finished with 7 mils factory laminated treated fibre glass cloth, first charge refrigerant gas R410A/R407C, cordless remote etc complete as required as per specification/ISHRAE standards.	3	Nos	39,200.00	1,17,600.00
2	Supply, installation testing and commissioning of of **450 mm sweep Wall mounted exhaust fan** complete with all required accessories, mounting accessories and all fan components suitable for sea side installation	2	Nos	15,826.00	31,652.00
	Sum				1,49,252.00
	Total Including GST (18%)				**1,76,117.00**

MEASUREMENT

	1L+1 S	2L+1S	3L+1S	4L+1S	5L+1 W	1L+2S	1W Switch	2W Switch	Ceiling Fan Point	Exhaust fan point	6A Socket	16A Socket	20A Socket	VDB	3P DB	1P DB	1 mod	2 mod	3 mod	4 mod	6 mod	8 mod	12 mod	Dummy
Admin Block Ground Floor																								
Green Room	4						6		1		1							1	1		1			
Toilet-1		1								1														
Toilet-2	1						1			1							1							
Toilet-3	1						1			1							1							
First Aid	2						3		1		1								1		1			1
Security Guard office	1						2		1		1								1	1				
Staff Room	2						3		1		2										2			1
Reception	1	1					3		1		1										1			1
Conference room	2						2				1	1	1					1					1	3
Beach Manager	3						3				1		1				1		1		1			1
Toilet-4	1						1			1														
L Wash Area	1						1											1						
M.Toilet	1						1			1														
Passage			2				2				2							1	1	1				
Entrance	2	1	2				4														1			1
Stair case						1		1						1	1	1								
	22	**3**	**4**	**0**	**0**	**1**	**33**	**1**	**5**	**5**	**10**	**1**	**2**	**1**	**1**	**1**	**3**	**4**	**5**	**2**	**7**	**0**	**1**	**8**
Admin Block First Floor																								
Surveillance & Server Room	2						2				12	2	2								1		4	12
Storage Room	3						3												1					
Electrical Panel room	3						3					1							2					
Amenities	2						4		1	1	1								1		1			
Passage		2					2	1			2							1	1		1			
Library	2						3		1		1								1					
Security Guard Rest Area	3						5		2		2								1		2			
Toilet-1	1						1			1							1							
Toilet-2	1						1			1							1							
Toilet-3	1						1			1							1							
Toilet-4	1						1			1							1							
Janitor Room	1						1										1							
Toilet Passage	2						2											1						
Wash Area	1						1										1							
Balcony	1	1					2								1									
	24	**3**	**0**	**0**	**0**	**0**	**32**	**1**	**4**	**5**	**18**	**3**	**2**	**0**	**1**	**0**	**6**	**2**	**7**	**0**	**5**	**0**	**4**	**12**

Toilet Block Ground Floor																								
WC-1 Male Toilet	1						1			1							1							
WC-2 Male Toilet	1						1			1							1							
WC-3 Male Toilet	1						1			1							1							
WC-4 Male Toilet	1						1			1							1							
WC-5 Male Toilet	1						1			1							1							
SR-1	1						1											1						
SR-2	1						1																	
SR-3	1						1										1							
SR-4	1						1										1							
SR-5	1						1										1							
SR-6	1						1										1							
SR-7	1						1										1							
Urinals		1	1	1			5			2											1			1
Handicapped Toilet	1						1			1							1							
Entrance stair case	1																							
Passage			2				3												1					
Janitor	1						1										1							
WC-1 Female Toilet	1						1			1							1							
WC-2 Female Toilet	1						1			1							1							
WC-3 Female Toilet	1						1			1							1							
WC-4 Female Toilet	1						1			1							1							
WC-5 Female Toilet	1						1			1							1							
Feeding Room		1					1										1							
SR-1	1						1										1							
SR-2	1						1										1							
SR-3	1						1										1							
SR-4	1						1										1							
SR-5	1						1										1							
SR-6	1						1										1							
SR-7	1						1										1							
Passage			1	1	1		5																	
Entrance stair case	1																		1					

Main Entrance stair case			1																					
Passage					2		3												1					
Stair case						6		6							1						1			
	28	**2**	**5**	**2**	**3**	**6**	**43**	**6**	**0**	**13**	**0**	**0**	**0**	**0**	**1**	**0**	**25**	**1**	**3**	**0**	**2**	**0**	**0**	**1**
Toilet Block First Floor																								
Amenities-1		2					4		2												1	1		
Amenities-2		2					4		2												1	1		
Amenities-3		1	1				6		3												2	1		
Cloak Room		3	2				9		4												1		1	1
Amenities		2					4		2												1	1		
Balcony		1	2	2			3	6			2				1			1	2	1	1			
	0	**11**	**5**	**2**	**0**	**0**	**30**	**6**	**13**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**2**	**1**	**7**	**4**	**1**	**1**
Toilet Block																								
WC-1 Female Toilet	1						1			1							1							
WC-2 Female Toilet	1						1			1											1			
WC-3 Female Toilet	1						1			1							1							
WC-4 Female Toilet	1						1			1							1							
SR-1	1						1																	
SR-2	1						1																	
SR-3	1						1																	
SR-4	1						1																	
Passage		1	1				1																	
Janitor	1						1										1							
Wash area	2						2												1					
Entrance	1						1										1							
WC-1 Male Toilet	1						1			1							1							
WC-2 Male Toilet	1						1			1											1			1
WC-3 Male Toilet	1						1			1										1				
Urinals	4						4			4														
Shower area	3						3																	
Passage			1				1																	
Janitor	1						1										1							
Wash area	2						2												1					
Entrance	1						1																	
Handicapped Toilet	1						1			1														
Entrance	1						1								1				1					
	28	**1**	**2**	**0**	**0**	**0**	**30**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**1**	**0**	**7**	**0**	**3**	**1**	**2**	**0**	**0**	**1**

Estimate – Part C (Firefighting)

