15 -ാം കേരള നിയമസഭ

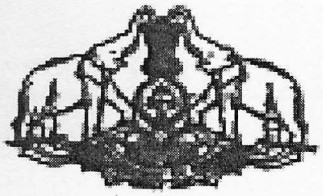
11 -ാം സമ്മേളനം

നക്ഷത്ര ചിഹ്നം ഇല്ലാത്ത ചോദ്യം നം. 1035 **12-06-2024 - ൽ മറുപടിയ്ക്ക്**

തിരുരങ്ങാടി മണ്ഡലത്തിലെ മൂഴിക്കൽ തടയണ

ചോദ്യം		ഉത്തരം	
ശ്രീ. കെ. പി. എ. മജീദ്		**ശ്രീ. റോഷി അഗസ്റ്റിൻ (ജലവിഭവ വകുപ്പ് മന്ത്രി)**	
(എ)	തിരുരങ്ങാടി മണ്ഡലത്തിലെ പാലത്തിങ്ങൽ പ്രദേശത്ത് സ്ഥാപിക്കുന്ന നിർദിഷ്ട മൂഴിക്കൽ തടയണയുടെ നിർമ്മാണ പ്രവൃത്തിയുടെ നിലവിലെ അവസ്ഥ വിശദമാക്കാമോ;	(എ)	തിരുരങ്ങാടി മണ്ഡലത്തിലെ മൂഴിക്കൽ തടയണയുടെ ഇൻവെസ്റ്റിഗേഷൻ പ്രവർത്തികൾ പൂർത്തീകരിച്ച് ഡിസൈൻ ലഭ്യമാക്കുന്നതിനായി പര്യവേക്ഷണ റിപ്പോർട്ട് ഐ.ഡി.ആർ.ബി-യ്ക്ക് നല്കിയിട്ടുണ്ട്. ഡിസൈൻ ലഭ്യമാകുന്ന മുറയ്ക്ക് എസ്റ്റിമേറ്റ് തയ്യാറാക്കാവുന്നതാണ്. പ്രവൃത്തിയെ സംബന്ധിച്ച പഠന റിപ്പോർട്ടിന്റെ (പര്യവേക്ഷണ റിപ്പോർട്ട്) പകർപ്പ് ഇതോടൊപ്പം അനുബന്ധമായി ചേർത്തിരിക്കുന്നു.
(ബി)	പ്രസ്തുത പ്രവൃത്തിയെ സംബന്ധിച്ച പഠന റിപ്പോർട്ടിന്റെ പകർപ്പ് ലഭ്യമാക്കാമോ;	(ബി)	മറുപടി എ പിരിവിൽ രേഖപ്പെടുത്തിയിരിക്കുന്നു.
(സി)	പ്രസ്തുത പദ്ധതിയുടെ എസ്റ്റിമേറ്റ് തയ്യാറാക്കിയിട്ടുണ്ടോ; ഉണ്ടെങ്കിൽ ജി. എസ്. ടി. അടക്കം മൊത്തം തുക എത്രയാണെന്ന് വിശദമാക്കാമോ;	(സി)	മറുപടി എ പിരിവിൽ രേഖപ്പെടുത്തിയിരിക്കുന്നു.
(ഡി)	പ്രസ്തുത പ്രവൃത്തിക്ക് ഭരണാനുമതി ലഭ്യമാക്കുന്നതിനുള്ള ഫയൽ സർക്കാരിൽ ഉണ്ടെങ്കിൽ ഫയൽ നമ്പർ സഹിതം വിശദമാക്കാമോ?	(ഡി)	മറുപടി എ പിരിവിൽ രേഖപ്പെടുത്തിയിരിക്കുന്നു.

സെക്ഷൻ ഓഫീസർ



GOVERNMENT OF KERALA

IRRIGATION DEPARTMENT

MALAPPURAM

PROJECT REPORT

ON

INVESTIGATION WORKS FOR THE CONSTRUCTION OF REGULATOR ACROSS KADALUNDI RIVER AT MOOZHIKKAL KADAVU NEAR PALATHINGAL BETWEEN TIRURANGADI MUNICIPALITY AND MOONNIYUR PANCHAYATH

LIST OF CONTENTS

THE REPORT FOR INVESTIGATION WORKS FOR THE CONSTRUCTION OF REGULATOR ACROSS KADALUNDI RIVER AT MOOZHIKKAL KADAVU NEAR PALATHINGAL BETWEEN TIRURANGADI MUNICIPALITY AND MOONNIYUR PANCHAYATH

It is proposed to construct a regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal bride. In order to find the suitable footing/Ground condition of proposed project geotechnical investigation was conducted. Analysis done at the site through 10 numbers of bore holes was taken along the proposed alignment of new regulator . Also total station surveying of proposed project was conducted. The new proposed regulator will help Thirurangadi municipality and Moonniyur panchayath people. Proposed regulator formation level will be 4.5 meter from the ground level.

CHECKLIST FOR INVESTIGATION WORKS FOR THE CONSTRUCTION OF REGULATOR ACROSS KADALUNDI RIVER AT MOOZHIKKAL KADAVU NEAR PALATHINGAL BETWEEN TIRURANGADI MUNICIPALITY AND MOONNIYUR PANCHAYATH

CHECKLIST -1

CHECK LIST OF DETAILS REQUIRED FOR APPROVAL OF ALIGNMENT

1	S.E'S AUTHENTICATION		✔
2	REPORT		✔
3	2 COPIES OF SPOT LEVELS AND SHOWING NAMES OF STATIONS CONNECTED		✔
	A	NORTH DIRECTION	✔
	B	NAME OF RIVER	✔
	C	DIRECTION OF FLOW	✔
	D	CONTINUOUS CHAINAGES OF APPROACH ROADS	✔
4	A	L.W.L.	-2.316
	B	O.F.L.	-1.438
	C	M.F.L.	7.960
	A	L.T.L.	-
	B	H.T.L.	-
5	FORMATION LEVEL OF PROPOSED REGULATOR		4.5
	A	ABOVE (M.F.L / O.F.L)	OFL
	B	NAVIGABLE	YES
	C	INS	NO
	D	N.W.W	NO
6	L.S OF THE ROAD SHOWING FORMATION LEVEL		✘
7	KEY MAP (SITE PLAN)		✔
8	INDEX MAP (DISTRICT MAP)		✔
9	STRAIGHT REACH		✔
	A	BOTH SIDES	✔
10	NATURE OF TERRAIN		PLAIN

CHECKLIST -2

CHECKLIST OF DETAILS REQUIRED FOR DESIGN

1	S.E'S AUTHENTICATION OF ALL DRAWINGS AND DATA		✔
2	REPORT		✔
4	LOADING		✔
6	VERTICAL CLEARANCE ABOVE : MFL/OFL		MFL
7	INLAND NAVIGATION SYSTEM		-
	NATIONAL WATERWAY		-
8	SALINITY		-
9	DISTANCE FROM SEA		10km/25km
10	EXISTING BRIDGES AND IRRIGATION STRUCTURESAT UPSTREAM OR DOWNSTREAM		✔
12	COMPLETE DESIGN DATA FILLED UP		
	a	L.W.L.	-2.316
	b	O.F.L.	-1.438
	c	M.F.L.	7.960
	d	L.T.L.	-
	e	H.T.L	-
13	C/S OF THE U/S LEFT BANK OF RIVER AT THE SITE		✔
14	L.S OF THE U/S LEFT BANK OF RIVER		✔
15	CATCHMENT AREA MAP		✕
18	BOREHOLE PARTICULARS ALONG APPD. ALIGNMENT WITH CHANGE		✔
18	SOIL INVESTIGATING REPORT		✔

ANNEXURE II

DESIGN DATA FOR MEDIUM AND MINOR BRIDGES

A. GENERAL

1	NAME OF THE STREAM		Kadalundi
2	LOCATION OF WORK		Palathingal
3	LATITUDE		11°2'15"N
4	LONGITUDE		75°52'41"E
5	ALTITUDE FROM MEAN SEA LEVEL		
6	DISTRICT		Malappuram
7	TALUK		Tirurangadi
8	ASSEMBLY CONSTITUENCY		Tirurangadi
9	VILLAGE		Tirurangadi/Munniyoor
10	MUNICIPALITY/PANCHAYATH		Tirurangadi/Munniyoor
11	WHAT ARRANGEMENT EXISTS FOR CROSSING THE RIVER AT PRESENT		
	A	DURING MONSOON	-
	B	DURING DRY SEASON	-
12	LIABILITY OF SITE TO SEISMIC DISTURBANCES		-

B. CATCHMENT AREA AND RUNOFF

13	CATCHMENT AREA		
	A	IN HILLY PARTS	-
	B	IN PLAINS	-
14	RAINFALL DURING THE YEAR AND MAXIMUM RECORDED INTENSITY		-
15	NATURE OF CATCHMENT		Plain
16	ANY ARTIFICIAL OR NATURAL STORAGE PRESENT IN CATCHMENT		Nil

C. NATURE OF STREAM

17	IS THE STREAM			
	a	ALLUVIAL WITH ERODABLE BANKS		Yes
	b	QUASI- ALLUVIAL WITH FIXED BED BUT ERODABLE BANKS		Yes
	C	RIGID WITH INERODABLE BED AND BANKS		No
18	IS THE STREAM			
	a	PERENNIAL		Yes
	b	SEASONAL		No
	c	NAVIGABLE		Yes
	d	TIDAL. IF SO LEVEL OF		
		i	HIGH TIDE	-
		ii	LOW TIDE	-
	b	SURFACE VELOCITY AT L.W.L		-
	c	WATER SURFACE SLOPE AT L.W.L		-
	d	BED SLOPE AT L.W.L		-
19	R.L AND LOCATION OF MAXIMUM SCOUR RECORDED BELOW H.F.L			-
20	R.L OF MAXIMUM ANTICIPATED SCOUR BELOW H.F.L			-

21	LOCATION AND PLAN OF BORINGS TAKEN IN THE BED OF THE RIVER AND AT OTHER LOCATIONS.		Marked in site plan
22	TEST RESULTS OF THE SAMPLES OF BORES GIVING THE FOLLOWING SOIL CHARACTERISTICS		
	a	LACEY'S SILT FACTOR	Refer soil report
	b	ANGLE OF INTERNAL FRICTION (0)	
	c	COHESION OF THE	
	d	ANGLE OF WALL FRICTION (S)	
	e	SAFE BEARING CAPACITY OF SOIL AT FOUNDATION LEVEL	
23	DOES THE STREAM CARRY DRIFTING MATTER IN FLOODS?		-
24	DETAILS OF TRAINING WORKS, IF NEEDED		
	A	IS THE STREAM NAVIGABLE? IF SO THE CLEARANCE PROVIDED	No

D. **SUPERSTRUCTURE**

E. FOUNDATION

25	FOUNDATIONS RECOMMENDED		Refer Soil Report
	a	OPEN	
	b	WELL	
	c	PILES	

F. EXISTING STRUCTURES

G. MISCELLANEOUS

26	NAME OF TOWN NEAREST TO THE PROPOSED SITE		PARAPPANANGADI
27	NEAREST RAILWAY STATION AND ITS DISTANCE FROM BRIDGE SITE		PARAPPANANGADI
28	HAVE THE FOLLOWING PLANS BEEN ENCLOSED DULY COMPLETED?		
	A	KEY MAP	YES
	B	INDEX PLAN	YES
	C	CONTOUR SURVEY PLAN	YES
	D	SITE PLAN	YES
	E	LONGITUDINAL AND CROSS-SECTIONS OF THE U/S LEFT BANK OF RIVER	YES
	F	TRIAL BORING CHARTS	YES
	G	DRAWING OF THE REGULATOR SHOWING GENERAL ARRANGEMENT, DETAILS OF FOUNDATIONS, SUB STRUCTURE AND SUPERSTRUCTURE	YES

To
The Executive Engineer,

Minor Irrigation Division,

Malapuuram-676505

SUB: GEOTECHNICAL INVESTIGATION REPORT

Respected Sir,

We are pleased to submit to you our soil investigation report on the sub soil exploration, field, laboratory investigation and geotechnical recommendation for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram .The purpose of the exploration was to evaluate the general subsoil conditions within the proposed site. This report presents our findings, conclusions and recommendations for the selection of foundation as well as construction considerations for the proposed foundation.

M/s Geo Structura appreciates the opportunity to assist you during this phase of the project. If you have any queries concerning this report, or if you need any further assistance, please contact us. We look forward to our continued relationship.

Respectfully submitted,

Geo Structura Geotechnical Engineering Laboratory

AJ Complex
Chandanathope PO
Kollam, PIN- 691014

For:

Jamshad Naseeri P K

Payyanil Karlathu (H)

Paithiniparamba
Down Hill PO, Malappuram

INDEX

NOTATIONS

BH	**Bore Hole**
CR	**Core Recovery**
FOS	**Factor of Safety**
G	**Specific Gravity**
GL	**Ground Level**
ISCS	**Indian Standard Classification System**
LL	**Liquid Limit**
NGL	**Natural Ground Level**
PI	**Plasticity Index**
PL	**Plastic Limit**
R.L	**Reduced Level**
RQD	**Rock Quality Designation**
SL	**Shrinkage Limit**
SPT	**Standard Penetration Test**
SPT 'N'	**Standard Penetration Test Number**
TCR	**Total Recovery Ratio**
UCS	**Unconfined Compressive Strength**
UDS	**Undisturbed Sample**
γ	**Unit weight**

1.0 INTRODUCTION

A bridge is a structure built to span a physical obstacle, such as a body of water, valley, or road, without closing the way underneath. It is constructed for the purpose of providing passage over the obstacle, usually something that can be detrimental to cross otherwise. The soil investigation work carried out for the construction of regulator across Kalandi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram.

