DETAILED PROJECT REPORT

FOR

DEVELOPING RAIL LINKED FREIGHT TERMINAL AT RAFLESHWAR NEAR MAKANSAR STATION

VOLUME – I

APRIL 2022

G-RIDE

(A JV of Govt. of Gujarat & Ministry of Railways)

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Chapter 0
Executive Summary

Chapter 0 - Executive Summary

0.1 Introduction

0.1.1 IPA at Feasibility Stage has been obtained for **Developing Rail Linked Freight Terminal at Rafleshwar near Makansar on WKR-MVI Section of RJT Division of Western Railway.**

0.1.2 G-RIDE to execute the project including preparation of work of Detailed Project Report (DPR) and Detailed Engineering Drawings.

0.1.3 The scope of work is as follows:

i. Detail Survey of the project area and land plans
ii. Preparation of Detailed Project Report
iii. Final Location Survey.
iv. Preparation of Engineering Scale Plan (ESP) and other Drawings.
v. Preparation of GAD's of Bridges and other structures.
vi. Cost Estimates.
vii. Financial analysis.

0.2 Traffic Projections

The ceramic cluster of Morbi is not only a national hub of Ceramic tiles but a renowned global center for ceramic production. Morbi Ceramic Association is the local industrial body, which represents the ceramic manufacturers of the Morbi region. Based on the inputs received from Morbi Ceramic Association and other inputs from the industry, G-RIDE has derived the current potential of potential containerised cargo volumes that can be catered at the proposed terminal.

Logistics Cost Comparison – Road Vs Rail:

To identify the suitability of rail logistics and container freight terminals in Morbi, a comparison of current road transport costs and potential transport costs via ICD on the rail was compared. The analysis is summarized below.

<table>
<tr><td colspan="3">Container Export
Morbi to Mundra (Export tiles/ceramic-ware)</td></tr>
<tr><td colspan="2">Rail Transport cost through ICD</td><td>Road Transport Cost from Morbi to Mundra</td></tr>
<tr><td>Rail Distance</td><td>218 Km</td><td rowspan="4">Current Road Transport Cost, Morbi to Mundra (176 Km):
~18,000 to 20,000 ₹/TEU*</td></tr>
<tr><td>Rail Haulage Charge (Loaded Container)</td><td>4873 ₹/TEU</td></tr>
<tr><td>Rail Haulage Charge (Empty container)</td><td>2,767 ₹/TEU</td></tr>
<tr><td>CTO/ICD Mark-up on loaded container dispatch</td><td>~75%**</td></tr>
</table>

Container Export **Morbi to Mundra (Export tiles/ceramic-ware)**		
Rail Transport cost through ICD		Road Transport Cost from Morbi to Mundra
Total Cost from ICD (without ICD Terminal handling charges)	12,100 ₹/TEU	
Estimated Terminal Handling charges	3,628* ₹/TEU	Logistics Cost savings resulting due to rail dispatch via proposed container terminal **~2,000 to 4,000+ ₹/TEU**
The total cost of Rail transport	**~15,700 ₹/TEU**	
** - Estimated based on comparison of rail haulage and container rail transport charges of container terminals in Gujarat.		
*-Including Terminal Access Charges and Terminal Cost		
* - Based on inputs received from industries in Morbi		

The above analysis confirms that the proposed rail terminal can generate transport cost savings of at least 2000 Rs per TEU for Tiles manufacturers of Morbi. To understand the wider impact of the proposed rail-linked container terminal, vital inputs and industry statistics from Ceramics Industries Association, Morbi (Annexure 1) were useful. These inputs were used to derive the forecasted demand and revenue for the proposed rail-linked container terminal. The overall approach adopted for determining the current and forecasted demand of containers at the proposed facility are detailed below:

Step No.	Activity	Rationale
Step-1	As-Is Status	Morbi's Current production capacity is pegged at ~170,000 to 200,000 TEUs per month, which translates to ~2,220,000 TEUs per annum
Step-2	Current Dispatch profile and attractiveness of rail	The assessment of the current dispatch profile confirms that more than 210,000 TEUs of finished goods are dispatched annually from Morbi to Mundra currently (by road) and around 109,000 TEUs from Morbi serve distant markets in Karnataka, Maharashtra, Haryana, Punjab, and Telangana – currently through road which can be easily and efficiently served through rail. In addition to Finished products, Paper is one of the key ingredients of the tiles industry – primarily for packaging purposes. The Export and Import of paper for Morbi is primarily handled by Mundra and these volumes are currently pegged at ~49,200 TEUs per annum
Step-3	Rail share	Based on the Origin-Destination wise inputs received from Ceramic Manufacturer's association, and synthesis of

Step No.	Activity	Rationale
		Step-1 and Step-2, Railways has the potential to cater to ~17% of total containerised cargo originating from/destined to Morbi. This leads to a potential volume of ~368,400 TEUs per annum.
Step-4	Forecast Demand	Based on forecasted upcoming capacity in Morbi, Ceramic Manufacturers Association has shared estimates of additional capacities in the Morbi cluster in TEUs as: 2024-25 – 120,000 to 130,000 TEUs 2026-27 – 100,000 to 110,000 TEUs 2029-30 – 125,000 to 140,000 TEUs Synthesis of this data reveals that by 2030, approximately 372,000 TEUs of new production capacity are likely to be added in the Morbi Ceramic cluster.
Step-5	Traffic projections based on the Market share of the Proposed terminal	Conservative estimates indicate that in the first year of operation, the proposed terminal can attract at least 40% of the rail-able container volumes. The proposed terminal will be functional by 2024-25 and with an installed capacity of Morbi industry to grow to ~2,354,500 TEUs by 2024-25; the potential volume that the proposed ICD will handle is: 2,354,500 x 17% (potential rail share) x 40% (ICD's share) = 1,56,288 TEUs per year = 1,56,288 x 75%[1] (Operations adjustment factor) TEUs per year = 3.57 Rakes per day (Total TEUs / 365 days / 90 TEUs per rake) Owing to the proximity to industrial cluster, The attractiveness of rail terminal will improve – which will translate to increased market share of the Morbi terminal from 30% in FY25 to 55% by FY30

Based on the above analysis, the potential traffic for the proposed terminal is derived as follows:

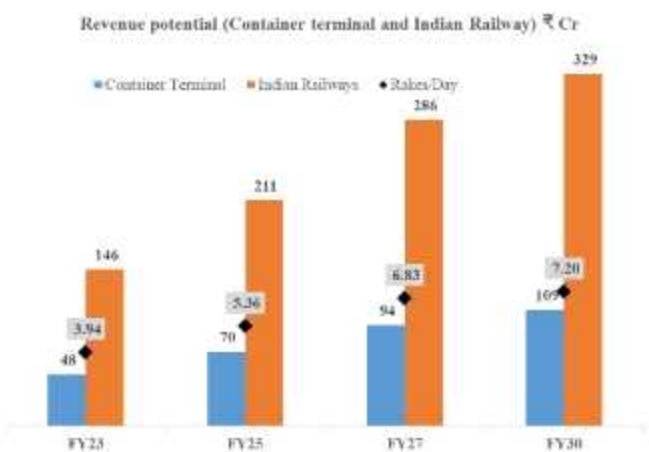
Year	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	20232-33
Market share of ICD Morbi	30%	35%	40%	45%	50%	55%	55%
Mundra Traffic	78,093	91,108	1,04,124	1,23,707	1,37,452	1,57,940	1,66,448

[1] The Terminal is expected to commence operations from July 2024 so for first year of operations only 75% of this volume will be catered by ICD

Year	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	20232-33
(TEUs) 70%							
Chandigarh Traffic (TEUs)-13%	14,100	16,450	18,800	22,336	24,818	28,517	30,053
Pune Traffic (TEUs)-6%	6,869	8,014	9,159	10,882	12,091	13,893	14,641
Bangalore Traffic (TEUs)- 5%	5,965	6,960	7,954	9,450	10,500	12,065	12,715
Hyderabad Traffic (TEUs)-5%	5,965	6,960	7,954	9,450	10,500	12,065	12,715
Total Traffic (TEUs)	**1,10,993**	**1,29,492**	**1,47,991**	**1,75,824**	**1,95,360**	**2,24,480**	**2,36,573**
Traffic (Rakes/Day)	**3.38**	**3.94**	**4.50**	**5.36**	**5.94**	**6.83**	**7.20**

Estimation of Revenue profile for the Terminal (considering a base tariff as 2,800/- Rs per TEU + Terminal Access Charges and Terminal Cost as per prevailing guidelines of MoR = 3,628/- Rs per TEU) and Railways (based on O-D mapping, as per annexure – 1 and container haulage charges, TC-I/2014/302/02) was carried out. A nominal 3% escalation in base tariff of terminals and railways was also considered.

The summary of the revenue profile for the proposed terminal and Railways is summarized herewith:



0.3 Train Operation Plan

0.3.1 This Container terminal siding will take off from the existing Dead End of the Makansar station BG loop line number 3 and zero chainage is fixed at centre line of Makansar Station (Km 15.39), the siding dead-end is at CH: 269.00. The proposed GCT line will take off from proposed Ch: 229.00

0.3.2 The terminal will not be required to own any locomotive for working trains. Western Railway will provide locomotives and wagons required to carry traffic as per EOL provision.

0.3.3 Engine-on-Load (EOL) working in the Terminal area is proposed as it is obligatory for all new sidings. Under this scheme, the train engine will perform the train and shunting movements within the handling/terminal yard. No separate shunting locomotive will therefore be required in the port and hence no shunting engine has been provided in the scheme.

0.3.4 Being a terminal yard, all trains will turn back from the Port. Hence every brake van will need reversal, i.e., detaching from rear of the incoming train and attaching it in rear of the outgoing train. Therefore, a single- entry brake van reversal siding has been provided just before start of loading/unloading line.

0.3.5 All trains will be received from Western Railway duly intensively examined. This is also a necessity under EOL working. Therefore, we have not provided any train examination facility in the terminal siding except GDR which will be carried out in handling yard where examination pathway and electrification will be provided.

0.3.6 Staff for Train Operation for proposed GCT siding will be decided by Western Railway

0.3.7 To get the weight of the incoming and outgoing trains, the facility of weighmentat electronic in-motion weigh Bridge (EIMWB) is proposed at chainage 2953.00 keeping the level grade of 100 m.

0.3.8 Placement, Removal, and Dispatch of Rakes at Terminal siding:

(i) Placement of Rakes

The procedure for reception of a train at Makansar station either from Wankaner or Morbi wouldbe the same as existing at present, but prior to allow the train for GCT either from Wankaner or Morbi, the SM on duty will telephonically contact the Transport Manager inside the proposed siding for his consent for the intended placement of the loaded or empty rake at the siding.

On arrival of the train, the SM on duty at Makansar will advise the Guard of the train and give necessary instructions to the shunting staff regarding the placement of the rake

and will take off Shunt signal protecting Trape point leading to GCT, with assurance that all enroute LC gates are closed.

The train has to move inside the GCT engine in leading position therefore, if the train arriving from Wankaner, load is itself in Engine leading position but if the train is arriving from Morbi side, then on arrival at Makansar, Engine has to reversal. The train will be shunted to the siding with the engine pulling, the Loco Pilot will follow the hand signals of the shunting staff.

The Guard of the train will supervise the operations. The speed of the train during shunting shall not exceed 15 Kmph. The Loco Pilot of the train will frequently whistle while moving the load to GCT.

The Loading/Unloading area being Top wired, so before placement of the rake load will be shunt off in handling area either of Line number 1 or 2, then load will be placed in either of three lines provided for loading unloading with Engine pushing position, after reversal of Engine at handling yard.

Before placement of a loaded rake weighment will be done while push back the load inside unloading area.

After placing of the load, BVG will be detached from the load and placed in the siding exclusive for the BVG parking.

After placement of the rake at the siding, the Guard and the shunting staff will return by the light engine. The engine will be stopped at the Stop Board, where its entry into the station yard will be guided by instructions given to the shunting staff by the SM on duty.