KOVALAM BEACH DEVELOPMENT PROJECT					
FIREFIGHTING SUPPLIER PRICE CONSOLIDATION					
Sl No	Item	Qty	Unit	Final To be Considered	
				Rate	Price
1	Supply and installation of ABC Stored pressure type **Fire Extinguisher 6 Kgs** Capacity Mono Ammonium Phosphate based Dry Chemical Powder as per IS 14609 with ISI Mark for Fighting ABC Class of Fire, stored Pressure type of Mild steel body pressurized by Nitrogen Gas. The Extinguisher shall have pressure gauge for indicating inside pressure with opening and closing lever of squeeze grip type with tamper proof seal, complete with wall bracket. The Extinguisher should be manufactured strictly as per IS: 15683:2006 with ISI mark.	12	Nos	3500	42000
2	Supply and installation of photoluminescent glow **Signage** such as **Fire exit** of standard size (300*150 MM) as per conventional design/ colour code on 3 mm thick Aluminum composite, panel conforming to IS 9457. The signage will be either fixed on the wall with the help of screws & double tape or hanged from the false ceiling with the help of chain & screws etc.	10	Nos	650	6500
3	Supply and installation of photoluminescent glow **signage** such as **Assembly point** of standard size (900*950 MM) as per conventional design/ colour code on 3 mm thick Aluminum composite, panel conforming to IS 9457. The signage will be either fixed on the wall with the help of screws & double tape or hanged from the false ceiling with the help of chain & screws etc.	2	Nos	20640	41280
4	Supply installation testing and commissioning of **100mm Y Type Strainer**; cast iron body, S.S mesh with leather gasket, matching flanges, suitable G.I Nut, Bolt and washer.	1	No	13316.294	13316.294
5	Supplying, installation, testing and commissioning of Kirloskar make 5.5KW/7.5HP centrifugal **Monobloc Pump** Model KDI 852, Suc 65 x Del 50mmwith Cast Iron Impeller and Mechanical Seal at 35Mtr the discharge will be (8.2 LPS), 450 LPM. With PUMP PANEL	1	No	50000	50000
6	Supply, installation, testing and commissioning of Heavy Duty Neoprene **Expansion Joints / Flexible Connectors**, PN:16, with Spilt Retainer Rings and Control Units, drilled to BS 10 Table E including all other necessary fixing accessories. - **100mm.**	2	Nos	7500	15000
7	Supply, installation, testing and commissioning of **pressure gauge** 0-200 PSI (0 - 14 Kg) range, 3/8" BSP bottom entry, 4" dial weather proof with stainless steel internals, siphon tube and ball valve including fittings, etc. complete as required as per the technical specification.	2	Nos	2405	4810
8	Supply, installation, testing and commissioning of industrial type **pressure switch** having 1/4" BSP(F) connection IP:32 enclosure protection, phosphor bronze bellows as sensing element, SPDT contact system, switch rating 6A Inductive/lOA resistive 380 V AC, 0.2A Inductive/10A resistive 250V DC suit with ball valve etc. complete as required as per technical specification	1	No	2830	2830

9	Supplying, fixing, testing and commissioning of **butterfly valve** of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required. **100 nominal bore**	2	Nos	3540	7080
10	Providing, installation, testing and commissioning of **non-return valve** of following sizes confirming to IS: 5312 complete with rubber gasket, GI bolts, nuts, washers etc.as required : **100 mm nominal bore**	2	Nos	2250	4500
11	Providing of following sizes of **GI C class pipes** conforming to IS-1239 with all accessories like all fittings (standard GI fitting with welded joint shall be used on the pipes) including tees, elbows, reducers, union, flanges, rubber gaskets, GI nuts bolts, washer including supporting/fixing the pipe on floor / wall /ceiling with clamps, hangers (using anchor fastners) as per specification. MS pipe sleeve of suitable higher size shall be provided wherever the pipes are crossing the walls/floors and sealing the sleeves with glass wool in between & fire sealent compound at either end all as per Project Manager's / Consultants.All hangers, clamps, brackets etc. shall be of galvanized iron unless specified otherwire and then supply of the same shall also be included for rates under this head. **100 mm dia**	20	Mtr	2490	49800
12	Providing of following sizes of **GI C class pipes** conforming to IS-1239 with all accessories like all fittings (standard GI fitting with welded joint shall be used on the pipes) including tees, elbows, reducers, union, flanges, rubber gaskets, GI nuts bolts, washer including supporting/fixing the pipe on floor / wall /ceiling with clamps, hangers (using anchor fastners) as per specification. MS pipe sleeve of suitable higher size shall be provided wherever the pipes are crossing the walls/floors and sealing the sleeves with glass wool in between & fire sealent compound at either end all as per Project Manager's / Consultants.All hangers, clamps, brackets etc. shall be of galvanized iron unless specified otherwire and then supply of the same shall also be included for rates under this head. **80 mm dia**	7	Mtr	1500	10500
13	Supply, laying, testing & commissioning of **C class** heavy duty **GI pipe** conforming to IS 1239 including fittings like elbows, tees flanges, tapers, nuts bolts, gaskets etc. in ground at a depth of 1m including excavation & providing cement concrete blocks as supports, anticorrosive wrapping coating 4 mm thick as per IS10221, refilling the trench etc. of following sizes complete as required as per technical specification: **100mm dia**	50	Mtr	3000	150000
14	Supply, installation, testing and commissioning of **Air Release Valve** Gunmetal, conforming to IS 903:1993, having rubber ball with sealing seat and with 25mm. BSP threaded male inlet, including necessary accessories and connections.	1	Nos	1430	1430
15	Supplying and fixing of **fire brigade connection** of cast iron body with gun metal male instantaneous inlet couplings complete with cap and chain as reqd. for suitable dia MS pipe connection conforming to IS 904 as required :	1	Nos	7500	7500