1.1 PURPOSE & SCOPE

Geo structura geotechnical lab, Kollam prepared this geotechnical report for the design and construction of construction of regulator across Kalandi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram. We prepared this report as outlined in agreement to Mr Jamshad Naseeri, he authorized Geo structura geotechnical lab, Kollam to conduct the scope of services outlined below.

- Service plan development
- Reconnaissance
- Sub surface exploration
- Soil laboratory testing
- Total station surveying
- Data analysis and conclusions
- Report preparation

This report was prepared for the exclusive use of concerned government authorities for the further evaluation and design of project.

1.2 FIELD INVESTIGATION

The field investigation consists of the following methods

- Mobilization including transportation of all necessary plant and equipment and materials of boring, field and sampling, demobilization after completing the work and personals.
- Setting up of **10 Number** of bore holes.
- Boring / drilling up to 50m or depth where hard strata available below N.G.L or refusal.
- Conducting standard penetration test (SPT) & collection of disturbed sample (DS) at the locations prefixed by the Engineer-in-charge.
- Observation of the depth of water table in the borehole.
- Study of site condition and surroundings with regards to the need of the project.
- Taking observation of surrounding structure to observe any deficiency in safety.
- Transportation of all soil samples to laboratory for analysis with proper care.

1.3 LABORATORY TESTS:

The Laboratory tests for the sample collected are given below

- Grain size analysis
- Soil moisture content
- Liquid limit ,Plastic limit
- Specific gravity ,Shear strength
- Preparation and submission of a technical report containing the details of the tests carried out, their analysis and recommendations regarding the economical and best foundation type to be adopted. Three copies of the report are to be submitted.

1.3 PROJECT LOCATION

Fig 1.1 and 1.2 displays the site location of proposed site .

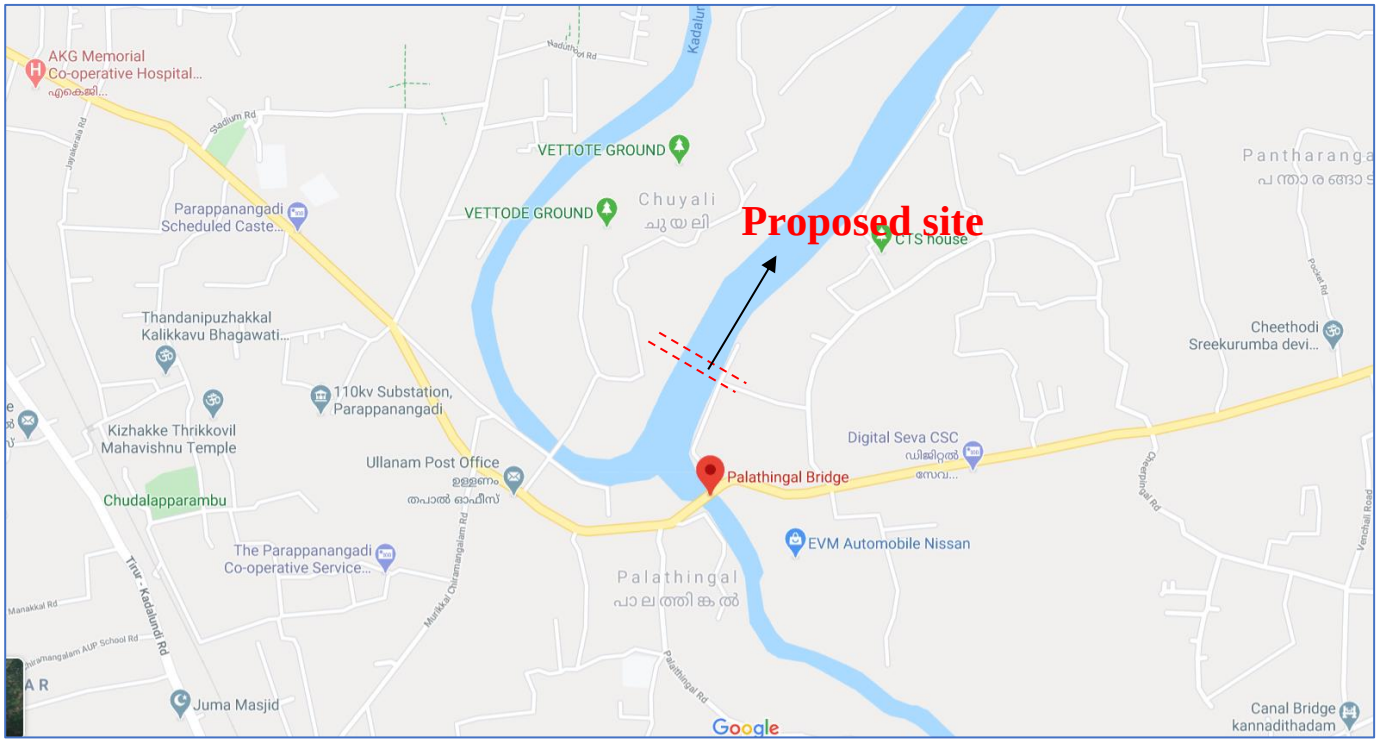


Fig 1.1 Site location

1.4 PROJECT DESCRIPTION

The proposed project includes the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi municipality and Moonniyur panchayath, Malappuram. In order to find the suitable footing/ground condition of proposed project geotechnical investigation was conducted. Analysis done at the site through 10 numbers of bore holes at various remote points across river. Bore holes 1 and10 was taken at each land portion of River (Total 2 Nos), 2.3,4, 5,6,7,8 and 9th bore holes was taken in the river. Also total station surveying of proposed project was conducted.

2.0 FINDINGS

2.1 RECCONAISSANCE

2.1.1 GEOLOGY

According to district survey report, Malappuram District, Kerala State, In the proposed project area contain riverine alluvium. Riverine alluvium is very deep with sandy loam to clayey loam texture. The riverine alluvium contains moderate organic matter, nitrogen, phosphorous and potash.

Malappuram district is mainly drained by the Kadalundi River, Chaliyar River and Bharathappuzha (locally known as Ponnani River). Of these rivers, only Chaliyar and Bharathappuzha are perennial and all others get dried up in summer and hence Malappuram district is drought prone. The Kadalundi River is formed by the confluence of its two main tributaries viz; the Olipuzha and the Veliyar. The Kadalundi River is 130 km long with a drainage area of 1274 sq. km. The river joins the Lakshadweep Sea at about 5 km south of the Chaliyar river mouth.

The drainage pattern of the three rivers in the district is generally dendritic. Tidal effects are experienced in places such as Vallikkunnu and Tirurangadi, which are 10km and 25km away from the coast. Analysis of the drainage characteristics of the two basins reveals that Kadalundi river is a fourth order stream, the Ponnani river is fifth order stream and the Chaliyar river is a seventh order stream .

2.1.2 SURFACE CONDITIONS

Riverine alluvium and Lateritic loam was found at the surface. Grass land, medium high trees and bushes at the banks of river.

According to site plan provided by Compass Surveyors ,Malappuram. Reduced levels shown are based on assuming bench mark elevation 7.654 m.

Following site features observed during renaissance and field Photography review

- The proposed regulator bridge has to be constructed across Kadalundi river near Moozhikkal Kadavu near Palathingal between Thirurangadi municipality and Moonniyur panchayath, Malappuram.
- Water level in the river is less and RL was -1.600m

.

2.2 SOIL EXPLORATION

Our field exploration included rotary drilling through 10 borings cross the river width on site. We performed field exploration on December 2019 to February 2020. The location and elevations of our explorations are approximate and were determined using total station survey.

Following describes soil exploration techniques used in the project.

2.2.1 SELECTION OF BOREHOLE

10 bore-holes was selected by the Engineer in charge in order to obtain comprehensive sub-soil data for this site with a provision of borings up to 50.0 m depth as required as per IS:1892 - 1979. A Schematic site plan showing the location of the test points marked by the client is given in appendix A. For detailed laboratory investigation, SPT is conducted at 1.0 m intervals or at change of soil strata in different Boreholes and S.P.T soil samples were collected for laboratory analysis. Disturbed representative, soil samples from all the boreholes were collected at 1.0 m. interval for different tests.

10 no's of 100 mm diameter bore holes are drilled using heavy duty calyx drilling rigs with direct mud circulation i.e wash boring for soil other than Rocks. Standard penetration tests (SPT) are done as per IS 2131 1963, the SPT value, viz (N values) are recorded in the bore log charts are accompanying this report. The soil samples are recovered using split spoon sampler are classified and tested in the laboratory. These lab investigations are included in this report.

2.2.2 BORING

Observed drilling of 10 borings and logged the subsurface conditions at each location. Boring locations are shown on site plan. Borings were advanced mechanically by rotary power drilling equipment using tungsten carbide bit (TC) in soft strata and power operated mechanical boring in hard strata using diamond cutter , as per IS : 1892 – 1979 .

Borings were backfilled with drill cuttings. Rotary drilling is the most rapid method of advancing the boreholes in any type of soil. This method uses rotation of drill bits (tungsten), with the simultaneous application of pressure to advance the borehole.

In core drilling, an annular bit, fixed to the bottom of the outer rotating tube of a core barrel, cuts a core, which is recovered within the inner-most tube of the core barrel assembly and brought to the surface for examination and testing. The core is prevented from dropping out of the core barrel

by a core catcher made of spring steel and located just above the core bit. The boring/drilling works at the proposed locations identified and marked by client's representative were performed by the hydraulic rotary drilling rig. Rotary drilling operations were performed to obtain the best possible recovery of rock cores and disturbed soil samples in the boreholes. Disturbed soil samples were obtained through a split spoon sampler during execution of Standard Penetration Tests (SPT).

The test consists of dropping of a hammer of mass 63.5 kg on to a drive head from a height of 750 mm. The number of such blows (N) necessary to achieve a penetration of the split spoon sampler by 300 mm is regarded as the penetration resistance. The blow counts for each 150 mm penetration were recorded. Small, disturbed samples of soil were obtained from the split spoon sampler after completion of the tests.

On reaching the rock, the rock core samples were obtained through double tube core barrels. The quantitative description of natural fracture state of rock masses is indicated by means of total core recovery (TCR) and rock quality designation (RQD) as determined from the borehole cores.

TCR is the percentage ratio of core recovered (whether solid, intact with full diameter, or non-intact) to the total length of core run.

RQD is a quantitative index based on core recovery procedure that incorporates only those pieces of core which are 100mm or more in length. It is the total length of solid core pieces, each greater than 100mm between natural fractures, expressed as a percentage of the total length of core run.

2.2.3 STANDARD PENETRATION TESTS

Standard penetration test plays a major role in sub soil investigation termination of safe bearing capacity of soil in non-cohesive type soil, particularly in non-cohesive granular sandy soil and where the UDS could not be collected either due to high liquidity or non-cohesive nature of soil .The SPT tests were conducted as per IS: 2131-1981 respectively.

The SPT sampler was lower inside the borehole after drilling the required level and is driven by a 63.50 kg Rammer with a free fall of 750 mm. driving 450 mm in One stages 150 mm each and the number of blows for each 150mm penetration for 2nd & 3rd 150 mm drive recorded as "N". Refusal was considered for N>100. The details of location of test and SPT value [N] are presented in bore log data annexed separately.

Table 2.1 Summary of Field Work executed for the Project

SL NO	Bore Hole No	In-situ Test/ No of SPT	Termination Depth (m)	Field Activity Dates	
				From	To
1	1(Land)	16	36.6000	21-12-2019	26-12-2019
2	2(Under Water)	18	36.7000	28-12-2019	01-01-2020
3	3(Under Water)	17	36.1000	04-01-2020	08-01-2020
4	4(Under Water)	16	34.3000	10-01-2020	15-01-2020
5	5(Under Water)	15	35.1000	17-01-2020	21-01-2020
6	6 (Under Water)	16	36.9000	23-01-2020	27-01-2020
7	7 (Under Water)	16	37.0000	29-01-2020	01-02-2020
8	8 (Under Water)	16	36.0000	04-02-2020	07-02-2020
9	9 (Under Water)	17	35.6000	11-02-2020	14-02-2020
10	10(Land)	16	35.9000	17-02-2020	20-02-2020

Table 2.2 Bore Hole Number with Surface elevation (Reduced Level)

Bore Hole No	1	2	3	4	5	6	7	8	9	10
Reduced Level (m)	2.812	-1.178	-1.501	-1.487	-1.888	-2.809	-2.117	-1.784	-0.783	3.139
Total depth (m)	36.60	36.70	36.10	34.30	35.10	36.90	37.00	36.00	35.60	35.90

2.3 SUMMARY OF EXPLORATION OF BOREHOLES

A total of 10 borings were drilled during the exploration. The locations and graphical logs of these borings are shown on respectively, in Appendix A.