(II) Removal of Rakes: -

After consultation with the Terminal Transport Manager and confirmation of closing of enroute Level Crossings. the SM on duty at Makansar station will advise the Guard and instruct the shunting staff accompanying the light engine regarding the intended move. The engine will pull the load from loading area and simultaneously weighment will be done, after weighment load will be push back in the BVG siding for attaching the BVG, after that load will be shunt off to the handling area. Once after GDR of the train, the Guard will satisfy himself that the load is intact and instruct the shunting staff to signal the Loco Pilot to pull the load ahead towards Makansar station. During the shunting movement all LC gate enroute will remain closed. The Loco Pilot will stop the engine at the Stop Board. The train will be received in Line number 3 of Makansar station as per instructions of the SM on duty.

For GDR Pathway with sufficient lighting will be provided in Handling Yard.

(III) Dispatch of the Subsequent Train: -

Dispatch of the subsequent train to the Terminal siding can be done after completion of

the first move.

0.4 Proposed Layout and Engineering Parameters

The following parameters for the design of Rail alignment and planning of other facilities have been adopted:

i. Proposed connecting line from takeoff point, from Ch: 229.00 m, taking zero at center of Makansar Station and is running parallel to IR track at minimum 5.30 M c/c in Railway boundary. The land is to be acquired where land is inadequate for the formation and track work of proposed rail link to terminal proposed ~Ch:450.00 to ~ Ch:3460.00,
ii. Handling Yard for Engien run down and GDR is proposed from Ch: 985.26 to Ch: 1989.26 m
iii. The proposed terminal yard at Rafleshawar starts from Ch;3586.19 to Ch: 4803.68.
iv. One BVG and one Sick siding of 70 m and 150 m respectively is also developed from proposed loop line at the Teminal yard.
v. Land boundary of terminal area i.e 319273 sqm, length of boundary is 3812.1 m.
vi. IMWB cabin along with FOIS Room is provided at proposed Ch: 2953.00 m near terminal yard.
vii. Three full-length sidings are provided with a platform for loading and unloading in the terminal yard.
viii. Loading/unloading area is to be provided with Rail level platforms for loading and unloading and movement of RMG on all three sidings in the terminal.

0.4.1. Salient Features of the Siding and Yard Layout

i. The broad gauge adopted for the proposed rail infrastructure will be 1676 mm to be in conformity with the existing gauge of the Indian Railway track, in the vicinity of the project area.
ii. Proposed alignment of the siding has been planned with curves of 4° or flatter.
iii. Steepest Gradient in the proposed siding is 1 in 200.
iv. Train from Makansar Station will be placed in the existing Dead end at 269.00, the proposed line will Takeoff at proposed Ch 229.00 to terminal yard Rail link will be provided along with handling yard, BVG sidings and Sick Siding.
v. In handling yard, BVG siding and terminal yard turnouts of 1 in 12 curved switches are proposed.
vi. The connectivity is facilitated from takeoff point, from 229.00 m (Dismantling Dead End at Ch: 269.00 At Makansar Station).
vii. BVG sidings proposed Ch;3816.19 to Ch;3961.07
viii. Weighbridge (IMWB) is proposed at Ch: 2953.00 near Terminal Yard station.
ix. After takeoff from the existing track the alignment runs parallel to the IR track CH: 229.00 to 3586.19, connecting to the terminal. The alignment then enters the terminal at Ch: 3586.19 m and three lines are planned with loading/unloading platforms
Line 1 Ch; 3586.19 to Ch; 4718.61
Line 2 Ch; 3659.53 to Ch; 4803.68
Line 3 Ch; ; 3754.45 to Ch; 4734.31

0.5. Permanent Way

0.5.1. Following highlights are mentioned as under:

Sr. No.	Description	Details	Remarks
1.	Route KM	4.575 Km	From proposed take-off point to dead-end/Buffer Ch. 229.00 m (taking zero at center of Makansar Station) to Ch: 4740.40 m
2.	Track KM	8.36 Km	Track Km includes all points and crossings.
3.	Ballasted Track	~6260 m	Ch. 229.00 to Ch. 4026.00.00
4	Ballastless Track	2100 m	At the Loading/ Unloading Platform

0.6. Track Structure

i. Rail - 60 kg rails
ii. Sleepers - PSC monoblock sleepers with a sleeper density of 1660 nos. per km on main line and 1540 nos. per km on loop line.
iii. Turnouts – 60 Kg 1:12 curved switch on PSC sleeper with CMS crossing at Rafaleshwar takeoff point is proposed.
iv. 1 in 12 curved switches on PSC sleeper layout and 60 Kg rail section in the terminal yard and handling area.
v. Ballast – 350 on main line & 250-mm on loop lines cushion of hard stone ballast machine crushed ballast shall beused as per RDSO Specification and DFCC Standards
vi. Check Rail – at the location of level crossing and on curves sharper than 5°.
vii. Minimum C/C Spacing of tracks – 5.30m

0.7. Formation:

Blanketing material of minimum 450 mm depth has been considered below 350 mm on main line & 250-mm on loop lines ballast cushion and embankments/subgrade are to be made of compacted earth filling with a side slope of 2:1. The side slope in cutting in ordinary/hard soil would generally be 1:1. Steeper slopes of 0.5:1 in rocks and a flatter slope of 1.5:1 in soft/loose soil may have to be adopted, depending upon the nature of the material to be excavated. Standard Railway/DFC formation profile has been adopted.

CSR of ~950 m for 3 loading/unloading lines. Rail level Platform for loading/unloading will be provided of materials: VDC of 100mm, DLC (Dry Lean Concrete) of 150mm, WMM (Wet Mix Macadam) of 200mm and GSB (250mm avg. approx.), and rest will be Good Earth of ~ 500mm.

0.8. Bridges

i. All the minor and major bridges are to be designed corresponding to DFC loading standards of 32.5 t axle load.

ii. Major Bridges:

Sr. No.	Bridge No.	Existing Span /Type	Proposed span	Proposed Type of Br	Prop. Chainage	Remarks
1	MJ Bridge-20	6 x3.05 m Arch Bridge	3 X 6.10 M	PSC slab	Ch: 537.63	Extension
2	MJ Bridge-25	8 x3.05 m Arch Bridge	2 X 12.2 M	PSC slab	Ch: 2595.03	Extension

iii. Minor Bridges:

Sr. No.	Bridge No.	Existing Span /Type	Proposed span	Proposed Type of Br	Prop. Chainage	Remarks
1	Bridge-21	1x3.05 m Arch Bridge	1 X 3.05 M	RCC Box	Ch: 980.53	Extension
2	Bridge-22	1x3.05 m Arch Bridge	1 X 3.05 M	RCC Box	Ch: 1064.06	Extension
3	Bridge - 23	2 x 1.22m Girder Br.	1 X 3.00 M	RCC Box	Ch: 1473.92	Extension
4	Bridge - 24	1 x 1.83m Girder Br.	1 X 2.00 M	RCC Box	Ch: 1651.11	Extension

iv. LC's:

Sr. No.	Lc No.	Chainage	Type of LC	ATUV	Remarks
1	LC No. 18	388.38m	M	3749	To be retained and interloacked
2	LC No. 19	2152.31	M	3796	To be retained and non-interloacked
3	LC No. 20C	2836.00	M	199790	To be continue as LC until Constrution of ROB by R&B dept at LC 21

 # Note: ROB to be constructed by R&B at LC No. 21.

0.9. Proposed Signaling and Telecommunication Arrangements

0.9.1. Makansar is a exisiting B class station having Relay interlocking. To avoid Large scale changes in Existing Interlocking, It is proposed to provide New Electronic interlocking at Makanar along with Propsed connectivity of Siding from the dead end line no.3. Electrification work of this section is has been already commissioned.

0.9.2. The Makansar is Existing interlocked B class station having Relay interlocking. New Electronic interlocking along with Dual VDU, Multi aspect signaling, Electrical point operation, Datalogger, Integrated power supply is proposed for the Makansar station along with connecvtivity to siding and in New station Building. The New station Building will also be provided with communication arrangement like control phone, magenta phone, railway phone and communication through OFC &Quad cable.

0.9.3. The Siding will be provided with essential telecommunication gears is as under:

i. Autotelephone, magneto phone
ii. Control Communication through OFC & quad cable
iii. FOIS network at weigh bridges.
iv. VHFsets (25watts) fixed at the station & 5-watt walkie-talkie for mobile communication.

0.10. General Electrification

0.10.1. The Wankaner - Dahinsara section electrification is in progress with high-rise OHE. Hence, Makansar Station to ICD Siding at Rafaleshwar shall be electrified with High-Rise OHE. Makansar railway station is a B-class station. Which is situated on the Wankaner-Dahinsara section at 15.39 Km from Wankaner and 13.38 Km away from Morbi via rail. It is a special class station on a single line. Makansar Station to ICD Siding is to be electrified by Railway for which cost has been considered in the estimate to be incurred in future and the same shall be done by the proposed project SPV.

0.10.2. To examine power supply for siding: - Power supply shall be received from the new substation. One nos. of LT panel having 250 Amp MCCB as incomer is proposed to feed the required power supply from the proposed electrical substation.

0.10.3. To examine and consider the installation of 8 nos. high mast with power supply arrangements. Different sizes of 4 core LT power cables are taken in estimate to neutralized voltage drop in long distances.

0.10.4. To examine electrification of any additional structure, like Weigh Bridge, FOIS room, LT Pannel room, DG Set Room, TRD staff room, OPTG room, Record room, Toilet Block and Store with Staff room etc. Concealed type wiring in PVC pipes is taken in the estimate.

0.10.5. To examine load of the additional high mast, service building, and liaisoning work with statutory authorities for getting clearances for enhancement of load, etc.

0.11. Project Engineering and Estimation of Cost

0.11.1. Other Major Works Items:

Sr. No.	Description	Details	Remarks
1.	Providing Major Bridges 2 No.	Br No. 20 & 25	Extension of Existing Bridge
2.	Loading unloading area development in ICD	3 Nos. X 700 X 30 = 63000 sqm	
3.	Work-related Crossing to Rail	Conversion of 2 LC's to RUB's. One Lc will be continue for temporary purpose.	
4.	High Rise OHE	1x25 Kv AC 50 Hz from Ch: 0.00 up to the terminal and no OHE on loading-unloading lines.	Ch;0.00 to Ch; 4025.0 Track km: ~6500 m
5	Telecom cable from Rafleshwar station to the terminal yard.	Cable from Makansar to the terminal yard	
6	Station Building and Toilet Block at Makansar Station.	Total 420 sqm (approx.)	
7	Gate Loadge at LC 18,19,20	Total 165 sqm (approx.)	
6	FOIS, Weighbridge Room, Commercial operating facility at Handling yard and Toilet Block.	Total 85 sqm (approx.)	
7	General electrical substation and Toilet Block.	Total 110 sqm (approx.)	
8	High Mast (30 m Height)	08 nos Electrical high masts at Stacking & loading/unloading area	
9	Boundary wall, Security Gate offices	Boundary wall: ~2200m Security Gate office 70 sqm	
10	Internal Road facilities for cargo movement	~1.4 Km	

0.11.2. Estimation of cost

The cost has been worked out based on RVNL SOR and Last Accepted Rates (LARs) of similar kinds of items. Estimation cost of Rail Facilities works out as under:

Detailed Project Cost (As per Latest RVNL SOR Dt. March/2021)			
Lumpsum Cost of Construction for Developing Rail Linked Freight Terminal at Rafleshwar near Makansar Station On Wankaner-Morvi Section Of Rajkot Division Of Western Railway In Gujarat			
S.No.	**Description**	**Percentages**	**Cost (Rs) in Crores**
I	Land Acquisition including environmental charges		17.40
II	Civil Works		167.03
III	S&T		8.12
IV	Genl Electrification (Incl. Overhead Crossing)		1.81
V	TRD		6.62
VI	Mechanical Works		0.50
A	**Basic Cost :**		**201.48**
VII	Preliminary expenses @ **0.5 % of Total Project Cost Including Land**	0.2%	1.01
VIII	Escalation during Construction @ **5%** over **70%** of Basic cost for 1 year (Excluding Land Acquisition)	5%	6.44
IX	PMC @ **10%** over Basic Cost (Excluding Land Acquisition)	10%	18.41
X	SPV registration/Administration Charges Lumpsum @**1%** (Excluding Land Acquisition)	1%	1.84
XI	Legal and Insurance Charges @ **0.5%** percentage on Basic Cost (Excluding Land Acquisition)	0.5%	0.920
XII	Contingency @ **1%**	1%	1.84
B	**Total Cost Rounded Off :**		**232.00**
C	**Operator Cost**		**48.00**
TOTAL PROJECT COST (B + C)			**280.00**

Chapter 1
Introduction

Chapter 1 - Introduction

1. Background

Gujarat state takes pride of being a versatile and dynamic state in India with stronger economic foundation. Over the last two decades, the name of "Gujarat" has emerged synonymous with progress and vibrancy. The Government of Gujarat (GoG) is striving to deliver better than the best rail infrastructure in the state.