16	Supply, Installation, Testing & Commissioning of Type -A- single headed, Gunmetal ISI marked oblique pattern **hydrant landing valve** with 80 mm dia flange inlet and 63 mm dia instantaneous type female out let, blank caps, chain, bend complete with gunmetal/stainless steel cap and G.I chain twist release type plug and all accessories as per IS:5290-1983	2	Nos	6000	12000
17	Supply, installation, testing and commissioning of **First-aid Hose Reel** with MS construction spray painted in Post office Red, conforming to IS 884 with up to date amendments, complete with the following as required as per technical specification. (a) 30 m. long 20 mm (nominal internal dia water hose Thermoplastic (Textile reinforced) Type-2 as per IS:12585 (b) 20 mm (nominal internal) dia gun metal globe valve nozzle. (c) Drum and brackets for fixing the equipments on wall. (d) Connections from riser with suitable dia stop valve (gun metal)	2	Nos	8500	17000
18	Supplying and fixing 63 mm dia, 15 m long **RRL hose** pipe with 63 mm dia male and female Gun metal couplings duly bound with GI wire, rivets etc. conforming to IS 636 (type-A) as required	4	Nos	6000	24000
19	Supplying & fixing 63 mm dia **gun metal short branch pipe** with 20 mm nominal internal diameter size nozzle conforming to IS 903 suitable for instantaneous connection to interconnect hose pipe coupling as required	2	Nos	2940	5880
20	Supply, Testing and commissioning of Break glass type **Manual call point** .	2	Nos	5232.41	10464.82
21	Supply, Testing and commissioning of **Hooter**	2	Nos	7073	14146
22	Supply and laying of **2 core x 1.5 Sq. mm stranded Tinned copper conductor**, PVC insulated, FRLS PVC outer sheathed1100 Volts grade shielded, armoured cable.	300	Mtr	55.5919	16677.57
23	Supplying, fabricating and installing following size of perforated **M.S. cable trays**, including horizontal and vertical bends, reducers, tees, cross members and other accessories as required and duly suspended from the ceiling with M.S. suspenders and including paint 100 mm width X 50 mm depth X 1.6 mm thickness	200	Mtr	645.4084	129081.68
24	Supply, Testing and commissioning of **FACP**	1	Nos	10000	10000
25	Coordination and Getting approval from Fire Dept	1	LS	50000	50000
	Sum				**695796.364**