All borings were performed at the original planned locations of the proposed regulator bridge. 163 sample and 10 rock core borings were drilled at each of the bore locations. contour map were drawn to the assessment of drilling program This map is presented in the report. During the drilling process in soils, attention was given to the description and consistency of the soils encountered. Soils were identified in terms of classification, colour, grain size, consistency, and moisture content. The location of the groundwater table was also noted on the logs, Because of the size of check dam and the loads to which it could be subjected, rock bearing foundations are anticipated for substructure support. As an indication of general competency of the rock cored, the Core recovery (CR) of each coring run was recorded. A complete listing of the CR values recorded for the borings is presented in Table 2.4

Table 2.3 Summary of Boring Locations and Elevations

BH No	Depth interval (m)	Elevation interval (m)	Soil/rock type
1	0.00 - 0.80	2.812 - 2.012	Fine sand
	0.80 - 3.00	2.012 - -0.188	Silty clay (Brown)
	3.00 - 5.10	-0.188 - -2.288	Sandy clay (Yellow,Pink,Brown)
	5.10 - 8.50	-2.288 - -5.688	Fine sand (Black,Yellow)
	8.50 - 12.50	-5.688 - -9.688	Clay (Black)
	12.50 - 16.80	-9.688 - -13.988	Clayey sand (Yellow,Light grey)
	16.80 - 21.00	-13.988 - -18.188	Medium to fine sand (Light grey)
	21.00 - 24.80	-18.188 - -21.988	Laterite/Sandy clay (Yellow,Brown)
	24.80 - 28.20	-21.988 - -25.388	Clayey sand (Yellow,Light brown)
	28.20 - 28.40	-25.388 - -25.588	Boulder
	28.40 - 33.20	-25.588 - -30.388	Clayey sand (Yellow,Light brown)
	33.20 - 33.60	-30.388 - -30.788	Soft rock
	33.60 - 36.60	-30.788 - -33.788	Hard rock
2	0.00 - 0.80	-1.178 - -1.978	Fine sand (Black,Yellow)
	0.80 - 3.20	-1.978 - -4.378	Silty clay(Brown)
	3.20 - 4.80	-4.378 - -5.978	Sandy clay (Yellow,Pink,Brown)
	4.80 - 8.90	-5.978 - -10.078	Clay (Black)
	8.90 - 12.00	-10.078 - -13.178	Lateritic clayey sand (Yellow,Light grey)
	12.00 - 15.40	-13.178 - -16.578	Lateritic clayey sand (Yellow,Light grey)
	15.40 - 21.80	-16.578 - -22.978	Clayey sand(Black,Yellow)
	21.80 - 24.40	-22.978 - -25.578	Lateritic medium to fine sand (Light grey)
	24.40 - 27.00	-25.578 - -28.178	Lateritic sandy clay (Yellow,Brown)
	27.00 - 32.80	-28.178 - -33.978	Lateritic clayey sand (Yellow,Light brown)
	32.80 - 33.70	-33.978 - -34.878	Soft rock
	33.70 - 36.70	-34.878 - -37.878	Hard rock
3	0.00 - 0.90	-1.501 - -2.401	Fine sand
	0.90 - 4.10	-2.401 - -5.601	Lateritic clayey Sand (Brown,Grey,Yellow)
	4.10 - 8.70	-5.601 - -10.201	Clay (Black,Grey)
	8.70 - 11.50	-10.201 - -13.001	Lateritic clayey Sand (Yellow,Grey)
	11.50 - 12.60	-13.001 - -14.101	Sandy clay (Brown,Grey)
	12.60 - 15.40	-14.101 - -16.901	Medium to fine sand with clay (Pink,Grey)
	15.40 - 19.00	-16.901 - -20.501	Lateritic gravelly sand (Grey,Dark brown)
	19.00 - 23.50	-20.501 - -25.001	Lateritic Silty sand (Yellow)
	23.50 - 30.80	-25.001 - -32.301	Lateritic clayey silty sand (Yellow,Light brown)
	30.80 - 32.30	-32.301 - -33.801	Weathered rock/Fine sand (Grey)
	32.30 - 33.10	-33.801 - -34.601	Soft rock
	33.10 - 36.10	-34.601 - -37.601	Hard rock

BH No	Depth interval (m)	Elevation interval (m)	Soil/rock type
4	0.00 - 4.10	-1.487 - -5.587	Lateritic clayey sand (Light brown,Grey)
	4.10 - 8.80	-5.587 - -10.287	Silty clay (Black,Grey)
	8.80 - 14.00	-10.287 - -15.487	Lateritic clayey sand (Brown,Yellow,Grey)
	14.00 - 19.00	-15.487 - -20.487	Lateritic sandy clay (Pink,Grey)
	19.00 - 20.60	-20.487 - -22.087	Fine to medium sand (Red,Brown)
	20.60 - 24.40	-22.087 - -25.887	Lateritic clayey sand (Grey,Brown)
	24.40 - 24.70	-25.887 - -26.187	Lateritic boulder
	24.70 - 30.70	-26.187 - -32.187	Lateritic clayey sand (Pink,Yellow)
	30.70 - 31.30	-32.187 - -32.787	Soft rock
	31.30 - 34.30	-32.787 - -35.787	Hard rock
5	0.00 - 3.80	-1.888 - -5.688	Lateritic clayey sand (Brown,Red,Grey)
	3.80 - 9.00	-5.688 - -10.888	Silty clay (Grey)
	9.00 - 14.90	-10.888 - -16.788	Lateritic clayey sand (Brown,Red,Grey)
	14.90 - 20.60	-16.788 - -22.488	Lateritic clayey sand (Yellow,Brown)
	20.60 - 24.10	-22.488 - -25.988	Lateritic silty clayey sandv(Grey,Brown)
	24.10 - 31.20	-25.988 - -33.088	Lateritic silty sand (Pink,Yellow)
	31.20 - 31.60	-33.088 - -33.488	Weathered rock
	31.60 - 32.10	-33.488 - -33.988	Soft rock
	32.10 - 35.10	-33.988 - -36.988	Hard rock
6	0.000 - 4.30	-2.809 - -7.109	Lateritic clayey sand (Brown,Red,Grey)
	4.30 - 8.60	-7.109 - -11.409	Sandy clay (Grey)
	8.60 - 14.00	-11.409 - -16.809	Lateritic clayey sand (Brown,Red,Grey)
	14.00 - 20.80	-16.809 - -23.609	Lateritic clayey sand (Yellow,Brown)
	20.80 - 24.70	-23.609 - -27.509	Lateritic silty clayey sand(Grey,Brown)
	24.70 - 32.80	-27.509 - -35.609	Lateritic silty sand(Pink,Yellow)
	32.80 - 33.20	-35.609 - -36.009	Weathered rock
	33.20 - 33.90	-36.009 - -36.709	Soft rock
	33.90 - 36.90	-36.709 - - 39.709	Hard rock
7	1.80 - 3.10	-2.117 - -2.217	Lateritic clayey sand (Brown,Red,Grey)
	3.10 - 9.30	-2.217 - -8.417	Sandy clay (Grey)
	9.30 - 12.40	-8.417 - -11.517	Lateritic clayey sand (Brown,Red,Grey)
	12.40 - 16.20	-11.517 - -15.317	Lateritic clayey sand (Yellow,Brown)
	16.20 - 24.60	-15.317 - -23.717	Lateritic silty clayey sand(Grey,Brown)
	24.60 - 30.90	-23.717 - -30.017	Lateritic silty sand(Pink,Yellow)
	30.90 - 33.30	-30.017 - -32.417	Weathered rock
	33.30 - 34.00	-32.417 - -33.117	Soft rock
	34.00 - 37.00	-33.117 - -36.117	Hard rock

BH No	Depth interval (m)	Elevation interval (m)	Soil/rock type
8	0.00 - 4.10	-1.784 - -5.884	Lateritic clayey sand (Brown,Red,Grey)
	4.10 - 5.90	-5.884 - -7.684	Sandy clay (Grey)
	5.90 - 8.00	-7.684 - -9.784	Lateritic clayey sand (Brown,Red,Grey)
	8.00 - 12.60	-9.784 - -14.384	Clay(Grey)
	12.60 - 16.70	-14.384 - -18.484	Lateritic clayey sand (Yellow,Brown)
	16.70 - 21.60	-18.484 - -23.384	Lateritic silty clayey sand(Grey,Brown)
	21.60 - 24.90	-23.384 - -26.684	Silty clay (White)
	24.90 - 27.40	-26.684 - -29.184	Lateritic silty sand(Pink,Yellow)
	27.40 - 32.10	-29.184 - -33.884	Lateritic silty clayey sand(Grey,Brown)
	32.10 - 32.80	-33.884 - -34.584	Weathered rock
	32.80 - 33.00	-34.584 - -34.784	Soft rock
	33.00 - 36.00	-34.784 - -37.784	Hard rock
9	0.00 - 2.80	0.783 - -2.017	Fine sand (Grey,Yellow)
	2.80 - 5.60	-2.017 - -4.817	Lateritic clayey sand (Brown,Yellow)
	5.60 - 9.70	-4.817 - -8.917	Silty clay (Grey)
	9.70 - 13.20	-8.917 -12.417	Lateriic clayey sand (Yellow,Brown)
	13.20 - 18.50	-12.417 - -17.717	Lateritic sand (Yellow,Grey,red)
	18.50 - 25.00	-17.717 - -24.217	Lateritic medium sand with clay (Grey,Yellow)
	25.00 - 31.80	-24.217 - -31.017	Silty clay (White)
	31.80 - 32.60	-31.017 - -31.817	Soft rock
	32.60 - 35.60	-31.817 - -34.817	Hard rock
10	0.00 - 0.30	3.139 - 2.839	Lateritic clay
	0.30 - 1.40	2.839 - 1.739	Fine sand (Grey,Yellow)
	1.40 - 4.00	1.739 - -0.861	Lateritic clayey sand (Brown.Grey)
	4.00 - 5.30	-0.861 - -2.161	Silty clay (Grey)
	5.30 - 6.60	-2.161 - -3.461	Clayey sand (Brown.Yellow)
	6.60 - 10.20	-3.461 - -7.061	Silty clay (Grey)
	10.20 - 12.70	-7.061 - -9.561	Lateritic clayey sand (Yellow,Grey,Brown)
	12.70 - 15.60	-9.561 - -12.461	Sandy clay (White,Yellow)
	15.60 - 24.80	-12.461 - -21.661	Medium sand(Grey)
	24.80 - 26.30	-21.661 - -23.161	Hard laterite
	26.30 - 32.60	-23.161 - -29.461	Silty clay (White)
	32.60 - 32.90	-29.461 - -29.761	Soft rock
	32.90 - 35.90	-29.761 - -32.761	Hard rock

Table 2.3 Summary of Rock Core Data

Boring No	Top of Bedrock (m)		Core Recovery Ratio (cm/300cm)
	Depth Interval	Elevation Interval	
1	33.60 - 36.60	-30.788 - -33.788	118
2	33.70 - 36.70	-34.878 - -37.878	225
3	33.10 - 36.10	-34.601 - -37.601	162
4	31.30 - 34.30	-32.787 - -35.787	182
5	32.10 - 35.10	-33.988 - -36.988	194
6	33.90 - 36.90	-36.709 - - 39.709	205
7	34.00 - 37.00	34.00 - 37.00	185
8	33.00 - 36.00	-34.784 - -37.784	174
9	32.60 - 35.60	-31.817 - -34.817	200
10	32.90 - 35.90	-29.761 - -32.761	194

2.5 GROUND WATER CONDITIONS

Soil investigation at site was carried out in the month of December 2019 to February 2020, during this season, ground water table was varies at each bore location (by considering the level difference) 3.00m depth from ground level at land area. Details of water level encountered in each bore location was indicated in each bore log sheets.

3.0 LABORATORY INVESTIGATIONS

3.1 GENERAL

The selected disturbed soil and rock core samples meant for testing were transported to M/s Geo Structura laboratory, Kollam. The laboratory tests were conducted as per relevant parts of Indian Standards. Tests were performed based on the laboratory testing schedule approved by Client. A summary of laboratory tests carried out is shown below and complete testing results are presented along with bore logs.

3.2 MOISTURE CONTENT

To obtain the natural moisture content of soil specimen at various depth were carried out as per IS 2720 (Part 2/Section 1) by oven drying method. The results have been presented in the summarized data sheet.

3.3 GRAIN SIZE ANALYSIS

To obtain information concerning the type of soil met at various depths and to classify each soil strata, grain size analysis were carried out as per IS: 2720 (Part-IV). The results have been presented in the summarized data sheet.

3.ATTERBURGS LIMITS

Soil consistency refers to the resistance of the soil offered against forces that tend to deform or rupture the soil aggregate. Consistency limits indicate the soil moisture content limits for various states of consistency. The consistency limits include Liquid Limit (L.L), Plastic Limit (P.L), and Shrinkage Limit (S.L). The difference between the numerical values of liquid limit and plastic limit of the soil is called the Plasticity Index (P.I). It indicates the range of moisture content over which the soil exhibits plasticity. It is determined as per the procedure laid down in IS: 2720 (Part-IV). Plasticity index was computed. Results of liquid limit and plasticity index have been reported in the summarized data sheets.

3.5 SPECIFIC GRAVITY

The specific gravity of the soil sample is the ratio of the mass of a given volume of soil sample in air to the mass of an equal volume of water at 27^0C. Specific gravity of soil sample was determined as per the provisions of IS: 2720 (Part –III). Specific gravity of soil sample obtained during the test has been reported in the summarized data sheet.