With this backdrop, Government of Gujarat (GoG) and Ministry of Railway (MoR) have signed a joint venture agreement on 17th August 2016 to develop railway projects through a project specific SPV. Consequently, a JV company "Gujarat Rail Infrastructure Development Corporation Limited (G-RIDE)" has been incorporated under the provisions of the companies Act, 2013 on 6th January 2017 with equity contribution of 51% and 49% from Government of Gujarat (GOG) and Ministry of Railway (MOR) respectively.G-RIDE has been established with a mission to develop and augment critical Railway Infrastructure, to enhance capacity of High-Density Network and to provide last mile rail connectivity with the main railway line within the State, with high standards of safety and efficiency by adopting the best technological practices, sound financial strategy and optimum utilization of resources through implementing large capacity creation programs.

As part of this endeavor, GRIDE proposes to develop Rail linked freight terminal in the Morbi region on Rajkot Division on Western Railway on JV/PPP Mode. G-RIDE has received interest from M/S Millennium Tiles Ltd for equity participation in the project. Lack of container handling/freight handling rail-linked terminals in these regions is leading to large volumes of freight moving on the road. This results in high landed cost to industry and the overall increase in transport cost across the region; thereby constraining industrial development and resulting in systemic in-efficiency.

A pre-feasibility study was carried out for this project by GRIDE. In-Principal approval has been issued by DRM Rajkot vide letter no. T-183-6-18-4-GRIDE MU GCT dated 04 Feb 2022 under Gati Shakti Multimodal Cargo Terminal Policy recently issued by Railway Ministry. Considering, this as an opportunity GRIDE can undertake the development of the Cargo terminal at this location, utilizing the GOG land, for which all the charges has been already paid by G-RIDE. However, under the new policy GCTO (Gati Shakti Multi-Model Cargo Terminal Operator) i.e GRIDE SPV's will bear the cost of Track, OHE, and S&T from take-off point to buffer end of the terminal. From Takeoff point to entry point of the terminal, for linear connectivity railway and private land, both will be required for which Private land will be acquired by Railway at the Cost of GCTO. However, the ownership of assets created on this land shall remain with Railway including maintenance, In addition to this entire OHE from take-off point to buffer, the end shall be borne by Railway. The operation and Maintenance of GCT's can be done by

GRIDE SPV or the private Terminal Operator authorized by GRIDE SPV or JV/Consortium/ LLP arrangement can be made with the GCT operator by GRIDE SPV.

1.1 The Scope of Work:

The scope of services for the project as per TOR is as follows:

1.1.1 Detailed Project Report

- Firm-up category-wise traffic volumes, terminal throughput, and generation of trains.
- Preparation of Train Operation Plan for seamless movement of train in the proposed Corridor and smooth interchange of trains between siding corridor andIR.
- Detail plan of takeoff arrangement.
- Design of terminal with a quick evacuation plan.
- Assessment of needed base manpower for train operation.
- Carry out a detailed survey of the approved rail layout(s) comprising station, railway sidings, internal rail facilities, and connectivity.
- Based on loading/unloading arrangements and requirements prescribed bythe railways, develop train handing facilities/terminals and related infrastructure.
- Assess land area requirements for rail facilities.
- Prepare GAD for culverts/bridges and other civil structures.
- Propose suitable signal arrangements and draw signaling plans for the identified works.
- Preparation and submission of the technical specification of Civil work. G-RIDE will provide technical specifications for P-way material, earthwork in formation, bridgework, permanent way, laying of P-way.
- Prepare BOQ and cost estimate of all civil works (rail hardware, buildings, bridges, pavements, and other structures).

1.1.2 Final Location Survey

- Physical stacking of alignment through survey instruments and taking levels along the line and finalization of longitudinal section for gradient and curves and earthwork calculations.
- Fixing of centerline pillars as per Railway Engineering Code.
- Fixing of leveling pillars and benchmarks at suitable places concerning theGTS benchmark fixed by the survey of India.
- To carry out preliminary field investigation to broadly assess the bearing capacity of the soil required for GAD of control building viz. staff quarters, station building,cabin & restroom, etc. rail track formation and culverts/bridges.
- Calculation of land required for laying the proposed lines indicating railway and private land.
- Preparation of plans for diversion of roads etc. if any, falling on the alignment.

1.1.3 Engineering Scale Plan (ESP)

- Design and prepare detailed engineering scale plan (ESP) & L-section for the proposed rail facility.
- Preparation of Civil Engineering Plans for the alignment, junction arrangement with the new and existing railway system, unloading/loading terminal facilities, etc. on the scale 1:2500 horizontal and 1:500 vertical or any suitable scaleapplicable for the preparation of the layout plans.
- To assist the Client in obtaining approval of the engineering plan and longitudinal section from the concerned Railway office.

1.1.4 GADs of Bridges and Other Structures

- To prepare GAD for control buildings viz. staff quarters, station building, restroom cabin, etc. & culvert/bridges.

1.1.5 Cost Estimates

- To prepare cost estimates for civil, S&T, and Electrical

Chapter 2
Traffic Projections

Chapter 2 - Traffic Projections

The ceramic cluster of Morbi is not only a national hub of Ceramic tiles but a renowned global center for ceramic production. Morbi Ceramic Association is the local industrial body, which represents the ceramic manufacturers of the Morbi region. Based on the inputs received from Morbi Ceramic Association and other inputs from the industry, G-RIDE has derived the current potential of potential containerised cargo volumes that can be catered at the proposed terminal.

Logistics Cost Comparison – Road Vs Rail:

To identify the suitability of rail logistics and container freight terminals in Morbi, a comparison of current road transport costs and potential transport costs via ICD on the rail was compared. The analysis is summarized below.

Container Export **Morbi to Mundra (Export tiles/ceramic-ware)**		
Rail Transport cost through ICD		Road Transport Cost from Morbi to Mundra
Rail Distance	218 Km	**Current Road Transport Cost,** Morbi to Mundra (176 Km): **~18,000 to 20,000 ₹/TEU**[*]
Rail Haulage Charge (Loaded Container)	4873 ₹/TEU	
Rail Haulage Charge (Empty container)	2,767 ₹/TEU	
CTO/ICD Mark-up on loaded container dispatch	~75%[**]	
Total Cost from ICD (without ICD Terminal handling charges)	12,100 ₹/TEU	
Estimated Terminal Handling charges	3,628[#] ₹/TEU	Logistics Cost savings resulting due to rail dispatch via proposed container terminal **~2,000 to 4,000+ ₹/TEU**
The total cost of Rail transport	**~15,700 ₹/TEU**	
** - Estimated based on comparison of rail haulage and container rail transport charges of container terminals in Gujarat.		
*-Including Terminal Access Charges and Terminal Cost		
* - Based on inputs received from industries in Morbi		

The above analysis confirms that the proposed rail terminal can generate transport cost savings of at least 2000 Rs per TEU for Tiles manufacturers of Morbi. To understand the wider impact of the proposed rail linked container terminal, vital inputs and industry statistics from Ceramics

Step No.	Activity	Rationale
Step-1	As-Is Status	Morbi's Current production capacity is pegged at ~170,000 to 200,000 TEUs per month, which translates to ~2,220,000 TEUs per annum
Step-2	Current Dispatch profile and attractiveness of rail	The assessment of the current dispatch profile confirms that more than 210,000 TEUs of finished goods are dispatched annually from Morbi to Mundra currently (by road) and around 109,000 TEUs from Morbi serve distant markets in Karnataka, Maharashtra, Haryana, Punjab, and Telangana – currently through road which can be easily and efficiently served through rail. In addition to Finished products, Paper is one of the key ingredients of the tiles industry – primarily for packaging purposes. The Export and Import of paper for Morbi is primarily handled by Mundra and these volumes are currently pegged at ~49,200 TEUs per annum
Step-3	Rail share	Based on the Origin-Destination wise inputs received from Ceramic Manufacturer's association, and synthesis of Step-1 and Step-2, Railways has the potential to cater to ~17% of total containerised cargo originating from/destined to Morbi. This leads to a potential volume of ~368,400 TEUs per annum.
Step-4	Forecast Demand	Based on forecasted upcoming capacity in Morbi, Ceramic Manufacturers Association has shared estimates of additional capacities in the Morbi cluster in TEUs as: 2024-25 – 120,000 to 130,000 TEUs 2026-27 – 100,000 to 110,000 TEUs 2029-30 – 125,000 to 140,000 TEUs Synthesis of this data reveals that by 2030, approximately 372,000 TEUs of new production capacity are likely to be added in the Morbi Ceramic cluster.
Step-5	Traffic projections based on the Market share of the Proposed terminal	Conservative estimates indicate that in the first year of operation, the proposed terminal can attract at least 40% of the rail-able container volumes. The proposed terminal will be functional by 2024-25 and with an installed capacity of Morbi industry to grow to ~2,354,500 TEUs by 2024-25; the potential volume that the proposed ICD will handle is: 2,354,500 x 17% (potential rail share) x 40% (ICD's share) = 1,56,288 TEUs per year

Step No.	Activity	Rationale
		= 1,56,288 x 75%[2] (Operations adjustment factor) TEUs per year = 3.57 Rakes per day (Total TEUs / 365 days / 90 TEUs per rake) Owing to the proximity to industrial cluster, The attractiveness of rail terminal will improve – which will translate to increased market share of the Morbi terminal from 30% in FY25 to 55% by FY30

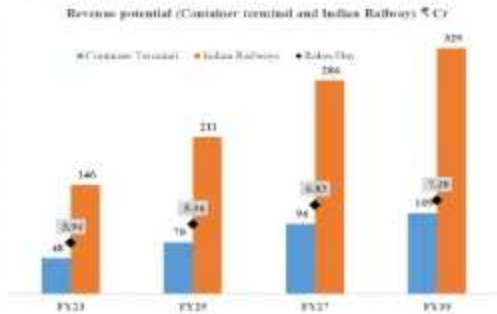
Industries Association, Morbi (Annexure 1) was useful. These inputs were used to derive the forecasted demand and revenue for the proposed rail-linked container terminal. The overall approach adopted for determining the current and forecasted demand of containers at the proposed facility are detailed below:

Based on the above analysis, the potential traffic for the proposed terminal is derived as follows:

Year	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	20232-33
Market share of ICD Morbi	30%	35%	40%	45%	50%	55%	55%
Mundra Traffic (TEUs) 70%	78,093	91,108	1,04,124	1,23,707	1,37,452	1,57,940	1,66,448
Chandigarh Traffic (TEUs)-13%	14,100	16,450	18,800	22,336	24,818	28,517	30,053
Pune Traffic (TEUs)-6%	6,869	8,014	9,159	10,882	12,091	13,893	14,641
Bangalore Traffic (TEUs)- 5%	5,965	6,960	7,954	9,450	10,500	12,065	12,715
Hyderabad Traffic (TEUs)-5%	5,965	6,960	7,954	9,450	10,500	12,065	12,715
Total Traffic (TEUs)	**1,10,993**	**1,29,492**	**1,47,991**	**1,75,824**	**1,95,360**	**2,24,480**	**2,36,573**
Traffic (Rakes/Day)	**3.38**	**3.94**	**4.50**	**5.36**	**5.94**	**6.83**	**7.20**

[2] The Terminal is expected to commence operations from July 2024 so for first year of operations only 75% of this volume will be catered by ICD

Estimation of Revenue profile for the Terminal (considering a base tariff as 2,800/- Rs per TEU + Terminal Access Charges and Terminal Cost as per prevailing guidelines of MoR = 3,628/- Rs per TEU) and Railways (based on O-D mapping, as per annexure – 1 and container haulage charges, TC-I/2014/302/02) was carried out. A nominal 3% escalation in base tariff of terminals and railways was also considered.