Including 18% GST 821039.71

Annexure

06

Cost Benefit Analysis

REVENUE GENERATION																									
FACTORS	***Number***	***Amount***	***1 Year***	***2 Year***	***3 Year***	***4 Year***	***5 Year***	***6 Year***	***7 Year***	***8 Year***	***9 Year***	***10 Year***	***11 Year***	***12 Year***	***13 Year***	***14 Year***	***15 Year***	***16 Year***	***17 Year***	***18 Year***	***19 Year***	***20 Year***	***21 Year***	***22 Year***	***23 Year***	***24 Year***	***25 Year***
Kiosk (per day 200 Rs for each@10 Nos)	*10*	₹ *200.00*	₹ 6,00,000.00	₹ 6,60,000.00	₹ 7,26,000.00	₹ 7,98,600.00	₹ 8,78,460.00	₹ 9,66,306.00	₹ 10,62,936.60	₹ 11,69,230.26	₹ 12,86,153.29	₹ 14,14,768.61	₹ 15,56,245.48	₹ 17,11,870.02	₹ 18,83,057.03	₹ 20,71,362.73	₹ 22,78,499.00	₹ 25,06,348.90	₹ 27,56,983.79	₹ 30,32,682.17	₹ 33,35,950.39	₹ 36,69,545.43	₹ 40,36,499.97	₹ 44,40,149.97	₹ 48,84,164.96	₹ 53,72,581.46	₹ 59,09,839.61
Pay and Use Toilet (10 Rs per person)		₹ *10.00*	₹ 74,62,992.00	₹ 82,09,291.20	₹ 90,30,220.32	₹ 99,33,242.35	₹ 1,09,26,566.59	₹ 1,20,19,223.25	₹ 1,32,21,145.57	₹ 1,45,43,260.13	₹ 1,59,97,586.14	₹ 1,75,97,344.75	₹ 1,93,57,079.23	₹ 2,12,92,787.15	₹ 2,34,22,065.87	₹ 2,57,64,272.45	₹ 2,83,40,699.70	₹ 3,11,74,769.67	₹ 3,42,92,246.64	₹ 3,77,21,471.30	₹ 4,14,93,618.43	₹ 4,56,42,980.27	₹ 5,02,07,278.30	₹ 5,52,28,006.13	₹ 6,07,50,806.75	₹ 6,68,25,887.42	₹ 7,35,08,476.16
Bath and changing Area (20 Rs per head)		₹ *20.00*	₹ 23,88,157.44	₹ 26,26,973.18	₹ 28,89,670.50	₹ 31,78,637.55	₹ 34,96,501.31	₹ 38,46,151.44	₹ 42,30,766.58	₹ 46,53,843.24	₹ 51,19,227.56	₹ 56,31,150.32	₹ 61,94,265.35	₹ 68,13,691.89	₹ 74,95,061.08	₹ 82,44,567.19	₹ 90,69,023.90	₹ 99,75,926.29	₹ 1,09,73,518.92	₹ 1,20,70,870.82	₹ 1,32,77,957.90	₹ 1,46,05,753.69	₹ 1,60,66,329.06	₹ 1,76,72,961.96	₹ 1,94,40,258.16	₹ 2,13,84,283.97	₹ 2,35,22,712.37
Cloak Room (20 Rs per belongings)		₹ *20.00*	₹ 17,41,364.80	₹ 19,15,501.28	₹ 21,07,051.41	₹ 23,17,756.55	₹ 25,49,532.20	₹ 28,04,485.42	₹ 30,84,933.97	₹ 33,93,427.36	₹ 37,32,770.10	₹ 41,06,047.11	₹ 45,16,651.82	₹ 49,68,317.00	₹ 54,65,148.70	₹ 60,11,663.57	₹ 66,12,829.93	₹ 72,74,112.92	₹ 80,01,524.22	₹ 88,01,676.64	₹ 96,81,844.30	₹ 1,06,50,028.73	₹ 1,17,15,031.60	₹ 1,28,86,534.76	₹ 1,41,75,188.24	₹ 1,55,92,707.06	₹ 1,71,51,977.77
Ticket counter 1 - Rs.200 foreigners (edakkal)		₹ *200.00*	₹ 62,19,160.00	₹ 68,41,076.00	₹ 75,25,183.60	₹ 82,77,701.96	₹ 91,05,472.16	₹ 1,00,16,019.37	₹ 1,10,17,621.31	₹ 1,21,19,383.44	₹ 1,33,31,321.78	₹ 1,46,64,453.96	₹ 1,61,30,899.36	₹ 1,77,43,989.29	₹ 1,95,18,388.22	₹ 2,14,70,227.05	₹ 2,36,17,249.75	₹ 2,59,78,974.73	₹ 2,85,76,872.20	₹ 3,14,34,559.42	₹ 3,45,78,015.36	₹ 3,80,35,816.90	₹ 4,18,39,398.58	₹ 4,60,23,338.44	₹ 5,06,25,672.29	₹ 5,56,88,239.52	₹ 6,12,57,063.47
Ticket counter 1 - Rs. 70 for domestic (edakkal)		₹ *70.00*	₹ 21,76,706.00	₹ 23,94,376.60	₹ 26,33,814.26	₹ 28,97,195.69	₹ 31,86,915.25	₹ 35,05,606.78	₹ 38,56,167.46	₹ 42,41,784.20	₹ 46,65,962.62	₹ 51,32,558.89	₹ 56,45,814.78	₹ 62,10,396.25	₹ 68,31,435.88	₹ 75,14,579.47	₹ 82,66,037.41	₹ 90,92,641.15	₹ 1,00,01,905.27	₹ 1,10,02,095.80	₹ 1,21,02,305.38	₹ 1,33,12,535.91	₹ 1,46,43,789.50	₹ 1,61,08,168.46	₹ 1,77,18,985.30	₹ 1,94,90,883.83	₹ 2,14,39,972.21
Ticket counter 2 - Rs.500 foreigners		₹ *500.00*	₹ 62,19,160.00	₹ 68,41,076.00	₹ 75,25,183.60	₹ 82,77,701.96	₹ 91,05,472.16	₹ 1,00,16,019.37	₹ 1,10,17,621.31	₹ 1,21,19,383.44	₹ 1,33,31,321.78	₹ 1,46,64,453.96	₹ 1,61,30,899.36	₹ 1,77,43,989.29	₹ 1,95,18,388.22	₹ 2,14,70,227.05	₹ 2,36,17,249.75	₹ 2,59,78,974.73	₹ 2,85,76,872.20	₹ 3,14,34,559.42	₹ 3,45,78,015.36	₹ 3,80,35,816.90	₹ 4,18,39,398.58	₹ 4,60,23,338.44	₹ 5,06,25,672.29	₹ 5,56,88,239.52	₹ 6,12,57,063.47
Ticket counter 2 - Rs.300 domestic		₹ *300.00*	₹ 93,28,740.00	₹ 1,02,61,614.00	₹ 1,12,87,775.40	₹ 1,24,16,552.94	₹ 1,36,58,208.23	₹ 1,50,24,029.06	₹ 1,65,26,431.96	₹ 1,81,79,075.16	₹ 1,99,96,982.68	₹ 2,19,96,680.94	₹ 2,41,96,349.04	₹ 2,66,15,983.94	₹ 2,92,77,582.34	₹ 3,22,05,340.57	₹ 3,54,25,874.63	₹ 3,89,68,462.09	₹ 4,28,65,308.30	₹ 4,71,51,839.13	₹ 5,18,67,023.04	₹ 5,70,53,725.34	₹ 6,27,59,097.88	₹ 6,90,35,007.66	₹ 7,59,38,508.43	₹ 8,35,32,359.27	₹ 9,18,85,595.20
Bicycles(Rs 20 for each @ 10	*10*	₹ *20.00*	₹ 2,48,766.40	₹ 2,73,643.04	₹ 3,01,007.34	₹ 3,31,108.08	₹ 3,64,218.89	₹ 4,00,640.77	₹ 4,40,704.85	₹ 4,84,775.34	₹ 5,33,252.87	₹ 5,86,578.16	₹ 6,45,235.97	₹ 7,09,759.57	₹ 7,80,735.53	₹ 8,58,809.08	₹ 9,44,689.99	₹ 10,39,158.99	₹ 11,43,074.89	₹ 12,57,382.38	₹ 13,83,120.61	₹ 15,21,432.68	₹ 16,73,575.94	₹ 18,40,933.54	₹ 20,25,026.89	₹ 22,27,529.58	₹ 24,50,282.54