3.6 UNCONFINED COMPRESSIVE STRENGTH TEST

The undrained shear strength of clay and silty clay soil was determined by IS 2720 (Part X). The determination of unconfined compressive strength of undisturbed and remolded soil was limited to cohesive or naturally or artificially cemented soil. Soil with inclined fissures, sand and silt lenses and slickenside has a tendency to slide prematurely along these weaker planes in unconfined compression tests. The unconfined compressive strength is considered to be equal to the load at which failure occurs divided by the cross sectional area of the sample at the time of failure. In clayey soil the undrained conditions are expected to be the lower design limits (i.e. the minimum factor of safety), the undrained shear strength (i,e Cohesion) governs the behavior of clay. This undrained shear strength is approximately equal to half the unconfined compressive strength of undisturbed samples.

3.7 DIRECT SHEAR TEST

The direct shear test was performed in accordance with IS 2720 (Part XIII).Apparent cohesion or angle of internal friction was obtained by conducting this test. Shear strength attributes to friction required a normal force and the soil material exhibit friction characteristics and multiple contact areas. In dense soils the individual soil grains can interlocks when sliding occurs the individual grains lifted over one another against the normal stress, there for the force required to overcome particle interlock is proportional to the normal stress. The angle of internal friction represent the sum of sliding friction and interlocking, it is the function of density, roundness, angularity and particle size.

4.0 FOUNDATION RECOMMENDATIONS

4.1 GENERAL

The soil investigation of this project is being designed in accordance with the Indian Standard Specifications. Total 10 bore holes were investigated in this project & Hard rocks were available at reasonable depth.

Axial compression load is assumed to be carried entirely in the bedrock, by combined rock socket side friction and end bearing at the base of the rock socket. The contribution of the overburden soil to piles axial capacity is neglected the average soil properties for the calculation of pile capacities listed in table 4.1.

Pile length shall take according to the availability of hard rock for each bore holes and according to laboratory results and SPT N Value. The safe load capacity of each pile was provided in accordance with IS Specifications.

4.2 BORE HOLE DESCRIPTION

1st and 10th bore holes were taken at each sides of river and other bore holes were at river.

In BH1, very loose fine sand/riverine alluvium was found as top soil up to 0.8m depth. Soft clay loam[silty clay & sandy clay] was found below up to 5.1m depth with SPT N of 1,16 and 15 at 1.5m,3m and 4.5m depth. Fine sand was found below up o 8.5m and very soft soil was found from 8.5m to 12.5m depth. Loose to dense sandy loam [Clayey sand] was found up to 0.2m thick boulder bed at 28.2m depth. SPT N at 6m, 7.5m, 9m, 10.5m, 12m, 13.5m, 15m, 17m, 19m and 25m depth was 7, 8, 3, 3, 2, 18, 23, 35, 39, 51 and more than 50 at 23m and 25m depth respectively. Dense clayey sand was found from 28.4m to 33.2m depth with SPT N of 49 at 32m depth. Soft rock followed by hard rock[Core recovery 118cm] was available at 33.2m and 33.6m depth respectively. Bore hole terminated at 36.6m depth.

In BH2, very loose fine sand/riverine alluvium was found as top soil up to 0.8m depth from river bed. Soft clay loam[silty clay & sandy clay] was found below up to 8.9 m depth with SPT N of 3,10,8 and 8 at 1.5m,3m and 4.5m depth and 5t 6m and 7.5mdepth respectively. Lateritic clayey sand was found below, up 24.48m and hard sandy clayey soil was found from 24.4m to 27m depth. Dense sandy loam [Clayey sand] was found up soft rock bed at 32.8m. SPT N at 9m,10.5m,12m,13.5m,15m,17m,19m,21m and 23m depth was 12,14,16,22,26,39,32,38 and 41 , 45 at 28m & more than 50 at 25m,31m and 32m depth and 25m depth respectively. Soft rock followed

by hard rock[Core recovery 225cm] was available at 32.8m and 33.7m depth respectively. Bore hole terminated at 36.7m depth.

In BH3, very loose fine sand/riverine alluvium was found as top soil up to 0.9m depth from river bed. Very loose lateritic clayey sand was found up to 4.1m depth and very soft clay was found between 4.1m and 8.7m. medium soft sand clay was found below up to 12.6m. loose to dense sand and sandy loam was found from 12.6m and 30.8m depth. SPT N at 1.5m, 3m, 4.5m, 6m, 7.5m, 9m, 10.5m, 12m, 13.5m, 15m, 17m, 19m, 21m, 23m, 25m and 28m depth was 5, 6, 2, 4, 4, 22, 25, 32, 27, 31, 45, 26, 27, 33, 50 and & more than 50 at 31m respectively. Weathered fine sand was found from30.8m and 32.3m depth. Soft rock followed by hard rock[Core recovery 162cm] was available at 32.3m and 33.1m depth respectively. Bore hole terminated at 36.1m depth.

In BH4, very loose lateritic sand and sandy or silty clay was found upto 8.8m depth from river bed with SPT N of 2,3,2,3 and 3 at 1.5m, 3m, 4.5m, 6m and 7.5m depth. Lateritic sand or sandy clay was found from 8.8m to 19m depth. Very dense to dense laterite was found below, up to 30.7m depth. Soft rock was at 20.7m and hard rock available at 31.3m[Core recovery 182cm].SPT N of 28,42,50,45,48,41,46,45,50 and 50 at 9m, 10.5m, 12m, 13.5m, 15m, 17m, 19m, 21m, 23m and 25m depth respectively. Bore hole terminated at 34.3 depth.

In BH5, Lateritic clayey sand was found up to 3.8m depth from river bed with SPT N of 3 and 5 at 1.5m and 3m depth respectively. Very soft silty clay layer was found below, up to 9m depth with SPT N at 6m and 7.5m depth was 2. Loose lateritic clayey sand was found below, up to 14.9m depth with SPT N of 15,14,11 and 14 at 9m, 10.5m, 12m and 13.5m depth respectively. Dense to very dense lateritic sand and sandy loam was extended below, up to weathered rock bed at 31.2m depth. SPT N was 39,33,40,22,33,50 and 45 at 15m, 17m, 19m, 21m, 23m, 25m and 28m depth respectively. Soft rock followed by hard rock [Core recovery 194cm] was available at 31.6m and 32.1m depth. Bore hole terminated at 35.1m depth.

In BH6 , Lateritic clayey sand was found upto 4.3m depth from river bed with SPT N of 4 at 1.5m depth. Very soft sandy clay layer was found below, up to 8.6m depth with SPT N at 4.5m,6m,7.5m and 9m depth was 6,1,1 and 9 respectively. Loose lateritic clayey sand /silty sand was found below, up to 31.8m depth with SPT N of 15,21,30,36,36,46,42 and 32 at 10.5m, 12m, 135.m, 15m, 17m ,19m 21m and 23m depth and more than 50 at 25m,27m and 29m depth respectively. Weathered rock bed was found at 32.8m depth. Soft rock followed by hard rock [Core recovery 205cm] was available at 33.2m and 33.9m depth. Bore hole terminated at 36.9m depth.

In BH7 , Lateritic clayey sand was found upto 3.1m depth from river bed with SPT N of 6 at 1.5m depth. Very soft sandy clay with SPT N of 1,1,2and 8 at 4.5m, 6m, 7.5m and 9m depth respectively. Loose to dense lateritic clayey sand /silty sand was found below, up to 29.4m depth with SPT N of 16,16,21,34,39,39,36,41 and 52 at 10.5m, 12m, 13.5.m, 15m, 17m ,19m 21m, 23m and 25m depth and more than 50 at 27m and 29m depth respectively. Weathered rock bed was found at 30.9m depth. Soft rock followed by hard rock [Core recovery 185cm] was available at 33.3m and 34m depth respectively. Bore hole terminated at 37m depth.

In BH8 , Lateritic clayey sand was found from upto 4.1m depth from river bed with SPT N of 7 at 3m depth. Very soft sandy clay extended up to 5.9m and up to 8m depth respectively with SPT N of 5,2,3 and 5 at 4.5m, 6m, 7.5m and 9m depth respectively. Very soft to soft clay was found below up to 12.6m with SPT N at 10.5m and 12m depth was 21 and 24 respectively. Loose to dense lateritic clayey sand /silty sand was found below, up to 32.1m depth with SPT N of 22,41,38,47,46,45,50,26 and 47 at 13.5.m, 15m, 17m ,19m 21m, 23m 25m, ,27m and 29m depth respectively. Weathered rock bed was found at 32.1m depth. Soft rock followed by hard rock [Core recovery 174cm] was available at 32.8m and 33m depth respectively. Bore hole terminated at 36m depth.

In BH9 , Loose riverine alluvium found up to 2.8m depth from river bed with SPT N at 1.5m and 3m was 7 and 8 respectively. Lateritic clayey sand was found from 2.8m to 5.6m depth with SPT N of 6 at 4.5m and 3,4, and 3 at 6m, 7.5m and 9m depth respectively. Very soft silty clay was extended from 5.6m up to 9.7m depth. Loose to dense lateritic clayey sand and sand was found upto 25m depth. Medium soft silty clay (Kaolin clay) was found up to soft rock bed at 31.8m with SPT N of 32 and 33 at 28m and 31m depth respectively. Hard rock[Core recovery 200cm] available at 32.6m.Bore hole terminated at 35.6m depth.

In BH10, very loose lateritic sand /silty clay was found at alternate layers up to 10.2m from ground level with SPT N of 7,6,1,2,3 and 3 at 1.5m, 3m, 4.5m, 6m,7.5m and 9m depth. Lateritic clayey sand or sandy clay was found from 10.2 m to 15.6m depth with SPT N of 28,24,21 and 24 at 10.5m, 12m, 13.5m, 15m depth respectively. Very dense to dense medium sand was found below, up to 24.8m depth with SPT N of 49 at 17m and 50 or more than 50 at 19m, 21m and 23m depth.1.5m thick hard laterite layer was found 24.8m depth below, were, SPT hammer rebounded. Medium hard silty clay was found between 26.3m and 32.6m depth with SPT N at 28m and 31m was 32 and 29 respectively. Soft rock was at 32.6m and hard rock available at 32.9m[Core recovery 194cm].Bore hole terminated at 35.9m depth.

4.3 TYPE OF FOUNDATION

Provide pile foundation resting over hard rock (Core recovery >50%) at each pier location as the foundation of regulator bridge & should be provided by angering the pile into rock bed.

Table 4.1 Minimum length of pile at bore locations

Bore hole No	1	2	3	4	5	6	7	8	9	10
Pile length (m)	>33.6m	33.7	33.5	31.5	32.5	34.5	34	33.5	33	33.0

Load carrying capacity of individual piles in each bore locations was tabulated here.

Table 4.2 Load Carrying Capacity at Bore locations

Pile diameter (m)	**Safe Axial capacity (T)**	**Safe lateral capacity (T)**	
		Normal Load	**Seismic Load**
0.60	83	9	7
0.70	110	14	12
0.80	145	16	14
1.00	227	21	17
1.20	320	24	22

5.0 LIMITATIONS & UNIFORMITY CONDITIONS

This report presents geotechnical recommendations for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi municipality and Moonniyur panchayath, Malappuram If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations.. The conclusions and recommendations contained in this report are solely professional opinions .We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area.

This report is based upon field and other conditions discovered at the time of report preparation.

We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data is representative of the actual subsurface conditions across the site.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative Information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

APPENDIX A

I BORELOG SHEETS

II LAB TEST REPORT

III. LOCATION SKETCH

IV TOTAL STATION SURVEY - DETAILED DRAWING

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 1 (Land)**	Date of Commence	**: 21-12-2019**	Ground water level	**: 5.200 m**
Type of boring	: Rotary Drilling	Date of completion	**: 26-12-2019**	Reduced Level Surface	**: 2.812 m**
Termination depth(m)	**: 36.60 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**: 0.60 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								PLOT OF SPT 'N' VALUE	OBSERVATIONS
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	DEPTH (m)	Penetration Value 15	30	45	SPT 'N'			
0.00	2.8120		Fine sand	0.80									0 15 30 45 60 75 90	
0.80	2.0120		Silty clay (Brown)	2.20	DS1	SPT1	1.50	2	1	1	2			
3.00	-0.1880				DS2	SPT2	3.00	6	8	8	16			
			Sandy clay (Yellow,Pink,Brown)	2.10										
5.10	-2.2880				DS3	SPT3	4.50	5	7	8	15			
			Fine sand (Black,Yellow)	3.40	DS4	SPT4	6.00	4	3	4	7			
					DS5	SPT5	7.50	3	3	5	8			
8.50	-5.6880													
			Clay (Black)	4.00	DS6	SPT6	9.00	1	1	2	3			
					DS7	SPT7	10.50	1	2	1	3			
12.50	-9.6880				DS8	SPT8	12.00	1	1	1	2			
			Clayey sand (Yellow,Light grey)	4.30	DS9	SPT9	13.50	8	9	9	18			
16.80	-13.9880				DS10	SPT10	15.00	8	10	13	23			
			Medium to fine sand (Light grey)	4.20	DS11	SPT11	17.00	12	16	19	35			
					DS12	SPT12	19.00	13	18	21	39			
21.00	-18.1880				DS13	SPT13	21.00	18	24	27	51			
			Laterite/Sandy clay (Yellow,Brown)	3.80	DS14	SPT14	23.00	26	33	17	>50			Balance 9cm
24.80	-21.9880				DS15	SPT15	25.00	19	28	22	>50			Balance 7cm
			Clayey sand (Yellow,Light brown)	3.40										
28.20	-25.3880						28.20	SPT Rebounded						TC bit drilling from 28.2m to 28.4m
28.40	-25.5880		Boulder	0.20										
			Clayey sand (Yellow,Light brown)	4.80	DS16	SPT16	29.00	17	21	28	49			
33.20	-30.3880						32.00	SPT Rebounded						TC bit drilling from 33.2m to 33.6m
			Soft rock	0.40										
33.60	-30.7880						Core recovery : 20cm [33.6m to 34.6m], 98cm [34.6m -36.6m]							DC bit drilling from 33.6m to 36.6m
			Hard rock	3.00										
36.60	-33.7880						END OF BORE HOLE AT 36.60 m							