Chapter 3
Train Operation Plan

Chapter 3 - Train Operation Plan

3.0 Introduction

Makansar station is a electrified B class station under the jurisdiction of Rajkot Division (Western Railway). The Makansar station is situated on Wakener-Morbi single line section. The Operating system for working trains between Makansar and proposed Terminal siding has to be conceived in the context of:

(i) System Provisions for regulating the safe movement of trains to and from the proposed siding

(ii) Procedure for placement of wagons at the siding and their removal after loading/unloading and

3.1 Descriptions of Makansar Station Yard

Makansar is a three-line interlocked B class station situated at Km 15.39 from Wankaner. The clear holding capacity of the lines in meters is tabulated as under vide table no.3.1.

Table No.3.1: Holding Capacity in CSR

Line No.	Nomenclature	CSR in Meters
1	Common Loop Line	742.00
2	Main Line	686.00
3	Common Loop Line	742.00

3.1.1 The working of the said section is tabulated vide table no. **3.2** herewith to understand the system of train working between Makansar-Wankaner and Makansar-Morbi.

Table 3.2: Working on the Section

Section	Distance	Maximum Permissible Speed on the section (Km/h)	System of working
Makansar-Wankaner	15.39 Km	75 kmph	Absolute Block System
Makansar-Morbi	13.38km	75 kmph	Absolute Block System

3.2 Rail Hardware Planned in GCT Siding

3.2.1 This siding will take off from the existing Dead End of Loop line (line number 3) of Makansar station yard and zero chainage is fixed to centre line of Makansar station, the dead-end placed at Ch: 269.00 m

Following provisions are proposed for regulating movement:

(i) Stop Boards are proposed to control train movement to enter GCT and Makansar station yard respectively.

(ii) A Trap Point at the take-off position to provide isolation between the station yard and the siding. The normal position of the Trap Point is Open.

(iii) A Trap indicator to show the position of the Trap Point to the train driver and the shunting staff.

3.2.2 The Terminal siding will not be required to own any locomotive for working trains. Western Railway will provide locomotives and wagons required to carry traffic as per EOL provision.

3.2.3 We have proposed Engine-on-Load (EOL) working in the Port area as it is obligatory for all new sidings. Under this scheme, the train engine will perform the train and shunting movements within the Terminal siding. No separate shunting locomotive will therefore be required in the siding and hence no shunting engine has been provided in the scheme.

3.2.4 Brake Van Reversal Siding

Being a terminal yard, all trains will turn back from the siding. Hence every brake van will need reversal, i.e., detaching from the rear of the incoming train and attaching it to the rear of the outgoing train. Therefore, single-entry brake van reversal siding has been provided just before the start of loading/unloading lines.

3.2.5 Carriage and Wagon Facilities

All trains will be received from Western Railway duly intensively examined. This is also a necessity under EOL working. Therefore, we have not provided any train examination facility in the Terminal siding.

3.2.6 Necessary Staff Requirement

(i) Staff for Train Operation will be decided by Western Railway for GCT.

3.3 In Motion Electronic Weigh Bridge (EIMWB)

To get the weight of the incoming and outgoing loaded train, the facility of weighment at in motion e-weigh Bridge (EIMWB) is proposed at Ch. 2953.0 before the loading-unloading area.

3.4 Train Operations

3.4.1 Placement and Removal of Rakes at Makansar Railway Siding

(i) Placement of Rakes

The procedure for reception of a train at Makansar station either from Wankaner or Morbi wouldbe the same as existing at present, but prior to allow the train for GCT either from

Wankaner or Morbi, the SM on duty will telephonically contact the Transport Manager inside the proposed siding for his consent for the intended placement of the loaded or empty rake at the siding.

On arrival of the train, the SM on duty at Makansar will advise the Guard of the train and give necessary instructions to the shunting staff regarding the placement of the rake and will take off Shunt signal protecting Trape point leading to GCT, with assurance that all enroute LC gates are closed.

The train has to move inside the GCT engine in leading position therefore, if the train arriving from Wankaner, load is itself in Engine leading position but if the train is arriving from Morbi side, then on arrival at Makansar, Engine has to reversal. The train will be shunted to the siding with the engine pulling, the Loco Pilot will follow the hand signals of the shunting staff.

The Guard of the train will supervise the operations. The speed of the train during shunting shall not exceed 15 Kmph. The Loco Pilot of the train will frequently whistle while moving the load to GCT.

The Loading/Unloading area being Top wired, so before placement of the rake load will be shunt off in handling area either of Line number 1 or 2, then load will be placed in either of three lines provided for loading unloading with Engine pushing position, after reversal of Engine at handling yard.

Before placement of a loaded rake weighment will be done while push back the load inside unloading area.

After placing of the load, BVG will be detached from the load and placed in the siding exclusive for the BVG parking.

After placement of the rake at the siding, the Guard and the shunting staff will return by the light engine. The engine will be stopped at the Stop Board, where its entry into the station yard will be guided by instructions given to the shunting staff by the SM on duty.

(II) Removal of Rakes

After consultation with the Terminal Transport Manager and confirmation of closing of enroute Level Crossings. the SM on duty at Makansar station will advise the Guard and instruct the shunting staff accompanying the light engine regarding the intended move. The engine will pull the load from loading area and simultaneously weighment will be done, after weighment load will be push back in the BVG siding for attaching the BVG, after that load will be shunt off to the handling area. Once after GDR of the train, the Guard will satisfy himself that the load is intact and instruct the shunting staff to signal the Loco Pilot to pull the load ahead towards Makansar station. During the shunting movement all LC gate enroute will remain closed. The Loco Pilot will stop the engine at the Stop Board. The train will be received in Line number 3 of Makansar station as per instructions of the SM on duty.

For GDR Pathway with sufficient lighting will be provided in Handling Yard.

(iii) Dispatch of the Subsequent Train: -

Dispatch of the subsequent train to the Terminal siding can be done after completion of the first move.

3.4.2 System Provisions for Loading/Unloading of Wagons

There is no provision made by the client for a fully mechanized loading/unloading system like a silo, loading conveyor belt, etc. However, arrangements have to be made for loading/unloading with the help of Rubber Tyre Gantry Crane which is a mobile gantry used for container lifting and stacking in container terminals and storage yards

3.4.3 In respect to the length constraints of the stacking area, the rake loading/unloading will be done from both sides to maintain the free time. Prior stacking is required saving time before placement of trains. Also, the rail level Platform is required for smooth movement of loading/unloading machinery.

In the case of bagged consignment, presently only one option of manual loading/unloading isavailable by using the laborers.

3.5 EIMWB Operations

The weighment operation is required for loaded trains, in the case of Inward loaded trains the weighment operation is performed before placement in the siding.

In the case of Outward loaded train, a weighing operation is performed when the train is going outfor Makansar station under the supervision of the Guard and Commercial clerk jointly.

Chapter 4
Proposed Layout Design & Engineering Parameters

Chapter 4 - Proposed Layout Design & Engineering Parameters

General

G-RIDE has carried out a study of Makansar Station on the WKR-MVI section for a proposed terminal at Rafaleshwar near Makansar, and rail connectivity from Makansar station to the terminal that is briefly discussed in the below-mentioned paragraphs. The connectivity of terminal is proposed by taking take-off from Dead end at makansar Station MVI end;

4.1 Engineering Parameters as adopted

- **Gauge:** The broad gauge adopted for the proposed rail infrastructure will be 1676 mm to be in conformity with the existing gauge of the Indian Railway track, in the vicinity of the project area.
- **Curves:** Proposed alignment of the siding has been planned with curves of 4°.
- **Gradients:** Steepest Gradient in the proposed siding is 1 in 200.
- **Formation:** Blanketing material of minimum 450 mm depth has been considered below 350 mm on main line & 250-mm on loop lines ballast cushion and embankments/subgrade are to bemade of compacted earth filling with a side slope of 2:1. The side slope in cutting in ordinary/hard soil would generally be 1:1. Steeper slopes of 0.5:1 in rocks and a flatter slope of 1.5:1 in soft/loose soil may have to be adopted, depending upon the nature of the material to be excavated. Standard Railway/DFC formation profile has been adopted.
- CSR of ~950 m for 3 loading/unloading lines. Rail level Platform for loading/unloading will be provided of materials: VDC of 100mm, DLC (Dry Lean Concrete) of 150mm, WMM(Wet Mix Macadam) of 200mm and GSB (250mm avg. approx.), and rest will be Good Earth of ~ 500mm.
- **Bridges:** All the minor and major bridges are to be designed corresponding to DFC loading standards of 32.5 t axle load.
- **Moving Dimensions:** Fixed structures are to be designed to suit the Recommended Dimensions indicated in the B.G. Schedule of Dimensions of Indian Railways.
- **Standard of Track:** The track structure is proposed to be made up of 60 kg R-260 rails laid on PSC monoblock sleepers with sleeper density of 1660 Nos. for main line and 1540 Nos. for loop lines, siding. per km on a 250-mm cushion of hard stone ballast in conformity with the existing track structure. Points and crossings within the yard will be 1 in 12 with curved switches on the PSC sleeper layout and 60 Kg rail section.
- **Turfing:** Turfing is generally envisaged for the side slopes of all embankments. Present alignment is in filling mostly, turfing if required will be provided basedon the nature of soil strata.
- **Protection Works:** Hill slopes, as well as approaches of nalas/creek and high bank, will be protected by pitching as well as sodding in general. Stone pitchingwith boulders grouted in (1:6) cement sand mortar has been recommended in the high bank portion. Also, Retaining Wall/Toe Wall/Stone pitching has been considered along the track running parallel to the existing track connecting to ICD retaining wall on one side of formation has also been considered along the track due to land constraint

- **HT/LT Crossings:** Provision of minimum vertical & lateral clearances may require shifting/raising/lowering of HT/ LT and telephone lines as per site requirement.
- **Structural Clearance:** All overhead structures will have clearance to cater for High Rise electric traction (OHE).

4.1.1 In addition to the above, the following parameters for the design of Rail alignment and planning of other facilities have been adopted:

- Platform on sidings are Rail level platform of 700x30 m
- Level crossing to be provided at the suitable place (wherever feasible) for the crossing of proposed railway tracking side in the depot.

4.2 General Topography

The general nature of the terrain in this area is undulation. Proposed railway track is in filling for almost the entire length of the siding. Existing ground levels vary from 61 m to 73m. The Rail top level of Main Line at proposed Ch: 320.00 at is 63.803 and at Ch: 4740 it is 66.449. Formation levels of the proposed siding have been decided based on Rail levels of existing railway track with a difference from formation level as 0.767m.

4.3 Study of connectivity

4.3.1 The rail connectivity to the terminal has been planned from the existing Rafaleshwar Station yard of Indian Railways from the Existing mainline at proposed ch: 229.00 m.

4.3.2 Take-off details & Route Description

The connectivity is facilitated by taking take-off from Ch: 229.00 by dismateling the existing Dead End at Ch: 269.00 m taking zero Chainage (Existing Ch: 15.39) as center of Makansar Station at Wakaner end.