no.s)(10 % for DTPC)																									
Bill Boards(80 in Nos)(3000 PER BILLBOARD per month)	*80*	*3000 /month*	₹ 19,20,000.00	₹ 21,12,000.00	₹ 23,23,200.00	₹ 25,55,520.00	₹ 28,11,072.00	₹ 30,92,179.20	₹ 34,01,397.12	₹ 37,41,536.83	₹ 41,15,690.52	₹ 45,27,259.57	₹ 49,79,985.52	₹ 54,77,984.08	₹ 60,25,782.48	₹ 66,28,360.73	₹ 72,91,196.80	₹ 80,20,316.49	₹ 88,22,348.13	₹ 97,04,582.95	₹ 1,06,75,041.24	₹ 1,17,42,545.37	₹ 1,29,16,799.90	₹ 1,42,08,479.89	₹ 1,56,29,327.88	₹ 1,71,92,260.67	₹ 1,89,11,486.74
Led walls-Advertising(800 per sq.ft per month)	*200 sq.ft*	₹ *800.00*	₹ 1,60,000.00	₹ 1,76,000.00	₹ 1,93,600.00	₹ 2,12,960.00	₹ 2,34,256.00	₹ 2,57,681.60	₹ 2,83,449.76	₹ 3,11,794.74	₹ 3,42,974.21	₹ 3,77,271.63	₹ 4,14,998.79	₹ 4,56,498.67	₹ 5,02,148.54	₹ 5,52,363.39	₹ 6,07,599.73	₹ 6,68,359.71	₹ 7,35,195.68	₹ 8,08,715.25	₹ 8,89,586.77	₹ 9,78,545.45	₹ 10,76,399.99	₹ 11,84,039.99	₹ 13,02,443.99	₹ 14,32,688.39	₹ 15,75,957.23
Silent Valley (per month Rs 100000)		*100000/month*	₹ 12,00,000.00	₹ 13,20,000.00	₹ 14,52,000.00	₹ 15,97,200.00	₹ 17,56,920.00	₹ 19,32,612.00	₹ 21,25,873.20	₹ 23,38,460.52	₹ 25,72,306.57	₹ 28,29,537.23	₹ 31,12,490.95	₹ 34,23,740.05	₹ 37,66,114.05	₹ 41,42,725.46	₹ 45,56,998.00	₹ 50,12,697.80	₹ 55,13,967.58	₹ 60,65,364.34	₹ 66,71,900.78	₹ 73,39,090.85	₹ 80,72,999.94	₹ 88,80,299.93	₹ 97,68,329.93	₹ 1,07,45,162.92	₹ 1,18,19,679.21
Water Sports Activity (Knee boarding, water scooter)			₹ 30,00,000.00	₹ 33,00,000.00	₹ 36,30,000.00	₹ 39,93,000.00	₹ 43,92,300.00	₹ 48,31,530.00	₹ 53,14,683.00	₹ 58,46,151.30	₹ 64,30,766.43	₹ 70,73,843.07	₹ 77,81,227.38	₹ 85,59,350.12	₹ 94,15,285.13	₹ 1,03,56,813.64	₹ 1,13,92,495.01	₹ 1,25,31,744.51	₹ 1,37,84,918.96	₹ 1,51,63,410.85	₹ 1,66,79,751.94	₹ 1,83,47,727.13	₹ 2,01,82,499.85	₹ 2,22,00,749.83	₹ 2,44,20,824.82	₹ 2,68,62,907.30	₹ 2,95,49,198.03
Scuba diving 3000 daily 5 people (10% for dtpc)	*5*	₹ *3,000.00*	₹ 27,00,000.00	₹ 29,70,000.00	₹ 32,67,000.00	₹ 35,93,700.00	₹ 39,53,070.00	₹ 43,48,377.00	₹ 47,83,214.70	₹ 52,61,536.17	₹ 57,87,689.79	₹ 63,66,458.77	₹ 70,03,104.64	₹ 77,03,415.11	₹ 84,73,756.62	₹ 93,21,132.28	₹ 1,02,53,245.51	₹ 1,12,78,570.06	₹ 1,24,06,427.06	₹ 1,36,47,069.77	₹ 1,50,11,776.75	₹ 1,65,12,954.42	₹ 1,81,64,249.86	₹ 1,99,80,674.85	₹ 2,19,78,742.33	₹ 2,41,76,616.57	₹ 2,65,94,278.22
paragliding 2000 per 5 people (10% for dtpc)	*5*	₹ *2,000.00*	₹ 15,00,000.00	₹ 16,50,000.00	₹ 18,15,000.00	₹ 19,96,500.00	₹ 21,96,150.00	₹ 24,15,765.00	₹ 26,57,341.50	₹ 29,23,075.65	₹ 32,15,383.22	₹ 35,36,921.54	₹ 38,90,613.69	₹ 42,79,675.06	₹ 47,07,642.57	₹ 51,78,406.82	₹ 56,96,247.50	₹ 62,65,872.25	₹ 68,92,459.48	₹ 75,81,705.43	₹ 83,39,875.97	₹ 91,73,863.57	₹ 1,00,91,249.92	₹ 1,11,00,374.92	₹ 1,22,10,412.41	₹ 1,34,31,453.65	₹ 1,47,74,599.01
Hoardings (5000)			₹ 12,00,000.00	₹ 13,20,000.00	₹ 14,52,000.00	₹ 15,97,200.00	₹ 17,56,920.00	₹ 19,32,612.00	₹ 21,25,873.20	₹ 23,38,460.52	₹ 25,72,306.57	₹ 28,29,537.23	₹ 31,12,490.95	₹ 34,23,740.05	₹ 37,66,114.05	₹ 41,42,725.46	₹ 45,56,998.00	₹ 50,12,697.80	₹ 55,13,967.58	₹ 60,65,364.34	₹ 66,71,900.78	₹ 73,39,090.85	₹ 80,72,999.94	₹ 88,80,299.93	₹ 97,68,329.93	₹ 1,07,45,162.92	₹ 1,18,19,679.21
Solar panels			₹ 60,000.00	₹ 66,000.00	₹ 72,600.00	₹ 79,860.00	₹ 87,846.00	₹ 96,630.60	₹ 1,06,293.66	₹ 1,16,923.03	₹ 1,28,615.33	₹ 1,41,476.86	₹ 1,55,624.55	₹ 1,71,187.00	₹ 1,88,305.70	₹ 2,07,136.27	₹ 2,27,849.90	₹ 2,50,634.89	₹ 2,75,698.38	₹ 3,03,268.22	₹ 3,33,595.04	₹ 3,66,954.54	₹ 4,03,650.00	₹ 4,44,015.00	₹ 4,88,416.50	₹ 5,37,258.15	₹ 5,90,983.96
Cable stayed		₹ *500.00*	₹ 1,20,	₹ 1,32,	₹ 1,45,200.00	₹ 1,59,720.00	₹ 1,75,692.00	₹ 1,93,261.20	₹ 2,12,587.32	₹ 2,33,846.05	₹ 2,57,230.66	₹ 2,82,953.72	₹ 3,11,249.10	₹ 3,42,374.00	₹ 3,76,611.41	₹ 4,14,272.55	₹ 4,55,699.80	₹ 5,01,269.78	₹ 5,51,396.76	₹ 6,06,536.43	₹ 6,67,190.08	₹ 7,33,909.09	₹ 8,07,299.99	₹ 8,88,029.99	₹ 9,76,832.99	₹ 10,74,	₹ 11,81,