SITE IN CHARGE

ENGINEER IN CHARGE

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 2 (Under water)**	Date of Commence	**: 28-12-2019**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**:01-01-2020**	Reduced Level Surface (River bed)	**: -1.178 m**
Termination depth(m)	**: 36.70 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**: 0.90 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	DEPTH (m)	Penetration Value 15	30	45	SPT 'N'	PLOT OF SPT 'N' VALUE 0 15 30 45 60 75 90	OBSERVATIONS
	1.8220		Water	3.00									
0.00	-1.1780		Fine sand (Black,Yellow)	0.80									
0.80	-1.9780		Silty clay(Brown)	2.40	DS1	SPT1	1.50	2	1	2	3		
3.20	-4.3780		Sandy clay (Yellow,Pink,Brown)	1.60	DS2	SPT2	3.00	4	5	5	10		
4.80	-5.9780		Clay (Black)	4.10	DS3	SPT3	4.50	3	4	4	8		
					DS4	SPT4	6.00	2	2	3	5		
					DS5	SPT5	7.50	2	2	3	5		
8.90	-10.0780		Lateritic clayey sand (Yellow,Light grey)	3.10	DS6	SPT6	9.00	3	5	7	12		
					DS7	SPT7	10.50	4	7	7	14		
12.00	-13.1780		Lateritic clayey sand (Yellow,Light grey)	3.40	DS8	SPT8	12.00	6	7	9	16		
					DS9	SPT9	13.50	7	10	12	22		
15.40	-16.5780		Clayey sand(Black,Yellow)	6.40	DS10	SPT10	15.00	9	11	15	26		
					DS11	SPT11	17.00	12	17	22	39		
					DS12	SPT12	19.00	12	14	18	32		
21.80	-22.9780		Lateritic medium to fine sand (Light grey)	2.60	DS13	SPT13	21.00	13	17	21	38		
					DS14	SPT14	23.00	18	24	17	41		
24.40	-25.5780		Lateritic sandy clay (Yellow,Brown)	2.60	DS15	SPT15	25.00	19	30	20	>50		Balance 5cm
27.00	-28.1780		Lateritic clayey sand (Yellow,Light brown)	5.80	DS16	SPT16	28.00	13	15	30	45		
					DS17	SPT17	31.00	16	20	30	>50		Balance 8cm
													TC bit drilling from 32.8m to 33.7m
32.80	-33.9780				DS18	SPT18	32.00	50	-	-	>50		Balance 9cm
			Soft rock	0.90			32.80	SPT Rebounded					DC bit drilling from 33.7m to 36.7m
33.70	-34.8780						Core recovery : 61cm[33.7m-34.7m], 164cm [34.7m - 36.7m]						
			Hard rock	3.00									
36.70	-37.8780						END OF BORE HOLE AT 36.70 m						

SITE IN CHARGE

ENGINEER IN CHARGE

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 3 (Under water)**	Date of Commence	**: 04-01-2020**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**:08-01-2020**	Reduced Level Surface(River bed)	**: -1.501 m**
Termination depth(m)	**: 36.10 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**: 0.80 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								PLOT OF SPT 'N' VALUE	OBSERVATIONS
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	DEPTH (m)	Penetration Value 15	30	45	SPT 'N'		0 15 30 45 60 75 90	
	1.4990		Water	3.00										
0.00	-1.5010		Fine sand	0.90										
0.90	-2.4010		Lateritic clayey Sand (Brown,Grey,Yellow)	3.20	DS1	SPT1	1.50	2	2	3	5			
					DS2	SPT2	3.00	2	3	3	6			
4.10	-5.6010		Clay (Black,Grey)	4.60	DS3	SPT3	4.50	1	1	1	2			
					DS4	SPT4	6.00	1	2	2	4			
					DS5	SPT5	7.50	2	2	2	4			
8.70	-10.2010		Lateritic clayey Sand (Yellow,Grey)	2.80	DS6	SPT6	9.00	6	9	13	22			
					DS7	SPT7	10.50	8	12	13	25			
11.50	-13.0010		Sandy clay (Brown,Grey)	1.10	DS8	SPT8	12.00	11	14	18	32			
12.60	-14.1010		Medium to fine sand with clay (Pink,Grey)	2.80	DS9	SPT9	13.50	7	11	16	27			
					DS10	SPT10	15.00	10	13	18	31			
15.400	-16.9010		Lateritic gravelly sand (Grey,Dark brown)	3.60	DS11	SPT11	17.00	12	19	26	45			
19.00	-20.5010		Lateritic Silty sand (Yellow)	4.50	DS12	SPT12	19.00	12	11	15	26			
					DS13	SPT13	21.00	9	11	16	27			
					DS14	SPT14	23.00	12	15	18	33			
23.50	-25.0010		Lateritic clayey silty sand (Yellow,Light brown)	7.30	DS15	SPT15	25.00	19	32	18	50			Balance 5cm
					DS16	SPT16	28.00	16	22	29	51			
30.80	-32.3010		Weathered rock/Fine sand (Grey)	1.50	DS17	SPT17	31.00	50	-	-	>50			Balance 34cm TC bit drilling from 32.3m to 33.1m
32.30	-33.8010		Soft rock	0.80			32.30	SPT Rebounded						DC bit drilling from 33.1m to 36.1m
33.10	-34.6010		Hard rock	3.00			Core recovery : 52cm [33.1m to 34.1m], 110cm [34.1m - 36.1m]							
36.10	-37.6010						END OF BORE HOLE AT 36.10 m							

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 4 (Under water)**	Date of Commence	**: 10-01-2020**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**: 15-01-2020**	Reduced Level Surface(River bed)	**: -1.487m**
Termination depth(m)	**: 34.3 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**: 0.60 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								PLOT OF SPT 'N' VALUE	OBSERVATIONS
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	DEPTH (m)	15	30	45	SPT 'N'		0 15 30 45 60 75 90	
	1.5130		Water	3.00										
0.00	-1.4870		Lateritic clayey sand (Light brown,Grey)	4.100	DS1	SPT1	1.50	1	1	1	2			
					DS2	SPT2	3.00	1	2	1	3			
					DS3	SPT3	4.50	1	1	1	2			
4.10	-5.5870		Silty clay (Black,Grey)	4.70	DS4	SPT4	6.00	1	2	1	3			
					DS5	SPT5	7.50	1	1	2	3			
8.80	-10.2870		Lateritic clayey sand (Brown,Yellow,Grey)	5.20	DS6	SPT6	9.00	8	11	17	28			
					DS7	SPT7	10.50	14	18	24	42			
					DS8	SPT8	12.00	19	27	23	50			Balance 6cm
					DS9	SPT9	13.50	13	19	26	45			
14.00	-15.4870		Lateritic sandy clay (Pink,Grey)	5.00	DS10	SPT10	15.00	15	21	27	48			
					DS11	SPT11	17.00	14	17	24	41			
19.00	-20.4870		Fine to medium sand (Red,Brown)	1.60	DS12	SPT12	19.00	11	19	27	46			
20.60	-22.0870		Lateritic clayey sand (Grey,Brown)	3.80	DS13	SPT13	21.00	8	17	28	45			
24.40	-25.8870				DS14	SPT14	23.00	13	29	21	50			Balance 5cm
24.70	-26.1870		Lateritic boulder	0.30										
			Lateritic clayey sand (Pink,Yellow)	6.00	DS15	SPT15	25.00	14	26	24	50			Balance 5cm
							30.70	SPT Rebounded						TC bit drilling from 30.7m to 31.3m
30.70	-32.1870		Soft rock	0.60										DC bit drilling from 31.3m to 34.3m
31.30	-32.7870		Hard rock	3.00			Core recovery : 60cm[31.3m-32.3m], 122cm [32.3m - 34.3m]							
34.30	-35.7870						END OF BORE HOLE AT 34.3 m							

SITE IN CHARGE

ENGINEER IN CHARGE

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 5(Under water)**	Date of Commence	**: 17-01-2020**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**: 21-01-2020**	Reduced Level Surface (River bed)	**: -1.888 m**
Termination depth(m)	**: 35.1 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**: 0.50 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	Penetration Value DEPTH (m)	15	30	45	SPT 'N'	PLOT OF SPT 'N' VALUE (0 15 30 45 60 75 90)	OBSERVATIONS
	1.1120		Water	3.00									
0.00	-1.8880		Lateritic clayey sand (Brown,Red,Grey)	3.800	DS1	SPT1	1.50	1	2	1	3		
3.80	-5.6880				DS2	SPT2	3.00	2	2	3	5		
			Silty clay (Grey)	5.20	DS3	SPT3	4.50	1	0	1	1		
					DS4	SPT4	6.00	1	1	1	2		
					DS5	SPT5	7.50	1	1	1	2		
9.00	-10.8880		Lateritic clayey sand (Brown,Red,Grey)	5.90	DS6	SPT6	9.00	8	7	8	15		
					DS7	SPT7	10.50	6	6	8	14		
					DS8	SPT8	12.00	5	5	6	11		
					DS9	SPT9	13.50	4	5	9	14		
14.90	-16.7880		Lateritic clayey sand (Yellow,Brown)	5.70	DS10	SPT10	15.00	9	19	20	39		
					DS11	SPT11	17.00	6	14	19	33		
					DS12	SPT12	19.00	12	15	25	40		
20.60	-22.4880		Lateritic silty clayey sandv(Grey,Brown)	3.50	DS13	SPT13	21.00	5	9	13	22		
					DS14	SPT14	23.00	5	14	19	33		
24.10	-25.9880		Lateritic silty sand (Pink,Yellow)	7.10	DS15	SPT15	25.00	9	22	28	50		Balance 6cm
					DS15	SPT15	28.00	14	19	26	45		
31.20	-33.0880		Weathered rock	0.40			31.20	SPT Rebounded					TC bit drilling from 31.6m to 32.1m
31.60	-33.4880		Soft rock	0.50			Core recovery : 60cm [32.1m to 33.1m] , 134cm [33.1m - 35.1m]						DC bit drilling from 32.1m to 35.1m
32.10	-33.9880		Hard rock	3.00									
35.10	-36.9880						END OF BORE HOLE AT 35.10 m						

SITE IN CHARGE

ENGINEER IN CHARGE

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram				
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505				
Contractor	: Jamshad Naseeri P K	Site Location	: Palathingal-Parapanagadi site, Malappuram		

BORING/DRILLING DATA

Bore Hole No	**: 6(Under water)**	Date of Commence	**: 23-01-2020**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**: 27-01-2020**	Reduced Level Surface (River bed)	**: -2.809 m**
Termination depth(m)	**: 36.9 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**: 1.10 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	Penetration Value DEPTH (m)	15	30	45	SPT 'N'	PLOT OF SPT 'N' VALUE 0 15 30 45 60 75 90	OBSERVATIONS
	0.1910		Water	3.000									
0.00	-2.8090		Lateritic clayey sand (Brown,Red,Grey)	4.300	DS1	SPT1	3.00	1	2	2	4		
4.30	-7.1090		Sandy clay (Grey)	4.30	DS2	SPT2	4.50	2	2	4	6		
					DS3	SPT3	6.00	1	1	0	1		
					DS4	SPT4	7.50	1	0	1	1		
8.60	-11.4090		Lateritic clayey sand (Brown,Red,Grey)	5.40	DS5	SPT5	9.00	4	3	6	9		
					DS6	SPT6	10.50	5	5	10	15		
					DS7	SPT7	12.00	8	9	12	21		
					DS8	SPT8	13.50	11	13	17	30		
14.00	-16.8090		Lateritic clayey sand (Yellow,Brown)	6.80	DS9	SPT9	15.00	14	14	22	36		
					DS10	SPT10	17.00	6	12	24	36		
					DS11	SPT11	19.00	9	17	29	46		
20.80	-23.6090		Lateritic silty clayey sand(Grey,Brown)	3.90	DS12	SPT12	21.00	11	14	28	42		
					DS13	SPT13	23.00	12	11	21	32		
24.70	-27.5090		Lateritic silty sand(Pink,Yellow)	8.10	DS14	SPT14	25.00	12	22	28	>50		Balance 7cm
					DS15	SPT15	27.00	14	24	29	52		
					DS16	SPT16	29.00	>50	-	-	>50		Balance 38cm
32.80	-35.6090		Weathered rock	0.40			32.80	SPT Rebounded					TC bit drilling from 32.8m to 33.2m
33.20	-36.0090		Soft rock	0.70									DC bit drilling from 33.9m to 36.9m
33.90	-36.7090		Hard rock	3.00			Core recovery : 63cm [33.9m to 34.9m], 142cm [34.9m - 36.9m]						
36.90	-39.7090						END OF BORE HOLE AT 36.90 m						