After takeoff from Ch: 229.00 dismateling the existing Dead End at Proposed Ch: 269.0, the alignment runs parallel to the IR track from Proposed Ch: 229.0 to Proposed Ch: 3586.19 connecting to the terminal. The alignment then enters the terminal at proposed Ch: 3586.19 and three loading lines are planned with loading platforms
Line 1 Ch; 3586.19 to Ch; 4718.61
Line 2 Ch; 3659.53 to Ch; 4803.68
Line 3 Ch; ; 3754.45 to Ch; 4734.31

Handling Yard is also proposed for Engine Rundown and GDR from Ch: 985.26 to Ch: 1989.26
BVG sidings proposed Ch;3816.19 to Ch;3961.07
The weighbridge is proposed at Ch; 2953.00

As the terminal is to be established and made operational various structures required will be developed by the terminal operator in the DPR only track work with formation, bridges,

LC's, loading platforms, and IMWB is proposed.

- Extension of Level crossings in the alignment between take-off point and Terminal, Lc-18, 19, 20, Crossings in the terminal station yard will be provided for the movement of cargo.
- Existing Bridges will be extended in the proposed line.
- Loading, unloading platforms of 700m x30 m in the terminal yard with sidings
- Electric poles and other utilities coming in the alignment will be dismantled and shifted at a suitable location.
- Signaling & Telecom arrangements at Siding and handling yard and interface with Makansar station.
- BVG siding and terminal siding will be non-interlock with crank handle motor-operated points

Costing of the dismantling of road, Gate Loadge ect. coming in rail alignment and related facilities have been considered in the estimates.

4.3.3 Yard layout

Train from Makansar Station will be placed from Existing Dead End at Proposed Ch: 269.00 taking zero Chainage at center of makansar station, takeoff at proposed ch 229.00 and will be taken up to the handling yard with one loop line and after handling yard rakes will be placed in push back to the terminal yard.

In the handling yard and terminal yard, turnouts are proposed of 1 in 12 from where the Siding /Loop line will take-off respectively in the terminal.

The siding has the following salient features:

(i) The proposed line will take off from existing Dead End at proposed Chainage 229.00 m.

(ii) After takeoff from the Dead End at loop line, the alignment runs parallel to the IR track from proposed CH:- 229.00 to 3675.88m connecting to the terminal. The handling yard is also proposed from Ch: 985.26 to Ch: 1989.26.

(iii) The alignment then enters the terminal at proposed Ch: 3675.88 and three loading lines are planned with loading platforms
Line 1 Ch; 3586.19 to Ch; 4718.61
Line 2 Ch; 3659.53 to Ch; 4803.68
Line 3 Ch; ; 3754.45 to Ch; 4734.31

(iv) BVG sidings proposed Ch;3816.19 to Ch;3961.07

(v) Total Route Km from the Takeoff point to the terminal point is ~4.6 KM.

(vi) 02 no. Major Bridge has been proposed in the route alignment as per existing bridges.

(vii) 03 No. level crossing is to be extended as per the existing alignment

(viii) One IMWB has been proposed at Ch: 2953.00 keeping the level grade for 100m at either end.

Chapter 5
Proposed Signaling & Telecommunication Arrangements

Chapter 5 - Proposed Signalling & Telecommunication Arrangements

5.1 Makansar is B class station at present having Relay Interlocking situated in between Morbi-Makansar on electrified broad gauge single line section in Rajkot division of western railway. Now it is proposed to be Provide New Electronic interlocking along with connectivity of siding from line no.3. The station have one main line with 2 loop lines at present & proposed to provide connectivtity for siding from Dead end on line 3. Trains movements is on an Absolute block system using token less BlockInstrument(UFSBI) will be provided in the SM's office between Morbi- Makansar and Makansar-Wankaner stations.

5.2 **SIGNALLING** :-The station will be-interlocked with STD-II R with the latest signalling arrangement. Following Signaling provisions are proposed for the Rafaleshwarstation :-

- Electronic Interlocking with Dual VDU & MT terminal
- MACLS signalling with LED units
- Track circuiting by DC track circuits
- Electrical operation & detection of Points
- Absolute Block working with UFSBI & BPAC (HASSDAC)
- Provision of Datalogger for monitoring and fault diagnostic work.
- Provision for Track charger monitoring, Fuse Alarm, Fire Alarm, ELD etc
- Interlocking of LC-18 gates with Electrical lifting barrier & Slide booms.
- Fire alarm system & Fuse Alarm system
- 3 Nos of Electrical supply is proposed at all Station (i) 25kvA single phase AC. (ii) Local supply of station (iii) D.G. Set supply. Provision of Auto changeover.
- I.P.S is proposed for different supply which is required for signalling system.
- Relay room closing/Opening monitoring

5.3 The Siding will be Non-interlocked and isolation from same will be provided by Trap point for Makansar station. Entry into Makansar yard from siding and Entry Into the proposed siding to Makansar station will be shunting movement.

5.4 **TELECOMMUNICATION:-** It is proposed to provide 6 Quad Cable with Optical Fibre cable (OFC) at Makansar station. Following Telecom provisions are proposed for the Makansar station :-

- Control communications with Optical fibre cable in HDPE duct
- Block Phone, Auto Phone, and P&T phones
- Provision of STM & MUX
- Six Quad cable at station for LC gate communication
- Provision of Emergency communications
- Provision of VHF set
- Connectivity of UTS & PRS as per requirement

5.5 The Telecommunication arrangement at siding will be provided with as per standard practice. Both OFC and Quad cable connectivity will be provided for control communication. VHF set will be provided for shunting works. FOIS connectivity will be provided for the weigh Bridge.

5.6 ENGINEERNG REQUIREMENT FOR S&T:-STRUCTURES

a. At Maknasar

Following new structures are Required at proposed Makansar B' Class station.

- Relay Room size 9m x 6m
- Power Room size 4m x 6m
- Battery Room size 3m x 6m
- DG set Room size 3m x 6m
- ESM Duty Room size 3m x 6m
- Cable huts on both side of yard 3m x 6m
- LC Gate equipment room size 4m x 6m
- OFC Equipment room size 3m x6m
- OFC power equipment room size 4m x 6m

b. At Siding

Following new structures are required st Siding.

- OFC Equipment room size 3m x6m
- OFC power equipment room size 4m x 6m

➢ The height of the Relay room should be enough to accommodate the racks preferably 3.3M
➢ Provision of Double lock arramgenet on relay room door.
➢ Provision of Exhaust Fan holes in all rooms except Relay room
➢ DG set room will be disjointed from the main building.
➢ Cable pit & Cable duct to be provided in Building
➢ Provision of RDSO ventilators in all rooms.

P-WAY requirement

- Approximately 150 Glued Joints are required for track circuits
- Provision of PFN Liners & Rubber pads in Stations area
- All New points to be 1:12 & on PRC sleepers

5.7 ELECTRICAL REQUIREMENT FOR S&T

1. 25 KVA single phase electric supply at Makansar with Provision of Autochange over
2. Electronic Interlocking Relay room to be provided with Air conditioning.
3. Exhaust Fans to be provided in all Rooms.
4. All rooms may be provided with sufficient light & Fan arrangements.
5. Necessary Traction bonding in yards.

5.8 Abstract Estimated Cost = Latest available rates of RVNL SOR are considered for estimation

Abstract Estimate(Signalling)	=	7,15,13,146
Abstract Estimate(Telecom)	=	97,18,632
Total(S&T) Cost	=	**8,12,31,778**

Chapter 6

General Electrification

Chapter 6 - General electrification

The Wankaner - Dahinsara section electrification is in progress with high-rise OHE. Hence, Makansar Station to ICD Siding at Rafaleshwar shall be electrified with High-Rise OHE.

6.1 General Electrification

(i) The work has been carried out by following governing specifications and other statutory rules as per 3 pin plugs and socket-outlets up to 250 V; IS 11293:1988 –ISI Mark.
(ii) 1100 V XLPE insulated Armored Cables; IS 7098: Part1 – ISI Mark.
(iii) Glossary of items for electrical cable; IS1885:1971 – ISI Mark
(iv) Switches for domestic and similar purposes; IS 3854:1997
(v) Boxes for enclosure of electrical accessories; IS 5133:1969 – ISI Mark
(vi) Code of practice for electrical wiring installations; IS 732:1089
(vii) Guide for safety procedure and practice in electrical works; IS-5216:1982

Makansar Station is situated on the Wankaner-Dahinsara section at 15.39 Km from Wankaner and 13.38 Km away from Morbi via rail. It is a special class station on a single line.

The Wankaner-Dahinsara section was linked with the BG track as per the available record with authority. The proposed container siding shall relate to the proposed Loop line at Rafaleshwar from Dead End at Makansar Station for loading/unloading purposes. The proposed Rail linked container terminal will take off from **Dead end at Makansar Station** in Morbi district of Gujarat State on Wankaner-Dahinsara Single line section in Rajkot Division of Western Railway.

ICD siding and entrance area are to be illuminated with the high mast. Improvement in road lighting system has been initiated by authority. Eleven number electrical high mast from ICD siding.

6.2 TERMS OF REFERENCE (ELECTRICAL)

6.2.1 **Handling Yard Area Lighting:** There are 4 no's Electrical high masts at Handling yard 30-meter high with 16 no light fittings are to be installed at suitable locations. The average illumination level may be improved up to 40 lux, which is sufficient for safe working.

6.2.2 **Stacking & loading/unloading Area Lighting-**There are 4 no's Electrical high masts at Stacking & loading/unloading area 30-meter high with 16 no light fittings are to be installed at suitable locations. The average illumination level may be improved up to 40 lux, which is sufficient for safe working.

6.2.3 **Station Building**: The B-Class station building is proposed at makansar Station along with Submessible pump for bore, cable hut room and toilet block is provided. The proposed building not includes Station Master Room and any other existing room.

6.2.4 **Service Building** – The proposed New In-Motion Weigh Bridge, Goods Clark & Fois room, OPTG room, Record room, Toilet room, DG room, LT Panel room, Store with Staff room, TRD room etc. are to be electrified in concealed type wiring with PVC pipes and FRLS PVC insulated copper wire. Power supply for these proposed buildings to be taken from available sources of supply.

6.2.5 **Road lighting** – Light fittings are required on connecting and inside terminal Road

6.2.6 **Power Supply-** Power supply shall be received from the existing substation. Two no 250Amp MCCB as incomer is proposed to be installed to feed required power supply from existing electrical sub-station to a proposed electrical load.

6.2.7 The proposed High mast shall be of three sections hot-dipped galvanized and suitable for wind velocity as per IS 875 PART 3 and having an integral power tool installed inside the base compartment for its operation.

6.2.8 Crossings of tracks & bridges are to be done with HDPE pipes only. NP-4 Pipes along with the provision of RCC chambers at suitable distances will be used for cable laying works. Cables are laid easily in these suitable dia pipes and can be repaired/ replaced in case of failure.

6.2.9 Provision of electrification of gates No-20 along with gate hut has been made.

Estimated Cost of Electrical Works: Rs. 1,80,59,915/-

Chapter 6A

Over Head Electrification (OHE)

Chapter 6A - Overhead Electrification

6A.0 Introduction

Makansar Station is situated on the Wankaner-Dahinsara section at 15.39 Km from Wankaner and 13.38 Km away from Morbi via rail. It is a special class station on a single line. It is a special class station on a single line. The Wankaner-Dahinsara section electrified section with high-rise OHE.

6A.1 Electrification of ICD Siding at Rafaleshwar is proposed 25KV AC single phase 50 Hz high rise OHE, the work is to be carried out by following governing specification and other statutory rules as per the priority given below:

(i) Safety regulation – 2010 issued by Central Electricity Authority with latest amendments.
(ii) Indian Electricity Act-2003 with latest amendments.
(iii) Regulations laid down by Chief Electrical Inspector.
(iv) Rules and regulations prescribed by local authorities as applicable.
(v) Relevant Indian Standard.
(vi) Indian Railways Schedule of Dimensions (2004) – with Latest ACs for theworks concerning Indian Railways and connecting tracks.
(vii) Design manual for Electric Traction (Indian Railways)
(viii) Indian Railways AC Traction Manual.
(ix) Electrical safety code and National Building Code.
(x) IEC Standard, British standards, and other national/international standards carried out by following governing specifications and other statutory rules.