				000.00	000.00																				516.29	967.92
Boating	*considering 12 boats*	*6*	*₹ 1,500.00*	₹ 2,59,20,000.00	₹ 2,85,12,000.00	₹ 3,13,63,200.00	₹ 3,44,99,520.00	₹ 3,79,49,472.00	₹ 4,17,44,419.20	₹ 4,59,18,861.12	₹ 5,05,10,747.23	₹ 5,55,61,821.96	₹ 6,11,18,004.15	₹ 6,72,29,804.57	₹ 7,39,52,785.02	₹ 8,13,48,063.52	₹ 8,94,82,869.88	₹ 9,84,31,156.86	₹ 10,82,74,272.55	₹ 11,91,01,699.81	₹ 13,10,11,869.79	₹ 14,41,13,056.77	₹ 15,85,24,362.44	₹ 17,43,76,798.69	₹ 19,18,14,478.56	₹ 21,09,95,926.41	₹ 23,20,95,519.05	₹ 25,53,05,070.96
Parking - 2 wheel		*350*	*₹ 15.00*	₹ 12,60,000.00	₹ 13,86,000.00	₹ 15,24,600.00	₹ 16,77,060.00	₹ 18,44,766.00	₹ 20,29,242.60	₹ 22,32,166.86	₹ 24,55,383.55	₹ 27,00,921.90	₹ 29,71,014.09	₹ 32,68,115.50	₹ 35,94,927.05	₹ 39,54,419.75	₹ 43,49,861.73	₹ 47,84,847.90	₹ 52,63,332.69	₹ 57,89,665.96	₹ 63,68,632.56	₹ 70,05,495.82	₹ 77,06,045.40	₹ 84,76,649.94	₹ 93,24,314.93	₹ 1,02,56,746.42	₹ 1,12,82,421.07	₹ 1,24,10,663.17
Parking - 4 wheel		*250*	*₹ 35.00*	₹ 21,00,000.00	₹ 23,10,000.00	₹ 25,41,000.00	₹ 27,95,100.00	₹ 30,74,610.00	₹ 33,82,071.00	₹ 37,20,278.10	₹ 40,92,305.91	₹ 45,01,536.50	₹ 49,51,690.15	₹ 54,46,859.17	₹ 59,91,545.08	₹ 65,90,699.59	₹ 72,49,769.55	₹ 79,74,746.51	₹ 87,72,221.16	₹ 96,49,443.27	₹ 1,06,14,387.60	₹ 1,16,75,826.36	₹ 1,28,43,408.99	₹ 1,41,27,749.89	₹ 1,55,40,524.88	₹ 1,70,94,577.37	₹ 1,88,04,035.11	₹ 2,06,84,438.62
Parking - Bus		*60*	*₹ 70.00*	₹ 10,08,000.00	₹ 11,08,800.00	₹ 12,19,680.00	₹ 13,41,648.00	₹ 14,75,812.80	₹ 16,23,394.08	₹ 17,85,733.49	₹ 19,64,306.84	₹ 21,60,737.52	₹ 23,76,811.27	₹ 26,14,492.40	₹ 28,75,941.64	₹ 31,63,535.80	₹ 34,79,889.38	₹ 38,27,878.32	₹ 42,10,666.15	₹ 46,31,732.77	₹ 50,94,906.05	₹ 56,04,396.65	₹ 61,64,836.32	₹ 67,81,319.95	₹ 74,59,451.94	₹ 82,05,397.14	₹ 90,25,936.85	₹ 99,28,530.54
Advertisement			*₹ 300.00*	₹ 72,00,000.00	₹ 79,20,000.00	₹ 87,12,000.00	₹ 95,83,200.00	₹ 1,05,41,520.00	₹ 1,15,95,672.00	₹ 1,27,55,239.20	₹ 1,40,30,763.12	₹ 1,54,33,839.43	₹ 1,69,77,223.37	₹ 1,86,74,945.71	₹ 2,05,42,440.28	₹ 2,25,96,684.31	₹ 2,48,56,352.74	₹ 2,73,41,988.01	₹ 3,00,76,186.81	₹ 3,30,83,805.49	₹ 3,63,92,186.04	₹ 4,00,31,404.64	₹ 4,40,34,545.11	₹ 4,84,38,000.62	₹ 5,32,81,800.68	₹ 5,86,09,980.75	₹ 6,44,70,978.82	₹ 7,09,18,076.70
Open theater	*considering 2 shows*		*₹ 7,000.00*	₹ 33,60,000.00	₹ 36,96,000.00	₹ 40,65,600.00	₹ 44,72,160.00	₹ 49,19,376.00	₹ 54,11,313.60	₹ 59,52,444.96	₹ 65,47,689.46	₹ 72,02,458.40	₹ 79,22,704.24	₹ 87,14,974.67	₹ 95,86,472.13	₹ 1,05,45,119.35	₹ 1,15,99,631.28	₹ 1,27,59,594.41	₹ 1,40,35,553.85	₹ 1,54,39,109.23	₹ 1,69,83,020.16	₹ 1,86,81,322.17	₹ 2,05,49,454.39	₹ 2,26,04,399.83	₹ 2,48,64,839.81	₹ 2,73,51,323.79	₹ 3,00,86,456.17	₹ 3,30,95,101.79
Children's park		*150*	*₹ 30.00*	₹ 10,80,000.00	₹ 11,88,000.00	₹ 13,06,800.00	₹ 14,37,480.00	₹ 15,81,228.00	₹ 17,39,350.80	₹ 19,13,285.88	₹ 21,04,614.47	₹ 23,15,075.91	₹ 25,46,583.51	₹ 28,01,241.86	₹ 30,81,366.04	₹ 33,89,502.65	₹ 37,28,452.91	₹ 41,01,298.20	₹ 45,11,428.02	₹ 49,62,570.83	₹ 54,58,827.91	₹ 60,04,710.70	₹ 66,05,181.77	₹ 72,65,699.95	₹ 79,92,269.94	₹ 87,91,496.93	₹ 96,70,646.63	₹ 1,06,37,711.29
Segway		*10*	*₹ 30.00*	₹ 18,00,000.00	₹ 19,80,000.00	₹ 21,78,000.00	₹ 18,00,000.00	₹ 19,80,000.00	₹ 21,78,000.00	₹ 18,00,000.00	₹ 19,80,000.00	₹ 21,78,000.00	₹ 18,00,000.00	₹ 19,80,000.00	₹ 21,78,000.00	₹ 18,00,000.00	₹ 19,80,000.00	₹ 21,78,000.00	₹ 23,95,800.00	₹ 26,35,380.00	₹ 28,98,918.00	₹ 31,88,809.80	₹ 35,07,690.78	₹ 38,58,459.86	₹ 42,44,305.84	₹ 46,68,736.43	₹ 51,35,610.07	₹ 56,49,171.08
Total				**₹ 8,48,45,046.64**	**₹ 9,33,29,551.30**	**₹ 10,26,62,506.43**	**₹ 11,23,32,957.08**	**₹ 12,35,66,252.79**	**₹ 13,59,22,878.06**	**₹ 14,89,19,365.87**	**₹ 16,38,11,302.46**	**₹ 18,01,92,432.70**	**₹ 19,76,15,875.97**	**₹ 21,73,77,463.57**	**₹ 23,91,15,209.93**	**₹ 26,24,30,930.92**	**₹ 28,86,74,024.01**	**₹ 31,75,41,426.41**	**₹ 34,92,95,569.06**	**₹ 38,42,25,125.96**	**₹ 42,26,47,638.56**	**₹ 46,49,12,402.41**	**₹ 51,14,03,642.65**	**₹ 56,25,44,006.92**	**₹ 61,87,98,407.61**	**₹ 68,06,78,248.37**	**₹ 74,87,46,073.21**	**₹ 82,36,20,680.53**