SITE IN CHARGE

ENGINEER IN CHARGE

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 7 (Under water)**	Date of Commence	**: 29-01-2020**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**: 01-02-2020**	Reduced Level Surface (River bed)	**: -2.117 m**
Termination depth(m)	**: 37.0 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**:1.60 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	Penetration Value DEPTH (m)	15	30	45	SPT 'N'	PLOT OF SPT 'N' VALUE (0 15 30 45 60 75 90)	OBSERVATIONS
	0.8830		Water	3.00									
0.00	-2.1170		Lateritic clayey sand (Brown,Red,Grey)	3.10	DS1	SPT1	3.00	1	2	4	6		
3.10	-2.2170		Sandy clay (Grey)	6.20	DS2	SPT2	4.50	2	1	0	1		
					DS3	SPT3	6.00	1	0	1	1		
					DS4	SPT4	7.50	1	1	1	2		
9.30	-8.4170				DS5	SPT5	9.00	1	3	5	8		
			Lateritic clayey sand (Brown,Red,Grey)	3.10	DS6	SPT6	10.50	5	7	9	16		
12.40	-11.5170		Lateritic clayey sand (Yellow,Brown)	3.80	DS7	SPT7	12.00	4	6	10	16		
					DS8	SPT8	13.50	7	9	12	21		
16.20	-15.3170				DS9	SPT9	15.00	11	14	20	34		
			Lateritic silty clayey sand(Grey,Brown)	8.40	DS10	SPT10	17.00	10	18	21	39		
					DS11	SPT11	19.00	13	15	24	39		
					DS12	SPT12	21.00	10	10	26	36		
					DS13	SPT13	23.00	9	19	22	41		
24.60	-23.7170				DS14	SPT14	25.00	11	24	28	52		Balance 5cm
			Lateritic silty sand(Pink,Yellow)	6.30	DS15	SPT15	27.00	16	>50	-	>50		Balance 32cm
					DS16	SPT16	29.00	>50	-	-	>50		Balance 40cm
30.90	-30.0170						30.90	SPT Rebounded					
			Weathered rock	2.40									TC bit drilling from 30.9 m to 33.3m
33.30	-32.4170												
			Soft rock	0.70									DC bit drilling from 34m to 37m
34.00	-33.1170												
			Hard rock	3.00			Core recovery : 61cm [34m to 35m], 124cm [35m -37m]						
37.00	-36.1170						END OF BORE HOLE AT 37 m						

SITE IN CHARGE

ENGINEER IN CHARGE

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K
Site Location	: Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 8 (Under water)**	Date of Commence	**: 04-02-2020**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**: 07-02-2020**	Reduced Level Surface (River bed)	**: -1.784m**
Termination depth(m)	**: 36.0 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**:0.90 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								PLOT OF SPT 'N' VALUE	OBSERVATIONS
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	DEPTH (m)	15	30	45	SPT 'N'		0 15 30 45 60 75 90	
	1.2160		Water	3.00										
0.00	-1.7840		Lateritic clayey sand (Brown,Red,Grey)	4.10										
4.10	-5.8840		Sandy clay (Grey)	1.80	DS1	SPT1	3.00	1	3	4	7			
5.90	-7.6840		Lateritic clayey sand (Brown,Red,Grey)	2.10	DS2	SPT2	4.50	2	2	3	5			
8.00	-9.7840		Clay(Grey)	4.60	DS3	SPT3	6.00	1	1	1	2			
					DS4	SPT4	7.50	1	2	1	3			
					DS5	SPT5	9.00	1	2	3	5			
					DS6	SPT6	10.50	6	9	12	21			
					DS7	SPT7	12.00	7	10	14	24			
12.60	-14.3840		Lateritic clayey sand (Yellow,Brown)	4.10	DS8	SPT8	13.50	8	9	13	22			
16.70	-18.4840		Lateritic silty clayey sand(Grey,Brown)	4.90	DS9	SPT9	15.00	13	17	24	41			
					DS10	SPT10	17.00	11	18	20	38			
					DS11	SPT11	19.00	11	15	32	47			
					DS12	SPT12	21.00	12	16	30	46			
21.60	-23.3840		Silty clay (White)	3.30	DS13	SPT13	23.00	13	17	28	45			
24.90	-26.6840		Lateritic silty sand(Pink,Yellow)	2.50	DS14	SPT14	25.00	10	24	26	50			Balance 5cm
27.40	-29.1840		Lateritic silty clayey sand(Grey,Brown)	4.70	DS15	SPT15	27.00	8	11	15	26			Balance 32cm
					DS16	SPT16	29.00	11	22	25	47			Balance 40cm
32.10	-33.8840		Weathered rock	0.70			32.10	SPT Rebounded						TC bit drilling from 32.1m to 33m
32.80	-34.5840		Soft rock	0.20										DC bit drilling from 33m to 36m
33.00	-34.7840		Hard rock	3.00			Core recovery : 59cm [33m to 34m], 115cm [34m -36m]							
36.00	-37.7840						END OF BORE HOLE AT 36m							

SITE IN CHARGE

ENGINEER IN CHARGE

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**: 9 (Under water)**	Date of Commence	**: 11-02-2020**	River water level	**: 3.000 m**
Type of boring	: Rotary Drilling	Date of completion	**: 14-02-2020**	Reduced Level Surface (River bed)	**: -0.783m**
Termination depth(m)	**: 35.60 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**:0.80 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	Penetration Value DEPTH (m)	15	30	45	SPT 'N'	PLOT OF SPT 'N' VALUE	OBSERVATIONS
	3.7830		**Water**	**3.00**								0 15 30 45 60 75 90	
0.00	0.7830		**Fine sand (Grey,Yellow)**	**2.80**	DS1	SPT1	**1.50**	2	3	4	**7**		
2.80	-2.0170		**Lateritic clayey sand (Brown,Yellow)**	**2.80**	DS2	SPT2	**3.00**	2	3	5	**8**		
					DS3	SPT3	**4.50**	2	3	3	**6**		
5.60	-4.8170				DS4	SPT4	**6.00**	1	2	1	**3**		
			Silty clay (Grey)	**4.10**	DS5	SPT5	**7.50**	1	2	2	**4**		
					DS6	SPT6	**9.00**	2	1	2	**3**		
9.70	-8.9170				DS7	SPT7	**10.50**	7	11	16	**27**		
			Lateriic clayey sand (Yellow,Brown)	**3.50**	DS8	SPT8	**12.00**	10	14	18	**32**		
13.20	-12.4170					SPT9	**13.50**	9	8	13	**21**		No sample
			Lateritic sand (Yellow,Grey,red)	**5.30**	DS9	SPT10	**15.00**	15	21	28	**49**		
					DS10	SPT11	**17.00**	13	19	28	**47**		
18.50	-17.7170				DS11	SPT12	**19.00**	18	50	-	**>50**		Balance 17cm
			Lateritic medium sand with clay (Grey,Yellow)	**6.50**	DS12	SPT13	**21.00**	22	50	-	**>50**		Balance 19cm
					DS13	SPT14	**23.00**	20	38	12	**50**		Balance 12cm
25.00	-24.2170				DS14	SPT15	**25.00**	9	11	16	**27**		
			Silty clay (White)	**6.80**	DS15	SPT16	**28.00**	7	14	18	**32**		
					DS16	SPT17	**31.00**	11	16	17	**33**		TC bit drilling from 31.8m to 32.6m
31.80	-31.0170						**31.80**	**SPT Rebounded**					
			Soft rock	**0.80**									DC bit drilling from 32.6m to 35.6m
32.60	-31.8170												
			Hard rock	**3.00**			**Core recovery : 55cm [32.6m to 33.6m], 145 cm [33.6m -35.6m]**						
35.60	-34.8170						**END OF BORE HOLE AT 35.6 m**						

GEOTECHNICAL BORING LOG

Name of Project :	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram
Client	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505
Contractor	: Jamshad Naseeri P K — Site Location : Palathingal-Parapanagadi site, Malappuram

BORING/DRILLING DATA

Bore Hole No	**:10 (Land)**	Date of Commence	**: 17-02-2020**	Ground water level	**: 1.608 m**
Type of boring	: Rotary Drilling	Date of completion	**: 20-02-2020**	Reduced Level Surface	**: 3.139m**
Termination depth(m)	**: 35.90 m**	Diamond carbide bit drilling (m)	**: 3.00 m**	Tungston carbide bit drilling (m)	**: 1.80 m**

Notations : DS/UDS-Disturbed/Undisturbed sample , SPT - Standard penetration test

SUBSURFACE PROFILE					STANDARD PENETRATION TEST DATA								PLOT OF SPT 'N' VALUE	OBSERVATIONS
Elevation (M)	R.L (M)	Graphic Log	Description	Layer Thickness (M)	DS/ UDS	SPT Number	DEPTH (m)	15	30	45	SPT 'N'		0 15 30 45 60 75 90	
0.00	3.1390		Lateritic clay	0.30										
0.30	2.8390		Fine sand (Grey,Yellow)	1.10	DS1	SPT1	1.50	2	3	4	7			
1.40	1.7390		Lateritic clayey sand (Brown.Grey)	2.60	DS2	SPT2	3.00	2	2	4	6			
4.00	-0.8610													
			Silty clay (Grey)	1.30	DS3	SPT3	4.50	1	0	1	1			
5.30	-2.1610													
6.60	-3.4610		Clayey sand (Brown.Yellow)	1.30	DS4	SPT4	6.00	1	1	1	2			
					DS5	SPT5	7.50	1	2	1	3			
			Silty clay (Grey)	3.60	DS6	SPT6	9.00	1	2	1	3			
10.20	-7.0610													
			Lateritic clayey sand (Yellow,Grey,Brow	2.50	DS7	SPT7	10.50	8	13	15	28			
					DS8	SPT8	12.00	7	11	13	24			
12.70	-9.5610				DS9	SPT9	13.50	6	9	12	21			
			Sandy clay (White,Yellow)	2.90										
					DS10	SPT10	15.00	8	11	13	24			
15.60	-12.4610													
					DS11	SPT11	17.00	13	21	28	49			
					DS12	SPT12	19.00	20	37	13	50			Balance 10cm
			Medium sand(Grey)	9.20	DS13	SPT13	21.00	28	50	-	>50			Balance 20cm
					DS14	SPT14	23.00	31	50	-	>50			Balance 18cm
24.80	-21.6610						24.80	SPT Rebounded						TC bit drilling from 24.8m to 26.3m
26.30	-23.1610		Hard laterite	1.50										
					DS15	SPT15	28.00	12	17	15	32			
			Silty clay (White)	6.30										
					DS16	SPT16	31.00	10	14	15	29			
32.60	-29.4610						32.60	SPT Rebounded						TC bit drilling from 32.6m to 32.9m
			Soft rock	0.30										DC bit drilling from 32.9m to 35.9m
32.90	-29.7610						Core recovery : 65cm[32.9m-33.9m], 129cm [33.9m -35.9]							
			Hard rock	3.00										
35.90	-32.7610						END OF BORE HOLE AT 35.9 m							

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 21-12-2019-26-12-2019
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 27-12-2019-29-12-2019
BORE HOLE NO : 1		**DEPTH OF BORE HOLE**	: 36.60 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Silty clay (Brown)	2	17	2.40	CL	0	0	0	0	40	60	46.0	25.0		21.0	1.0	-	
SPT 2	DS2	3.0	Lateritic sandy clay (Yellow,Pink,Brown)	16	11	2.60	SC-CL	0	0	0	9	37	54	42.0	23.0		19.0	20.0	22.0	
SPT 3	DS3	4.5	-do-	15	13		"													
SPT 4	DS4	6.0	Lateritic fine sand (Black,Yellow)	7	15	2.54	SP	0	0	0	15	76	9						19.0	
SPT 5	DS5	7.5	-do-	8	16		"													
SPT 6	DS6	9.0	Clay (Black)	3	44	2.70	CH	0	0	0	0	1	99	61.0	15.0		46.0	0.2		
SPT 7	DS7	10.5	-do-	3	51		"													
SPT 8	DS8	12.0	-do-	2	51		"													
SPT 9	DS9	13.5	Lateritic clayey sand (Yellow,Light grey)	18	31	2.63	SC-CL	0	0	0	6	57	37	41.0	20.0		21.0	16.0		
SPT 10	DS10	15.0	-do-	23	30		"													
SPT 11	DS11	17.0	Lateritic medium to fine sand (Light grey)	35	20	2.65	SP	0	0	1	24	63	12						29.0	
SPT 12	DS12	19.0	-do-	39	18		"													
SPT 13	DS13	21.0	Lateritic sandy clay (Yellow,Brown)	51	21	2.66	CL	0	0	1	22	14	63					44.0		
SPT 14	DS14	23.0	Lateritic gravelly sand (Pink,Brown)	>50	18	2.60	SP	0	22	7	22	34	15					47.0	32.0	
SPT 15	DS15	25.0	Lateritic clayey sand (Yellow,Light brown)	>50	30	2.61	SC-CL	0	7	4	25	33	31							
SPT 16	DS16	29.0	-do-	49	31		"											42.0	31.0	

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
Moisture content and Shear tests conducted on remoulded specimens
All the tests are conducted based on relevent IS Codes
UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods
Direct Shear test
compression test