6A.2 Power Supply for ICD Siding:

The power supply shall be received from the Makansar Line No: -03 & also connected new proposed High-rise OHE. This also include the modification of Existing OHE (wherever required), and SSP accordingly.

6A.3 Design Criteria

The design is complying with AC traction manual (ACTM) and RDSO Specification

6A.3.1 25 KV High Rise OHE Design Principles

Design principles adopted for OHE designs and drawings are based on Design Handout for High rise OHE AC Traction Manual of Indian Railway and RDSO drawings.

Overhead Electrification consists of conductors supported by cantilevers and associated fittings from steel structures located at a setting distance from the track. The main drawings and principles adopted in each are detailed below.

6.A.3.2 Sectioning Diagram

The overhead equipment is divided electrically into sections insulated overlaps and section insulators at turnouts under normal working conditions, electrical continuity is maintained by bridging the insulated overlaps using interrupters or isolators, and isolation of small sections of OHE for the maintenance and repairs is possible.

6.A.3.3. Layout Plan/Pegging plan/Power supply diagram

All OHE principles laid down by RDSO and stated in ACTM will be followed for OHE erection, installation, testing, and commissioning.

6.A.3.4. Cross-sectional diagrams

(a) CSDs provide the details such as type and dimensions of foundation (which is selectedusing the approved volume chart), soil profile, mast type, mast embedded length, superblock, anchor type if any, and reverse deflection provided at the location

(b) Type and dimensions of the foundation are chosen from volume charts foundation bending movement code (FBM), soil type, and bearing capacity

6.A.3.5 Structural Erection Diagrams

SEDs provide the details like dimensions of the mast, details about bracket assembly, guy rod, termination style, etc.

6A.4 Overhead Structure/Mast:

Rolled fabricated hot-dipped galvanized OHE structure will be used. The zinc coating for steel structure and part shall be as per RDSO-specification no. ETI/OHE/13 i.e., minimum coating of zinc shall be 610 gm/sqm length of the OHE mast should be 11.40 meters and the Maximum span should be 54 meters.

6A.5 Foundation

Foundation design has been considered as per the Indian Railways Design Manual for Electric Traction Mixture M-10 & M-15 with the proportion as per IS: 456-1978. A nut bolt system for fixing mast on bridges etc. has also been considered. Foundation should be selected by SPT report.

6A.6 Overhead equipment conductors

6A.6.1 For yard lines for each track

The size of the contact and catenaries wire in the yards will be a minimum of sizes 107 sq. mm. HDGC copper and 65 sq. mm. catenary respectively to RDSO specification of copper contact and catenaries wires withstanding minimum 800 C Temperature will be provided.

6A.6.2 25 KV High-rise OHE configuration

The configuration of high-rise OHE for the double-stack container is given in below table. RDSO has issued Design Handout for Overhead equipment for running Double stack container & Three Tier Car under electrified route (High Rise OHE) with speed potential 140 KMPH. Some important parameters of High Rise OHE are as given below-

OHE Parameter

1	Height of Double Stack Container	7100 mm
2	Height of Contact Wire at support from Rail Level	7570 mm
3	Height of Contact Wire at mid span from Rail Level	7520 mm
4	Height of Catenary Wire at support from Rail Level	8970 mm
5	Pre sag at mid span	50 mm
6	Max stagger at Tangent Track	+ or – 150 mm
7	Max stagger at Curves	+ or – 250 mm
8	Standard Encumbrance	1.40 mtr
9	Speed	140 KMPH
10	Type of Mast	B-150/B-175/B-200/B-225/B-250
11	Mast Length	11.4 Mtr
12	Min Implantation	2.8 Mtr
13	Max Tension Length	1.5 KM
14	Catenary Wire	65 Sq mm
15	Contact Wire	107 Sq mm

The High Rise OHE shall be merged with conventional OHE with the contact wire gradient @ 10mm/metre.

HIGH RISE OHE FOR RUNNING DOUBLE STACK CONTAINERS UNDER ELECTRIFIED ROUTE (WITH SPEED POTENTIAL OF 140 KMPH)

Design, installation and erection of High Rise OHE shall conform as per RDSO's Design Document No-TI/DESIGNS/OHE/2014/00001(Rev 1), Dec 2014. Further RDSO has issued drawings for 11.4-meter masts, Portals, TTC, Employment Schedule, Foundations & Anchor Arrangement etc which shall be followed while executing the work.

1. The type of foundations shall remain same. However, the work to be done as per the relevant drawings issued by RDSO.
2. Structures: RDSO has issued the drawings of 11.4m high masts

6A.7 Cantilever Assembly for the yard

Cantilever assemblies, ATD, droppers, and other fittings in the yard will be as per Indian Railway design and RDSO specification.

6A.8 Encumbrance:

The proposed OHE encumbrance is 1.4 m while retaining an encumbrance value of 0.9 m for the out-of-turn (OR) OHE. Accordingly, the Bottom fittings will be provided at 7.27 m and the Top fitting at 9.27 m height from Rail level

6A.9 Integration

OHE to be integrated by the overlapping system to the Makansar from Dead End at Line No: -03. Federing will be done from existing SSP at Makarsan.

6A.10 SPT required as per RDSO

6A.11 SCADA integration to be done

6A.12 Employment schedule shall be as per wind pressure of the relevant zone.

6A.13 Cost of OHE Electrifications= Rs.6,62,04,334/-

Chapter 7

Project Engineering & Estimation of Cost

Chapter 7 - Project Engineering & Estimation of Cost

7.1 Project Engineering

This chapter covers details of works to be carried out by GRIDE for Rail connectivity to freight terminal at Rafaleshwar.

7.2 Preliminary works

Preliminary works include Feasibility Study ,Field survey, Geo-Technical Investigation, DPR, and Engineering Scale Plan, GAD's, Cost Estimate.

The feasibility study has been completed and In-Principal Approval of the proposal for setting up of Rail Connectivity has been received. Field Survey of the approved proposal have also been completed. Based on Field Survey, a detailed design of alignment has been carried out. ESP and Plan with L- section and ESP of the proposed rail connectivity is enclosed in Annexures as **Annexure-II**.

Major components of the project constituting the major cost of the project are briefly described in this chapter.

7.3 Curve and Gradient details of the Railway connectivity

A. Curve Details

Sl. No.	Curve No.	Deflection Angle			Degree of Curve	Radius (m)	(TL) Tangent Length	Circular Arc Length
		Deg.	Min.	Sec.				
1.	C-1	23	8	6	0.7	2500	57.49	100.48
2.	C-2	14	31	44	3.5	500	63.736	146.79
3	C-3	3	33	6	1.0	1750	54.25	138.48
4	C-4	14	25	56	1.458	1200	151.938	342.266
5	C-5	2	30	0	0.70	2500	54.55	109.083
6	C-6	26	23	56	1.0	1750	410.441	806.30
7	C-6A	31	9	45	1.4	1200	348.565	652.66
8	C-6B	35	55	34	1.944	900	291.786	564.325

B. Proposed Gradient Details

Sl. No.	Chainage (Length) Metre	Starting Ch. RL	Ending Ch. RL	Prop. Gradient
1	229 to 420 (191m)	64.647	64.920	G-700 (R)

Sl. No.	Chainage (Length) Metre	Starting Ch. RL	Ending Ch. RL	Prop. Gradient
2	420 to 660 (240 m)	64.920	64.920	G-Level
3	660 to 940 (280 m)	64.920	65.997	G-260 (R)
4	940 to 1200 (260 m)	65.997	65.997	G-Level
5	1200 to 1500 (300 m)	65.997	66.703	G-425 (R)
6	1500 to 1737 (237 m)	66.703	66.703	G-Level
7	1737 to 2180 (443m)	66.703	65.595	G-400 (F)
8	2180 to 2487 (307 m)	65.595	66.363	G-400 (R)
9	2487 to 2680 (193 m)	66.363	66.363	G-Level
10	2630 to 2853 (173 m)	66.363	66.792	G-403.5 (R)
11	2853 to 3105 (252 m)	66.792	66.792	G-Level
12	3105 to 3600 (495 m)	66.792	68.148	G-365 (R)
13	3600 to 4720 (1120 m)	68.148	69.081	G-1200 (R)

7.4 Land

Land for rail connectivity along the Railway line and the terminal from Rafalashwar station is to be acquired and the same has been taken as equity contribution from the Government of Gujarat. The land (approx. 428109 sqm.) shall be acquired by the Project SPV. Accordingly, the cost for the same has been included in the estimate.

The Government land (Sarkari Padtar) is located in the vicinity of the ceramic industry. Owing to the scale of industrial development in the vicinity the proposed land has been heavily excavated for minerals and is an extremely undulated parcel of the land. The identified land parcel is in the Morbi district and falls between Jambodiya and Jodhpar Nadi Village. The Northwest Corner of the proposed site houses a lake that has formed due to mining and the natural profile of being a low-lying area, over a period of time. The drain of this lake merges with Machu River 5 Km downstream. The elevation at the proposed site is 61 m and the elevation at Machu River is 39 m. There is a 22m drop in elevation over a distance of 5 Km. There will be cutting and filling while preparing the land for developing any project in the proposed site.

The area falling in both the villages available with Government of Gujarat as per records is as below:

1 Jambodiya Village: 17 Hectare (Survey No. 145)

2. Jodhpar Nadi Village: 27 Hectare (Survey No. 300)

3. Encroached land area (Survey NO. 300) is 3.3 Hectare of Village Jodhpar Nadi

The tentative cost of land assisted by Mamlatdar is 14.6 cr. At a cost of Rs 495 per sqm for Jambodiya village and Rs 240 per sqm for Jodhpar Nadi Village

Along with above, Project SPV will acquire the land of 31450 Sqm along the track at the require locations. The cost of same is considered in the estimate.

7.5 Formation

Almost the entire length of the siding is in cutting. Blanketing material of minimum 450 mm depth has been considered below 350 mm on main line & 250-mm on loop lines ballast cushion and embankments/subgrade are to bemade of compacted earth cutting/filling. The side slope in cutting in ordinary/hard soil would generally be 1:1. Steeper slopes of 0.5:1 in rocks and a flatter slope of 1.5:1 in soft/loose soil may have to be adopted, depending upon the nature of the material to be excavated. Standard Railway/DFC formation profile has been adopted.

CSR of ~950 m for 3 loading/unloading lines. Rail level Platform for loading/unloading will be provided of materials: VDC of 100mm, DLC (Dry Lean Concrete) of 150mm, WMM(Wet Mix Macadam) of 200mm and GSB (250mm avg. approx.), and rest will be Good Earth of ~ 500mm.