EXPENDITURE																									
Factors	***No:***	***Amount/month***	***1 Year***	***2 Year***	***3 Year***	***4 Year***	***5 Year***	***6 Year***	***7 Year***	***8 Year***	***9 Year***	***10 Year***	***11 Year***	***12 Year***	***13 Year***	***14 Year***	***15 Year***	***16 Year***	***17 Year***	***18 Year***	***19 Year***	***20 Year***	***21 Year***	***22 Year***	***23 Year***	***24 Year***	***25 Year***
Administrative work force	4	₹ 20,000.00	₹ 9,60,000.00	₹ 10,56,000.00	₹ 11,61,600.00	₹ 12,77,760.00	₹ 14,05,536.00	₹ 15,46,089.60	₹ 17,00,698.56	₹ 18,70,768.42	₹ 20,57,845.26	₹ 22,63,629.78	₹ 24,89,992.76	₹ 27,38,992.04	₹ 30,12,891.24	₹ 33,14,180.37	₹ 36,45,598.40	₹ 40,10,158.24	₹ 44,11,174.07	₹ 48,52,291.47	₹ 53,37,520.62	₹ 58,71,272.68	₹ 64,58,399.95	₹ 71,04,239.95	₹ 78,14,663.94	₹ 85,96,130.34	₹ 94,55,743.37
Supervisor	4	₹ 17,000.00	₹ 8,16,000.00	₹ 8,97,600.00	₹ 9,87,360.00	₹ 10,86,096.00	₹ 11,94,705.60	₹ 13,14,176.16	₹ 14,45,593.78	₹ 15,90,153.15	₹ 17,49,168.47	₹ 19,24,085.32	₹ 21,16,493.85	₹ 23,28,143.23	₹ 25,60,957.56	₹ 28,17,053.31	₹ 30,98,758.64	₹ 34,08,634.51	₹ 37,49,497.96	₹ 41,24,447.75	₹ 45,36,892.53	₹ 49,90,581.78	₹ 54,89,639.96	₹ 60,38,603.95	₹ 66,42,464.35	₹ 73,06,710.78	₹ 80,37,381.86
Cleaning staff	12	₹ 13,000.00	₹ 18,72,000.00	₹ 20,59,200.00	₹ 22,65,120.00	₹ 24,91,632.00	₹ 27,40,795.20	₹ 30,14,874.72	₹ 33,16,362.19	₹ 36,47,998.41	₹ 40,12,798.25	₹ 44,14,078.08	₹ 48,55,485.89	₹ 53,41,034.47	₹ 58,75,137.92	₹ 64,62,651.71	₹ 71,08,916.88	₹ 78,19,808.57	₹ 86,01,789.43	₹ 94,61,968.37	₹ 1,04,08,165.21	₹ 1,14,48,981.73	₹ 1,25,93,879.91	₹ 1,38,53,267.90	₹ 1,52,38,594.69	₹ 1,67,62,454.15	₹ 1,84,38,699.57
Security staff	16	₹ 12,000.00	₹ 23,04,000.00	₹ 25,34,400.00	₹ 27,87,840.00	₹ 30,66,624.00	₹ 33,73,286.40	₹ 37,10,615.04	₹ 40,81,676.54	₹ 44,89,844.20	₹ 49,38,828.62	₹ 54,32,711.48	₹ 59,75,982.63	₹ 65,73,580.89	₹ 72,30,938.98	₹ 79,54,032.88	₹ 87,49,436.17	₹ 96,24,379.78	₹ 1,05,86,817.76	₹ 1,16,45,499.54	₹ 1,28,10,049.49	₹ 1,40,91,054.44	₹ 1,55,00,159.88	₹ 1,70,50,175.87	₹ 1,87,55,193.46	₹ 2,06,30,712.80	₹ 2,26,93,784.09
Redevelopment	1	₹ 30,000.00	₹ 3,60,000.00	₹ 3,96,000.00	₹ 4,35,600.00	₹ 4,79,160.00	₹ 5,27,076.00	₹ 5,79,783.60	₹ 6,37,761.96	₹ 7,01,538.16	₹ 7,71,691.97	₹ 8,48,861.17	₹ 9,33,747.29	₹ 10,27,122.01	₹ 11,29,834.22	₹ 12,42,817.64	₹ 13,67,099.40	₹ 15,03,809.34	₹ 16,54,190.28	₹ 18,19,609.30	₹ 20,01,570.23	₹ 22,01,727.26	₹ 24,21,899.98	₹ 26,64,089.98	₹ 29,30,498.98	₹ 32,23,548.88	₹ 35,45,903.76
Lifeguards	16	₹ 15,000.00	₹ 28,80,000.00	₹ 31,68,000.00	₹ 34,84,800.00	₹ 38,33,280.00	₹ 42,16,608.00	₹ 46,38,268.80	₹ 51,02,095.68	₹ 56,12,305.25	₹ 61,73,535.77	₹ 67,90,889.35	₹ 74,69,978.29	₹ 82,16,976.11	₹ 90,38,673.72	₹ 99,42,541.10	₹ 1,09,36,795.21	₹ 1,20,30,474.73	₹ 1,32,33,522.20	₹ 1,45,56,874.42	₹ 1,60,12,561.86	₹ 1,76,13,818.05	₹ 1,93,75,199.85	₹ 2,13,12,719.84	₹ 2,34,43,991.82	₹ 2,57,88,391.01	₹ 2,83,67,230.11
Manufacturing expenses	1	₹ 25,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,00,000.00	₹ 3,30,000.00	₹ 3,63,000.00	₹ 3,99,300.00	₹ 4,39,230.00	₹ 4,83,153.00	₹ 5,31,468.30	₹ 5,84,615.13	₹ 6,43,076.64	₹ 7,07,384.31	₹ 7,78,122.74
Electrical appliances	1	₹ 60,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,20,000.00	₹ 7,92,000.00	₹ 8,71,200.00	₹ 9,58,320.00	₹ 10,54,152.00	₹ 11,59,567.20	₹ 12,75,523.92	₹ 14,03,076.31	₹ 15,43,383.94	₹ 16,97,722.34	₹ 18,67,494.57
Electronics appliances	1	₹ 65,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 7,80,000.00	₹ 8,58,000.00	₹ 9,43,800.00	₹ 10,38,180.00	₹ 11,41,998.00	₹ 12,56,197.80	₹ 13,81,817.58	₹ 15,19,999.34	₹ 16,71,999.27	₹ 18,39,199.20	₹ 20,23,119.12
Repair and replacement	1	₹ 30,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,60,000.00	₹ 3,96,000.00	₹ 4,35,600.00	₹ 4,79,160.00	₹ 5,27,076.00	₹ 5,79,783.60	₹ 6,37,761.96	₹ 7,01,538.16	₹ 7,71,691.97	₹ 8,48,861.17	₹ 9,33,747.29