Friction Angle-
Cohesion- Unconfined

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 28-12-2019 -01-01-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 02-01-2020 -04-01-2020
BORE HOLE NO : 2		**DEPTH OF BORE HOLE**	: 36.70 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Silty clay(Brown)	3	24	2.60	CL	0	0	0	0	9	91					2.7		
SPT 2	DS2	3.0	-do-	10	26		"													
SPT 3	DS3	4.5	Lateritic sandy clay (Yellow,Pink,Brown)	8	41	2.56	CL	0	0	0	14	27	59					11.6		
SPT 4	DS4	6.0	Clay (Black)	5	55	2.70	CH	0	0	0	0	16	84							
SPT 5	DS5	7.5	-do-	5	29	2.77	"											6.7		
SPT 6	DS6	9.0	Lateritic clayey sand(Black,Yellow)	12	31	2.60	SC	0	0	0	9	47	44					16.4		
SPT 7	DS7	10.5	-do-	14	33		"												21.3	
SPT 8	DS8	12.0	-do-	16	29	2.60	"	0	0	0	24	57	19					20.0		
SPT 9	DS9	13.5	Lateritic clayey sand (Yellow,Light grey)	22	24	2.40	SC	0	0	0	0	77	23						18.6	
SPT 10	DS10	15.0	-do-	26	22	2.50	"											21.3		
SPT 11	DS11	17.0	Lateritic clayey sand(Black,Yellow)	39	24	2.60	SC	0	0	0	7	64	29						28.9	
SPT 12	DS12	19.0	-do-	32	19	2.64	"											22.9		
SPT 13	DS13	21.0	-do-	38	22		"	0	0	0	7	59	34							
SPT 14	DS14	23.0	Lateritic medium to fine sand (Light grey)	41	29	2.60	SP	0	0	0	17	71	12						30.0	
SPT 15	DS15	25.0	Lateritic sandy clay (Yellow,Brown)	50	35	2.56	CL	0	0	0	17	26	57					46.8		
SPT 16	DS16	28.0	Lateritic clayey sand (Yellow,Light brown)	45	33	2.64	SC	0	0	0	4	55	41					46.0	30.3	
SPT 17	DS17	31.0	-do-	>50	31	2.63	"													

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
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Test Methods
Friction Angle- Direct Shear test
Unconfined compression test
Cohesion-

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 04-01-2020 -08-01-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 10-01-2020 -14-01-2020
BORE HOLE NO : 3		**DEPTH OF BORE HOLE**	: 36.10 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Lateritic clayey Sand (Brown,Grey,Yellow)	5	12	2.60	SC-CL	0	0	0	0	55	45					4.6	-	
SPT 2	DS2	3.0	-do-	6	18	2.70	"	0	0	0	4	49	47					6.0		
SPT 3	DS3	4.5	Clay (Black,Grey)	2	45	2.63	CH	0	0	0	0	6	94	63.0	17.0		46.0	1.5		
SPT 4	DS4	6.0	-do-	4	47															
SPT 5	DS5	7.5	-do-	4	51	2.61														
SPT 6	DS6	9.0	Lateritic clayey Sand (Yellow,Grey)	22	22	2.60	SC-CL	0	0	1	5	50	44					21.6	16.7	
SPT 7	DS7	10.5	-do-	25	20															
SPT 8	DS8	12.0	Lateritic sandy clay (Brown,Grey)	32	28	2.64	CL	0	0	0	0	44	56					32.5	-	
SPT 9	DS9	13.5	Lateritic medium to fine sand with clay (Pink,Grey)	27	26	2.54	SP	0	0	0	24	55	21					21.0	26.1	
SPT 10	DS10	15.0	-do-	31	21	2.63	"	0	0	0	40	33	27					29.6	27.6	
SPT 11	DS11	17.0	Lateritic gravelly sand (Grey,Dark brown)	45	15	2.60	SP	0	19	21	27	20	13						30.1	
SPT 12	DS12	19.0	Lateritic silty sand (Yellow)	26	33	2.54	SM	0	0	0	0	61	39							
SPT 13	DS13	21.0	-do-	27	30														16.0	
SPT 14	DS14	23.0	-do-	33	30															
SPT 15	DS15	25.0	Lateritic clayey silty sand (Yellow,Light brown)	50	27	2.60	SM	0	0	0	0	54	46						28.6	
SPT 16	DS16	28.0	-do-	51	30														31.0	
SPT 17	DS17	31.0	Fine sand (Grey)	>50	11	2.60	SP	0	0	0	10	85	5						31.2	

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 10-01-2020 -15-01-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 17-01-2020 -19-01-2020
BORE HOLE NO : 4		**DEPTH OF BORE HOLE**	: 34.3 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Lateritic clayey sand (Light brown,Grey)	2	26	2.63	SC-CL	0	0	0	2	57	41					1.7	-	
SPT 2	DS2	3.0	-do-	3	22		"	0	0	0	1	64	35					2.0	10.3	
SPT 3	DS3	4.5	Silty clay (Black,Grey)	2	61	2.64	CH	0	0	0	0	11	89					1.0		
SPT 4	DS4	6.0	-do-	3			"													
SPT 5	DS5	7.5	-do-	3	65	2.66	"													
SPT 6	DS6	9.0	Lateritic clayey sand (Brown,Grey)	28	29	2.60	SC-CL	0	0	0	0	62	38					28.6	27.4	
SPT 7	DS7	10.5	-do-	42	41		"	0	0	0	11	64	25					37.8	30.1	
SPT 8	DS8	12.0	-do-	>50	31	2.66	"													
SPT 9	DS9	13.5	Lateritic clayey sand (Grey,Yellow,Brown)	45	26	2.51	SC-CL	0	0	0	24	55	21					40.7	29.6	
SPT 10	DS10	15.0	Lateritic sandy clay (Pink,Grey)	48	36	2.64	CL	0	0	0	1	44	55					37.8		
SPT 11	DS11	17.0	-do-	41	33		"													
SPT 12	DS12	19.0	Lateritic fine to medium sand (Red,Brown)	46	12	2.59	SP	0	0	0	51	34	15					0.0	31.0	
SPT 13	DS13	21.0	Lateritic clayey sand (Grey,Brown)	45	27	2.53	SC-CL	0	0	0	19	44	37					27.8	28.6	
SPT 14	DS14	23.0	-do-	>50	26		"													
SPT 15	DS15	25.0	Lateritic clayey sand (Pink,Yellow)	>50	22	2.58	SC-CL	0	0	0	10	51	39					26.0	30.1	

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 17-01-2020 -21-01-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 23-01-2020 -26-01-2020
BORE HOLE NO : 5		**DEPTH OF BORE HOLE**	: 35.1 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Lateritic clayey sand (Brown,Red,Grey)	3	33	2.60	SC	0	1	1	25	51	22					2.3		
SPT 2	DS2	3.0	-do-	5	26		"													
SPT 3	DS3	4.5	Silty clay (Grey)	1	41	2.58	CH	0	0	0	0	14	86					0.4		
SPT 4	DS4	6.0	-do-	2	44		"													
SPT 5	DS5	7.5	-do-	2	52	2.60	"											1.6		
SPT 6	DS6	9.0	Lateritic clayey sand (Brown,Red,Grey)	15	37	2.61	SC	0	0	0	4	79	17					15.2	26.4	
SPT 7	DS7	10.5	-do-	14	31		"												26.0	
SPT 8	DS8	12.0	-do-	11	22	2.62	"	0	0	0	0	70	30					10.6		
SPT 9	DS9	13.5	Lateritic clayey sand (Yellow,Brown)	14	29	2.40	SC	0	0	0	0	67	33					14.7		
SPT 10	DS10	15.0	-do-	39	14	2.64	"												28.5	
SPT 11	DS11	17.0	-do-	33	16		"											29.8		
SPT 12	DS12	19.0	-do-	40	17	2.60	"	0	0	0	0	65	35							
SPT 13	DS13	21.0	Lateritic silty clayey sand(Grey,Brown)	22	26	2.62	SC	0	0	0	0	64	36					20.7		
SPT 14	DS14	23.0	-do-	33	24		"												25.6	
SPT 15	DS15	25.0	Lateritic silty sand(Pink,Yellow)	>50	11	2.60	SM	0	0	0	7	71	22							
SPT 16	DS16	28.0	-do-	45	16	2.50	"												30.1	

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
Moisture content and Shear tests conducted on remoulded specimens
All the tests are conducted based on relevent IS Codes
UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods
Direct Shear test
compression test

Friction Angle-
Cohesion- Unconfined

GEO STRUCTURA LABORATORIES

Geotechnical | Structural | Environmental

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 23-01-2020-27-01-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 29-01-2020-30-01-2020
BORE HOLE NO : 6		**DEPTH OF BORE HOLE**	: 36.9 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	3.0	-do-	4	25	2.61	SC	0	0	0	1	77	22					2.6	17.6	
SPT 2	DS2	4.5	Sandy clay (Grey)	6	41	2.66	CH	0	0	0	0	41	59					5.5		
SPT 3	DS3	6.0	-do-	1			"											0.9		
SPT 4	DS4	7.5	-do-	1	42	2.61	"											0.4		
SPT 5	DS5	9.0	Lateritic clayey sand (Brown,Red,Grey)	9	38	2.65	SC	0	0	0	0	71	29					9.6	20.7	
SPT 6	DS6	10.5	-do-	15			"	0	0	0	6	70	24					14.6		
SPT 7	DS7	12.0	-do-	21	36	2.40	"											22.0	25.5	
SPT 8	DS8	13.5	-do-	30	44		"													
SPT 9	DS9	15.0	Lateritic clayey sand (Yellow,Brown)	36	26	2.65	SC	0	0	0	26	52	22					26.6	28.4	
SPT 10	DS10	17.0	-do-	36	40		"	0	0	0	1	24	75							
SPT 11	DS11	19.0	-do-	46	26		"											37.6		
SPT 12	DS12	21.0	Lateritic silty clayey sand(Grey,Brown)	42	31	2.61	SC	0	0	0	0	77	23					41.2	30.2	
SPT 13	DS13	23.0	-do-	32			"													
SPT 14	DS14	25.0	Lateritic silty sand(Pink,Yellow)	>50	21	2.64	SM	0	0	0	2	71	27						31.2	
SPT 15	DS15	27.0	-do-	52	17		"	0	0	1	6	77	16							
SPT 16	DS16	29.0	-do-	>50	18	2.65	"												29.8	

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
Moisture content and Shear tests conducted on remoulded specimens
All the tests are conducted based on relevent IS Codes
UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods
Friction Angle- Direct Shear test
Cohesion- Unconfined compression test

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 29-01-2020-01-02-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 03-02-2020-05-02-2020
BORE HOLE NO : 7		**DEPTH OF BORE HOLE**	: 37.0 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	3.0	Lateritic clayey sand (Brown,Red,Grey)	6	27	2.60	SC	0	0	0	44	15	41					1.2	17.1	
SPT 2	DS2	4.5	Sandy clay (Grey)	1	33	2.69	CH	0	0	0	10	44	46					0.5		
SPT 3	DS3	6.0	-do-	1			"	0	0	0	0	45	55							
SPT 4	DS4	7.5	-do-	2	34	2.65	"											1.8		
SPT 5	DS5	9.0	-do-	8			"	0	0	0	0	41	59							
SPT 6	DS6	10.5	Lateritic clayey sand (Brown,Red,Grey)	16	29	2.60	SC	0	0	0	17	51	32					16.0	26.4	
SPT 7	DS7	12.0	-do-	16	27		"													
SPT 8	DS8	13.5	Lateritic clayey sand (Yellow,Brown)	21	33	2.62	SC	0	0	0	0	58	42					20.8	26.9	
SPT 9	DS9	15.0	-do-	34	40		"													
SPT 10	DS10	17.0	Lateritic silty clayey sand(Grey,Brown)	39	37	2.63	SC	0	0	0	0	62	38					36.4	30.1	
SPT 11	DS11	19.0	-do-	39			"												28.7	
SPT 12	DS12	21.0	-do-	36	30	2.65	"	0	0	0	0	64	36					29.6		
SPT 13	DS13	23.0	-do-	41			"												28.9	
SPT 14	DS14	25.0	Lateritic silty sand(Pink,Yellow)	>50	20	2.61	SM	0	0	0	1	71	28							
SPT 15	DS15	27.0	-do-	>50	21		"												27.8	
SPT 16	DS16	29.0	-do-	>50	19	2.65	"	0	0	1	1	65	33							

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
Moisture content and Shear tests conducted on remoulded specimens
All the tests are conducted based on relevent IS Codes
UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods
Direct Shear test
compression test

Friction Angle-
Cohesion- Unconfined

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 04-02-2020-07-02-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 08-02-2020-11-02-2020
BORE HOLE NO : 8		**DEPTH OF BORE HOLE**	: 36.0 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	3.0	Lateritic clayey sand (Brown,Red,Grey)	7	34	2.56	SC	0	0	0	41	27	32					10.2	21.8	
SPT 2	DS2	4.5	Sandy clay (Grey)	5	59	2.61	CH	0	0	0	20	44	36					4.4		
SPT 3	DS3	6.0	Lateritic clayey sand (Brown,Red,Grey)	2	27	2.63	SC	0	0	0	1	65	34					1.7	14.6	
SPT 4	DS4	7.5	-do-	3	26		"													
SPT 5	DS5	9.0	Clay(Grey)	5	71	2.67	CH	0	0	0	0	7	93					4.9		
SPT 6	DS6	10.5	-do-	21			"													
SPT 7	DS7	12.0	-do-	24	65	2.67	"											26.7		
SPT 8	DS8	13.5	Lateritic clayey sand (Yellow,Brown)	22	29	2.68	SC	0	0	0	5	71	24					19.0	24.5	
SPT 9	DS9	15.0	-do-	41	33		"	0	0	0	9	65	26							
SPT 10	DS10	17.0	Lateritic silty clayey sand(Grey,Brown)	38	27	2.67	SC	0	0	0	11	61	28					30.7	28.6	
SPT 11	DS11	19.0	-do-	47			"	0	0	0	12	57	31							
SPT 12	DS12	21.0	-do-	46	26	2.65	"													
SPT 13	DS13	23.0	Silty clay (White)	45	51	2.61	CH	0	0	0	7	17	76					40.7		
SPT 14	DS14	25.0	Lateritic silty sand(Pink,Yellow)	50	20	2.67	SM	0	0	0	1	77	22					41.0	29.6	
SPT 15	DS15	27.0		26			"													
SPT 16	DS16	29.0	Lateritic silty clayey sand(Grey,Brown)	47	24	2.60	SC	0	0	0	5	64	31					27.0		