7.6 Permanent Way

Following track structure has been proposed for siding and other tracks inside the PFT:

Sl. No.	Brief Description ofItem	Specification	Remarks
1	Rails – 60 Kg, 90 UTS(IU)	T-12/90 UTS, IRS.T- 43-1992/1996	These Rails and Sleepers shall be used in siding track
2	Sleepers – 60 Kg PSCSleeper %-2496	T-39/1993	
3	Sleeper Density	1660 nos. per km on main line and 1540 nos. per km on loop line	
4	Points & crossing on PSC Sleeper	Drawing no. of layout and sleeper are as under:	
	a) 1 in 12 fan shaped Layout	RT-4865, RT-4793 to 4844 & RT-4512	To be provided in connection with loop lines and BVG siding
5	Curved Sleeper		
	With Check Rail	RDSO drawing no. T-4183, 84, 85 & 86	On Curve Sharper than 5o
	Without Check Rail	RDSO drawing no. T-4170, 71, 72 & 73	On Curve Sharper than 5o
6	Level crossing sleeper with the provision of checkrail	RDSO Drawing no. T-4148	To be provided at level crossings
7	Ballast	65mm and downsize track ballast as per RDSO specification	The hard stone (dolomite/granite) machine crushed ballast shall be used

7.7 Bridges and Level Crossing

Following bridges/Culverts/ LC has been proposed in the Rail Alignment:

i. Major Bridges:

Sr. No.	Bridge No.	Existing Span /Type	Proposed span	Proposed Type of Br	Prop. Chainage	Remarks
1	MJ Bridge-20	6 x3.05 m Arch Bridge	6 X 3.05 M	PSC slab	Ch: 536.43	Extension
2	MJ Bridge-25	8 x3.05 m Arch Bridge	8 X 3.05 M	PSC slab	Ch: 2594.72	Extension

ii. Minor Bridges:

Sr. No.	Br. No	Existing Span /Type	Proposed span	Proposed Type of Br	Prop. Chainage	Remarks
1	Bridge-21	1x3.05 m Arch Bridge	1 X 3.05 M	RCC Box	Ch: 979.93	Extension
2	Bridge-22	1x3.05 m Arch Bridge	1 X 3.05 M	RCC Box	Ch: 1063.37	Extension
3	Bridge - 23	2 x 1.22m Girder Br.	1 X 3.00 M	RCC Box	Ch: 1473.09	Extension
4	Bridge - 24	1 x 1.83m Girder Br.	1 X 2.00 M	RCC Box	Ch: 1650.47	Extension

iii. LC's:

Sr. No.	Lc No.	Chainage	Type of LC	ATUV	Remarks
1	LC No. 18	388.38m	M	3749	To be retained and interloacked
2	LC No. 19	2152.31	M	3796	To be retained and non-interloacked
3	LC No. 20C	2836.00	M	199790	To be continue as LC until Constrution of ROB by R&B dept at LC 21

****LC 21 is Converted to ROB by R&B Depatment**

7.8 Other Structures

(a) In-Motion Weigh Bridge: In-Motion Weigh Bridge has been provided at proposed Ch:2953.0 m near entry of Yard. A straight length of 100 m is available on either end of the In-Motion Weight Bridge as required.

(b) Station Building: Additional rooms has been proposed in the Makansar along with existing station building such as DG Set room, Ralley room, Toilet block and other as required. Station master room is not included in new proposed structure.

(c) Service Buildings: Provision for Cabin for FOIS, Inmotion Weight bridge, LT Pannel Room, DG Set Room, Sub Station Building, security room ect is provided as shown in ESP.

(d) Three Nos. **Pathway cum Drain** of 755 m X 0.75m has been proposed in the Handling Yard between the existing and proposed tracks.

(e) Drain of 1000m has been proposed as in Termial Yard shown in ESP.

(f) Broundary wall of 2200m around the proposed yard area.

(g) Retaning Wall of length 1600 m is proposed in the terminal yard along the Yard boundary.

7.9 Estimation of Cost: The cost of railway facilities has been worked out based on DSR/Railway SOR and Last Accepted Rates (LARs) of similar items.

Detailed Project Cost (As per Latest RVNL SOR Dt. March/2021)			
Lumpsum Cost of Construction for Developing Rail Linked Freight Terminal at Rafleshwar near Makansar Station On Wankaner-Morvi Section Of Rajkot Division Of Western Railway In Gujarat			
S.No.	**Description**	**Percentages**	**Cost (Rs) in Crores**
I	Land Acquisition including environmental charges		17.40
II	Civil Works		167.03
III	S&T		8.12
IV	Genl Electrification (Incl. Overhead Crossing)		1.81
V	TRD		6.62
VI	Mechanical Works		0.50
A	**Basic Cost :**		**201.48**
VII	Preliminary expenses @ **0.5 % of Total Project Cost Including Land**	0.2%	1.01
VIII	Escalation during Construction @ **5%** over **70%** of Basic cost for 1 year (Excluding Land Acquisition)	5%	6.44
IX	PMC @ **10%** over Basic Cost (Excluding Land Acquisition)	10%	18.41
X	SPV registration/Administration Charges Lumpsum @**1%** (Excluding Land Acquisition)	1%	1.84
XI	Legal and Insurance Charges @ **0.5%** percentage on Basic Cost (Excluding Land Acquisition)	0.5%	0.920
XII	Contingency @ **1%**	1%	1.84
B	**Total Cost Rounded Off :**		**232.00**
C	**Operator Cost**		**48.00**
	TOTAL PROJECT COST (B + C)		**280.00**

Chapter 8
Engineering Survey & Geo-Technical Investigation

Chapter 8 - Engineering Survey & Geo-Technical Investigation

1.0 Introduction

Field Survey has been carried out by establishing control points by the DGPS system. Geo-Technical Investigation has been carried out by GMB and a report has been submitted to GRIDE. Based on Field Survey and Geo-Technical Investigation, a detailed design of alignment has been carried out.

Geo-Technical Investigation Report of the proposed siding covering bore log details at various locations is enclosed at the end of the report as Annexure-8A.

1.1. Methodology Adopted for Topographical Survey using DRONE (UAV):

1.1.1. Preparation:

This step includes site survey along with all the structure to be measured in the Topographic survey and Digital Surface model.

1.1.2. Survey:

This step includes two different survey

- GCP Survey
- Aerial Photogrammetric Survey: To be done with prescribed technology

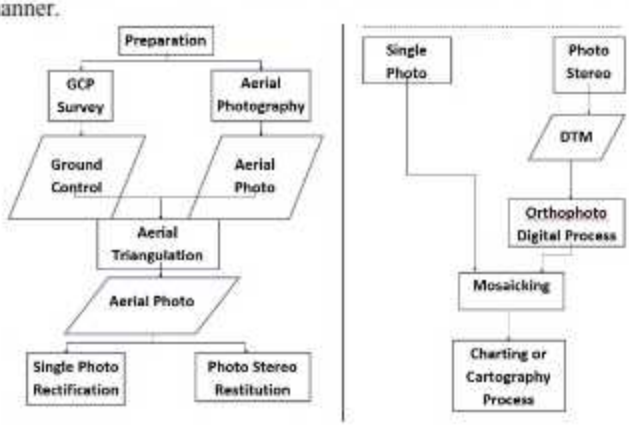
1.1.3. Post Survey Data Generation & Processing:

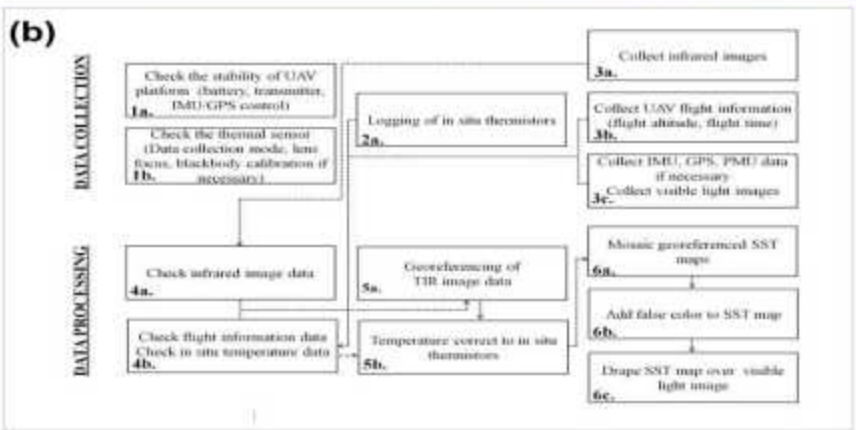
This step includes following results

- Ortho-mosaic models
- DEM model
- Digital Point Cloud Generations

1.1.4. Charting/ Cartography:

This step includes demanded dataset on paper or on soft copy module which is as per the described manner.





1.2. R8-RTK DGPS (GNSS) System:

DGPS (Differential GPS) is essentially a system to provide positional corrections to GPS signals. DGPS uses a fixed, known position to adjust real time GPS signals to eliminate pseudo range errors. First Base is fixed at Known level location and reading is taken after 3 to 4 hours to finalize the base point level. A Rower is then moved along the alignment coordinates as a receiver and levels are saved in it. Basically this instrument is used to fix the control points which are then closed by triangulation method.

1.3. The Total Station:

The South is a user friendly data collection and calculation program for the Series Total Stations with the accuracy of 1 second. It will be used for the traversing and the detailed topography survey. The Total Station incorporates not only the Power surveying programs as the Special Function but also File Manager and Data Transfer Programs. The internal memory of the instrument can store a maximum of 60,000 points of data.

The Total Station vary with the selections of the "Preference". The factory default settings of the Preference are shown there. It is also possible to select "Process type" that takes over the functionality.

1.4. South Auto Level:

The B series South Auto level will be used for the detailed levelling work. It incorporate the most precise and reliable compensator available in the market today. The optimally designed telescope provides exceptionally bright and sharp view that reduces operator's eye strain. Quick collimation and horizontal angle measurement combine for fast and easy aiming of layout and alignment tasks. The basic features are as under.

Levelling Accuracy:	B30 ±1.5mm
Telescope Magnification:	B30 – 28x
Minimum focus distance:	0.2m from end of telescope,
0.3m from instrument centre	

Features:

1) IPX6 (IEC 60529:2001) dust tight and water tight protection
2) Precise, Reliable Automatic Compensator
3) Horizontal Angle Measurement
4) Quick collimation with two horizontal motion knobs
5) Superior telescope with two-speed focus knob

Result of the Topographical Survey Work

TBM List

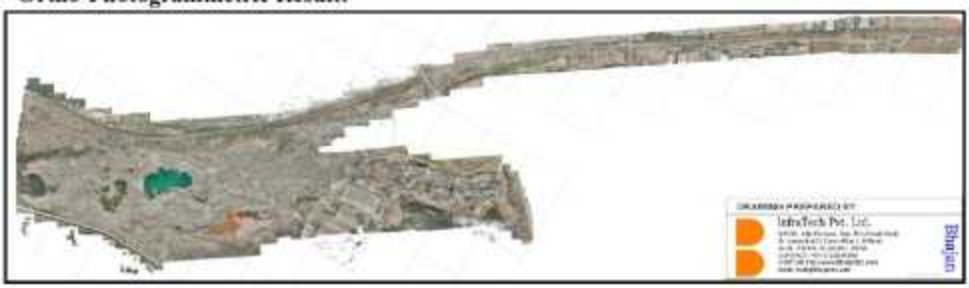
Point No.	Easting	Northing	R.L.	Discription
1	695446.252	2518683.213	65.528	TBM1
2	695103.364	2519296.701	64.24	TBMA2