Solar panel	1	₹ 55,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 6,60,000.00	₹ 7,26,000.00	₹ 7,98,600.00	₹ 8,78,460.00	₹ 9,66,306.00	₹ 10,62,936.60	₹ 11,69,230.26	₹ 12,86,153.29	₹ 14,14,768.61	₹ 15,56,245.48	₹ 17,11,870.02
Maintanace and procurement	1	₹ 20,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,40,000.00	₹ 2,64,000.00	₹ 2,90,400.00	₹ 3,19,440.00	₹ 3,51,384.00	₹ 3,86,522.40	₹ 4,25,174.64	₹ 4,67,692.10	₹ 5,14,461.31	₹ 5,65,907.45	₹ 6,22,498.19
Solid waste management	1	₹ 50,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,60,000.00	₹ 7,26,000.00	₹ 7,98,600.00	₹ 8,78,460.00	₹ 9,66,306.00	₹ 10,62,936.60	₹ 11,69,230.26	₹ 12,86,153.29	₹ 14,14,768.61	₹ 15,56,245.48
Lumpsump	1	₹ 40,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 4,80,000.00	₹ 5,28,000.00	₹ 5,80,800.00	₹ 6,38,880.00	₹ 7,02,768.00	₹ 7,73,044.80	₹ 8,50,349.28	₹ 9,35,384.21	₹ 10,28,922.63	₹ 11,31,814.89	₹ 12,44,996.38
Other amenities	1	₹ 50,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,00,000.00	₹ 6,60,000.00	₹ 7,26,000.00	₹ 7,98,600.00	₹ 8,78,460.00	₹ 9,66,306.00	₹ 10,62,936.60	₹ 11,69,230.26	₹ 12,86,153.29	₹ 14,14,768.61	₹ 15,56,245.48
Water usage (Toilet)	20	₹ 5,790.00	₹ 69,480.00	₹ 76,428.00	₹ 84,070.80	₹ 92,477.88	₹ 1,01,725.67	₹ 1,11,898.23	₹ 1,23,088.06	₹ 1,35,396.86	₹ 1,48,936.55	₹ 1,63,830.21	₹ 1,80,213.23	₹ 1,98,234.55	₹ 2,18,058.00	₹ 2,39,863.80	₹ 2,63,850.18	₹ 2,90,235.20	₹ 3,19,258.72	₹ 3,51,184.60	₹ 3,86,303.05	₹ 4,24,933.36	₹ 4,67,426.70	₹ 5,14,169.37	₹ 5,65,586.30	₹ 6,22,144.93	₹ 6,84,359.43
Total			₹ 1,40,01,480.00	₹ 1,49,27,628.00	₹ 1,59,46,390.80	₹ 1,70,67,029.88	₹ 1,82,99,732.87	₹ 1,96,55,706.15	₹ 2,11,47,276.77	₹ 2,27,88,004.45	₹ 2,45,92,804.89	₹ 2,65,78,085.38	₹ 2,87,61,893.92	₹ 3,11,64,083.31	₹ 3,38,06,491.64	₹ 3,67,13,140.81	₹ 3,99,10,454.89	₹ 4,39,01,500.38	₹ 4,82,91,650.41	₹ 5,31,20,815.46	₹ 5,84,32,897.00	₹ 6,42,76,186.70	₹ 7,07,03,805.37	₹ 7,77,74,185.91	₹ 8,55,51,604.50	₹ 9,41,06,764.95	₹ 10,35,17,441.44

KIIFB Consultancy Services Unit

2nd Floor, Felicity Square, MG Road, Statue,
Thiruvanathapuram, Kerala, India-695001