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
Moisture content and Shear tests conducted on remoulded specimens
All the tests are conducted based on relevent IS Codes
UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods
Friction Angle- Direct Shear test
Cohesion- Unconfined compression test

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 11-02-2020-14-02-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 16-02-2020-19-02-2020
BORE HOLE NO : 9		**DEPTH OF BORE HOLE**	: 35.60 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Fine sand (Grey,Yellow)	22	16	2.63	SP	0	0	0	0	91	9						24.4	
SPT 2	DS2	3.0	Clayey sand (Brown,Yellow)	8	28	2.66	SC	0	0	0	3	70	27					8.6		
SPT 3	DS3	4.5	-do-	6	31		"													
SPT 4	DS4	6.0	Silty clay (Grey)	3	33	2.70	CH	0	0	0	0	14	86					2.7		
SPT 5	DS5	7.5	-do-	4	39		"													
SPT 6	DS6	9.0	-do-	3	41		"	0	0	0	0	64	36					2.8		
SPT 7	DS7	10.5	Lateritic clayey sand (Yellow,Brown)	27	26	2.65	SC	0	0	0	6	57	37					26.4	28.7	
SPT 8	DS8	12.0	-do-	32	24		"													
SPT 9	DS9	15.0	Lateritic sand (Yellow,Grey,red)	49	9	2.61	SP	0	0	0	22	70	8						32.2	
SPT 10	DS10	17.0	-do-	47	4		"													
SPT 11	DS11	19.0	Medium sand with clay (Grey,Yellow)	>50	10	2.64	SP	0	0	0	11	81	8						31.0	
SPT 12	DS12	21.0	-do-	>50	17		"													
SPT 13	DS13	23.0	-do-	50	11	2.62	"												31.5	
SPT 14	DS14	25.0	Silty clay (White)	27	30	2.64	CH	0	0	0	0	16	84					20.1		
SPT 15	DS15	28.0	-do-	32	37		"	0	0	0	0	19	81							
SPT 16	DS16	31.0	-do-	33	45	2.54	"											34.5		

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
Moisture content and Shear tests conducted on remoulded specimens
All the tests are conducted based on relevent IS Codes
UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods
Friction Angle- Direct Shear test
Unconfined compression test

Cohesion-

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 17-02-2020-20-02-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 21-02-2020-24-02-2020
BORE HOLE NO : 10		**DEPTH OF BORE HOLE**	: 35.90 m

TEST RESULTS

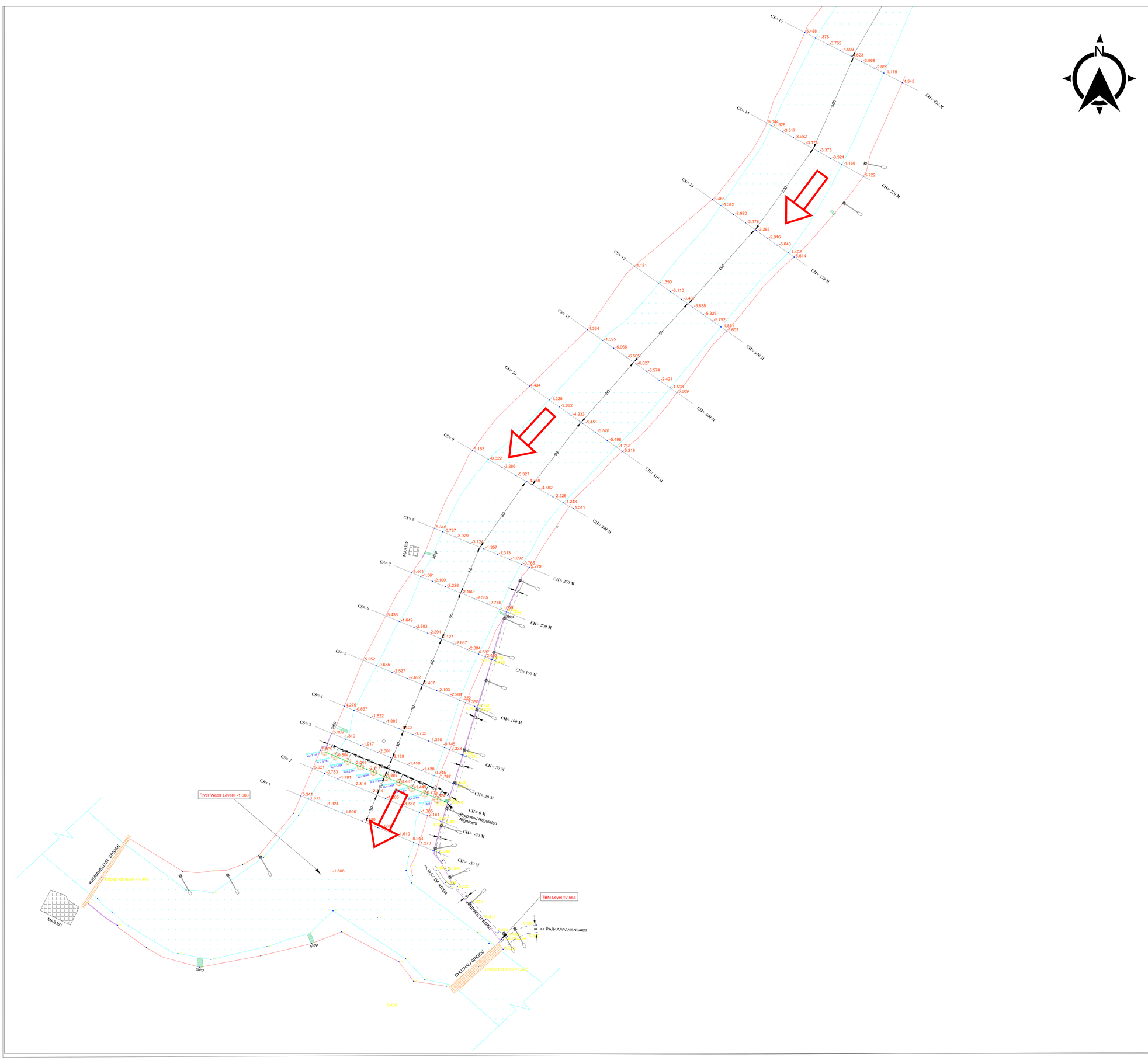
Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Fine sand (Grey,Yellow)	7	10	2.58	SP	0	0	0	0	94	6						21.2	
SPT 2	DS2	3.0	Clayey sand (Brown.Grey)	6	22	2.60	SC	0	0	0	2	75	23						26.0	
SPT 3	DS3	4.5	Silty clay (Grey)	1	41	2.61	CH	0	0	0	0	17	83					0.5		
SPT 4	DS4	6.0	Clayey sand (Brown.Yellow)	2	33	2.66	SC	0	0	0	0	74	26						18.6	
SPT 5	DS5	7.5	Silty clay (Grey)	3	46	2.70	CH	0	0	0	1	19	80					2.7		
SPT 6	DS6	9.0	-do-	3	47		"											3.3		
SPT 7	DS7	10.5	Clayey sand (Yellow,Grey,Brown)	28	26	2.62	SC	0	0	0	4	75	21						27.0	
SPT 8	DS8	12.0	-do-	24	28		"													
SPT 9	DS9	13.5	Sandy clay (White,Yellow)	21	54	2.65	CL	0	0	0	0	11	89					22.1	27.7	
SPT 10	DS10	15.0	Sandy clay (Yellow)	24	52	2.66	CL	0	0	0	0	27	73					24.1	27.9	
SPT 11	DS11	17.0	Medium sand(Grey)	49	29	2.58	SP	0	0	0	27	44	29						30.2	
SPT 12	DS12	19.0	-do-	50	10	2.60	"													
SPT 13	DS13	21.0	-do-	95	9	2.65	"	0	0	0	28	51	21						31.3	
SPT 14	DS14	23.0	-do-	95	11		"													
SPT 15	DS15	24.8	-do-	95	7	2.65	"	0	0	0	77	11	12						31.0	
SPT 16	DS16	28.0	-do-	32	10		"													
SPT 17	DS17	31.0	Silty clay (White)	29	41	2.66	CH	0	0	0	0	74	26					28.9		

Lab in Charge : Aparna A G, B Tech **Checked by : Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client
Moisture content and Shear tests conducted on remoulded specimens
All the tests are conducted based on relevent IS Codes
UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods
Direct Shear test
compression test

Friction Angle-
Cohesion- Unconfined



CLIENT :- Drawing Of parappanangadi River Site.

Distric: Malappuram	Village :
Taluk :	
PAPER SIZE = A1	SCALE=1:1800

River Boundary Line	
River bottom	
Existing Road	
Compound Wall	
crosssction line	
Electric Post	
TBM	
Bore hole	
Existing Building	
Bridge	
River	
crosssction line level	1.254
water flow direction	

Note:-

- All Dimensions are in meters.
- Level shown are based on Assuming Bench Mark Elevation 7.654 m.
- Co-ordinate shown are based on Assuming Co-ordinate E=1000,N=1000
- Each Grid Interval showing on 3 m
- Each Major Contour Line is Showing on 0.2 m
- Each Minor Contour Line is Showing on 0.4 m

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PROJECT	: Soil investigation work for the construction of regulator across Kadalundi river at Moozhikkal Kadavu near Palathingal between Thirurangadi Municipality and Moonniyur Panchayath, Malappuram	**DATE OF BORING**	: 17-02-2020-20-02-2020
CLIENT	: The Executive Engineer, Minor Irrigation Division,Malapuuram-676505	**TYPE OF BORING**	: Rotary Drilling
LOCATION	: Palathingal-Parapanagadi site, Malappuram	**DATE OF TESTING**	: 21-02-2020-24-02-2020
BORE HOLE NO : 10		**DEPTH OF BORE HOLE**	: 35.90 m

TEST RESULTS

Sample Number	Sample Type (DS/UDS)	Depth (m)	Soil Description	SPT N Value	Natural Moisture content (%)	Specific Graveity	IS Classification	Grain Size Distribution (%)						Consistancy Limits (%)			Plasticity Index	Shear Parameters		Remarks
								Gravel		Sand			Silt & Clay	Liquid Limit	Plastic Limit	Shrinkage Limit		Cohesion (kN/m2)	Friction Angle(Degree)	
								Coarse	Fine	Coarse	Medium	Fine								
SPT 1	DS1	1.5	Fine sand (Grey,Yellow)	7	10	2.58	SP	0	0	0	0	94	6						21.2	
SPT 2	DS2	3.0	Clayey sand (Brown.Grey)	6	22	2.60	SC	0	0	0	2	75	23						26.0	
SPT 3	DS3	4.5	Silty clay (Grey)	1	41	2.61	CH	0	0	0	0	17	83					0.5		
SPT 4	DS4	6.0	Clayey sand (Brown.Yellow)	2	33	2.66	SC	0	0	0	0	74	26						18.6	
SPT 5	DS5	7.5	Silty clay (Grey)	3	46	2.70	CH	0	0	0	1	19	80					2.7		
SPT 6	DS6	9.0	-do-	3	47		"											3.3		
SPT 7	DS7	10.5	Clayey sand (Yellow,Grey,Brown)	28	26	2.62	SC	0	0	0	4	75	21						27.0	
SPT 8	DS8	12.0	-do-	24	28		"													
SPT 9	DS9	13.5	Sandy clay (White,Yellow)	21	54	2.65	CL	0	0	0	0	11	89					22.1	27.7	
SPT 10	DS10	15.0	Sandy clay (Yellow)	24	52	2.66	CL	0	0	0	0	27	73					24.1	27.9	
SPT 11	DS11	17.0	Medium sand(Grey)	49	29	2.58	SP	0	0	0	27	44	29						30.2	
SPT 12	DS12	19.0	-do-	50	10	2.60	"													
SPT 13	DS13	21.0	-do-	95	9	2.65	"	0	0	0	28	51	21						31.3	
SPT 14	DS14	23.0	-do-	95	11		"													
SPT 15	DS15	24.8	-do-	95	7	2.65	"	0	0	0	77	11	12						31.0	
SPT 16	DS16	28.0	-do-	32	10		"													
SPT 17	DS17	31.0	Silty clay (White)	29	41	2.66	CH	0	0	0	0	74	26					28.9		

Lab in Charge : **Aparna A G, B Tech** **Checked by :** **Neethu R,M Tech,Geotechnical Engg,AMIE** **GSL/GTE/LR/06/2020/45**

NOTE: Samples were supplied by client

Moisture content and Shear tests conducted on remoulded specimens

All the tests are conducted based on relevent IS Codes

UDS/DS - Disturbed Soil Sample and Undisturbed Soil Sample

Test Methods

Direct Shear test

compression test

Friction Angle-

Cohesion- Unconfined