Ground Control Point List

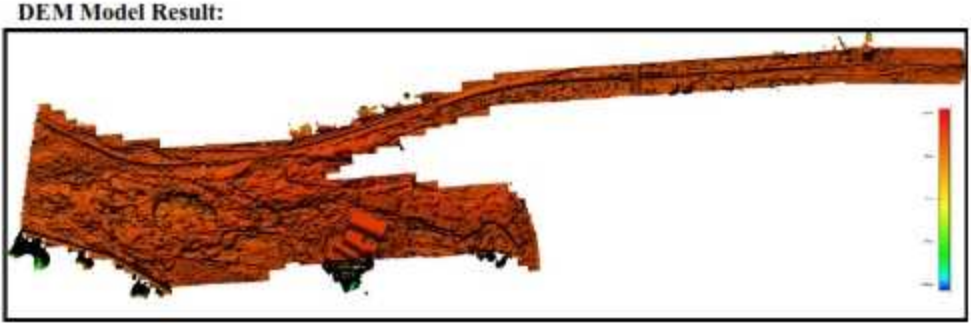
Point No.	Easting	Northing	R.L.	Discription
1	694655.757	2519777.493	67.529	GCP1
2	694802.155	2519641.202	66.59	GCP2
3	694914.43	2519504.243	65.977	GCP3
4	695023.6	2519337.975	65.383	GCP4
5	695132.149	2519171.64	65.005	GCP5
6	695240.784	2519005.14	64.989	GCP6
7	695349.436	2518838.623	65.077	GCP7
8	695455.395	2518675.84	65.45	GCP8
9	695554.197	2518504.63	65.667	GCP9
10	695603.336	2518416.81	65.744	GCP10
11	694526.639	2519892.918	68.161	GCP11
12	694487.056	2519891.741	70.368	GCP12
13	694362.194	2520042.779	69.026	GCP13
14	694336.094	2520040.867	72.637	GCP14
15	694315.582	2520009.975	71.175	GCP15
16	694267.922	2520156.171	68.86	GCP16
17	694187.649	2520095.649	73.316	GCP17
18	694088.13	2520062.328	68.827	GCP18
19	693995.582	2520022.175	66.728	GCP19
20	693904.489	2520173.505	67.538	GCP20
21	693972.591	2520208.587	68.703	GCP21
22	694072	2520257.434	65.912	GCP22
23	694145.139	2520324.477	67.628	GCP23
24	694054.509	2520473.775	66.764	GCP24
25	693974.826	2520427.194	64.725	GCP25
26	693887.851	2520400.069	67.021	GCP26
27	693812.19	2520399.79	67.58	GCP27
28	693760.131	2520592.686	62.723	GCP28
29	693853.38	2520642.93	62.937	GCP29
30	693930.569	2520662.996	63.657	GCP30
31	694015.213	2520714.63	66.331	GCP31
32	694227.87	2519976.621	75.554	GCP32
33	694159.229	2519951.355	70.517	GCP33
34	694095.547	2519923.95	68.399	GCP34
35	694267.537	2519782.112	71.874	GCP35
36	694275.149	2519839.245	73.574	GCP36
37	694335.302	2519826.416	73.768	GCP37
38	694399.666	2519702.948	71.444	GCP38
39	694364.742	2519680.523	72.173	GCP39
40	694335.016	2519656.174	71.919	GCP40
41	694376.534	2519489.412	71.732	GCP41

Point No.	Easting	Northing	R.L.	Discription
42	694416.787	2519489.7	72.327	GCP42
43	694455.128	2519509.1	71.827	GCP43
44	694510.939	2519456.301	69.708	GCP44
45	694502.9	2519425.623	72.393	GCP45
46	694474.502	2519380.767	72.239	GCP46
47	694425.814	2519316.248	71.674	GCP47

Ortho-Photogrammetric Result:



DEM Model Result:



1.5. Geo technical and sub soil exploration investigation:

The Bore Sample will be carried out with the hand augur for the depth of 3m. It may vary as per availability of strata Soil samples will be collected at every interval of 1.5m or at change of strata. and in following pattern. It may vary as per availability of strata i.e. availability of SPT value whichever is earlier.

Depth in meter	Type of Sample
1.5	SPT & DS
3.0	UDS

Physical property of the soil available in the vicinity of the Rafleshwar Yard and Morbi region are Hard Murram with Red & Loamy, Salty, Sandy loam and available at shallow depth. All the Soil available in the vicinity of the Rafleshwar Yard would be used for

preparation of Roof Tiles and Flooring Tiles. Hence there are two kind of soil is available in this region.

1) **Hard Murram with Sandy Loam having Redish Colour:** Used to prepare Roof Tiles
2) **Hard Murram with Sandy Loam having Whitish colour:** Used to prepare Floor Tiles

Rocky strata are available in this region at very shallow depth i.e. 2m or so. Hence the ground is strong enough for the land development purpose.

Chapter 9
Financial Analysis

Chapter 9 – Financial Analysis

Summary of Capital Cost Estimate

The Cost Estimate of all components of works envisaged to be taken up for implementation has been prepared. The overall capital cost for GCT at Rafleshwar for G-RIDE including land cost is as follows:

Detailed Project Cost			
S.No.	**Description**	**Percentages**	**Cost (Rs) In Crores**
I	Land Acquisition including environmental charges		17.40
II	Civil Works		167.03
III	S&T		8.12
IV	Genl Electrification (Incl. Overhead Crossing)		1.81
V	TRD		6.62
VI	Mechanical Works		0.50
A	**Basic Cost :**		**201.48**
VII	Preliminary expenses @ **0.5 % of Total Project Cost Including Land**	0.2%	1.01
VIII	Escalation during Construction @ **5%** over **70%** of Basic cost for 1 year (Excluding Land Acquisition)	5%	6.44
IX	PMC @ **10%** over Basic Cost (Excluding Land Acquisition)	10%	18.41
X	SPV registration/Administration Charges Lumpsum @**1%** (Excluding Land Acquisition)	1%	1.84
XI	Legal and Insurance Charges @ **0.5%** percentage on Basic Cost (Excluding Land Acquisition)	0.5%	0.920
XII	Contingency @ **1%**	1%	1.84
B	**Total Cost Rounded Off :**		**232.00**
C	**Operator Cost**		**48.00**
	Total Project Cost (B+C)		**280.00**

Revenue and Opex Estimates

Basis the traffic analysis asssed in the traffic chapter, the potential traffic for the proposed GCT terminal is as per follows:

Year	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	20232-33
Market share of ICD Morbi	30%	35%	40%	45%	50%	55%	55%
Traffic (TEUs)	1,10,993	1,29,492	1,47,991	1,75,824	1,95,360	2,24,480	2,36,573
Traffic (Rakes/Day)	**3.38**	**3.94**	**4.50**	**5.36**	**5.94**	**6.83**	**7.20**

Estimation of Revenue profile for the Terminal (considering a base tariff as 2,800/- Rs per TEU + Terminal Access Charges and Terminal Cost as per prevailing guidelines of MoR = 3,628/- Rs per TEU) and Railways (based on O-D mapping, as per annexure – 1 and container haulage charges, TC-I/2014/302/02) was carried out. A nominal 3% escalation in base tariff of terminals (vis-à-vis 3% escalation for tariff) per annum to comprehend the financial performance of project from a conservative view-point.

The summary of the revenue profile for proposed terminal and Railways is as below:

PROJECT STRUCTURE AND FINANCIAL RESULTS

- The project is proposed to be implemented under the Gati Shakti Multi Modal Cargo Terminal (GCT) Policy
- G-RIDE shall incorporate a project SPV with 100% equity shareholding
- Project SPV shall develop PFT under Gati Shakti Cargo Terminal Policy, 2022 under full equity model
- O&M shall be contracted to the private operator with revenue sharing arrangement

The summarized financial results are as below:

Financial Performance of the project (base case):	
Project IRR (Post Tax)	12.3 %

Annexures

ANNEXURE I

PROJECT FINANCIALS

CASHFLOW STATEMENT

Morbi ICD																
Year Start			01-Apr-22	01-Apr-23	01-Apr-24	01-Apr-25	01-Apr-26	01-Apr-27	01-Apr-28	01-Apr-29	01-Apr-30	01-Apr-31	01-Apr-32	01-Apr-33	01-Apr-34	01-Apr-35
Year End			31-Mar-23	31-Mar-24	31-Mar-25	31-Mar-26	31-Mar-27	31-Mar-28	31-Mar-29	31-Mar-30	31-Mar-31	31-Mar-32	31-Mar-33	31-Mar-34	31-Mar-35	31-Mar-36
Financial Year			FY-2023	FY-2024	FY-2025	FY-2026	FY-2027	FY-2028	FY-2029	FY-2030	FY-2031	FY-2032	FY-2033	FY-2034	FY-2035	FY-2036
Cash Flow Statement																
Cash Generated from Operations	INR Crores															
Revenue Generated for Project SPV	INR Crores		-	-	40.27	48.39	58.07	69.71	79.79	94.42	97.25	100.17	108.73	112.00	115.36	118.82
Net Revenue of SPV	INR Crores		-	-	40.27	48.39	58.07	69.71	79.79	94.42	97.25	100.17	108.73	112.00	115.36	118.82
Operating Expenses	INR Crores		-	-	(21.33)	(26.37)	(31.89)	(40.23)	(47.38)	(57.73)	(61.30)	(64.85)	(72.40)	(76.79)	(81.40)	(88.28)
Interest on term loans	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest income	INR Crores		-	-	-	3.68	1.48	2.48	3.50	4.73	8.14	7.57	9.28	10.38	12.11	13.87
Tax	INR Crores		-	-	(2.03)	(2.73)	(3.41)	(4.43)	(5.17)	(6.20)	(6.94)	(6.47)	(6.92)	(7.00)	(7.24)	(7.25)
Net Cash Generated from Operations		[illegible]	-	-	16.93	19.99	23.08	27.47	30.71	35.23	35.86	36.42	38.40	38.78	38.93	38.95
(NPV of Operating Cash flows @ 12%)		[illegible]														
Cash flow from Investment Activities																
Capex	INR Crores		-	(232.00)	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Flow from Investment Activities			-	(232.00)	-	-	-	-	-	-	-	-	-	-	-	-
Cash flow from Financing Activities																
Equity Drawdown	INR Crores		-	232.00	-	-	-	-	-	-	-	-	-	-	-	-
Debt Drawdown	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt Repayment	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-
VGF Drawdown	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash From Financing Activities			-	232.00	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash balance																
Cash brought forward	INR Crores			-	-	16.93	36.92	60.01	87.48	118.19	153.42	189.28	225.70	264.10	302.88	341.79
Addition	INR Crores		-	-	16.93	19.99	23.08	27.47	30.71	35.23	35.86	36.42	38.40	38.78	38.93	38.95
Cash Carried forward			-	-	16.93	36.92	60.01	87.48	118.19	153.42	189.28	225.70	264.10	302.88	341.79	380.74

Morbi ICD																			
Year Start			01-Apr-36	01-Apr-37	01-Apr-38	01-Apr-39	01-Apr-40	01-Apr-41	01-Apr-42	01-Apr-43	01-Apr-44	01-Apr-45	01-Apr-46	01-Apr-47	01-Apr-48	01-Apr-49	01-Apr-50	01-Apr-51	01-Apr-52
Year End			31-Mar-37	31-Mar-38	31-Mar-39	31-Mar-40	31-Mar-41	31-Mar-42	31-Mar-43	31-Mar-44	31-Mar-45	31-Mar-46	31-Mar-47	31-Mar-48	31-Mar-49	31-Mar-50	31-Mar-51	31-Mar-52	31-Mar-53
(All Numbers are in INR Crores)																			
Cash Flow Statement																			
Cash Generated from Operations	INR Crores																		
Revenue Generated for Project SPV	INR Crores		122.38	126.05	129.83	133.73	137.74	141.87	146.13	150.51	155.03	159.68	164.47	169.40	174.49	179.72	185.11	190.66	196.38
Net Revenue of SPV	INR Crores		122.38	126.05	129.83	133.73	137.74	141.87	146.13	150.51	155.03	159.68	164.47	169.40	174.49	179.72	185.11	190.66	196.38
Operating Expenses	INR Crores		(91.46)	(96.55)	(102.77)	(108.93)	(115.47)	(122.40)	(125.74)	(137.53)	(145.78)	(154.52)	(163.80)	(173.62)	(184.04)	(195.08)	(206.79)	(219.20)	(232.35)
Interest on term loans	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest income	INR Crores		15.23	16.79	18.33	19.56	21.37	22.85	24.20	25.66	26.50	28.19	29.33	30.35	31.25	32.01	32.60	33.00	33.18
Tax	INR Crores		(7.25)	(7.22)	(7.71)	(6.97)	(6.78)	(6.54)	(6.24)	(5.95)	(5.50)	(4.97)	(4.35)	(3.64)	(2.87)	(1.88)	(0.62)	-	-
Net Cash Generated from Operations		[illegible]	38.90	38.7	38.29	37.69	36.88	35.78	34.4	32.69	30.71	28.38	25.66	22.50	18.88	14.77	10.10	4.47	(2.78)
(NPV of Operating Cash flows @ 12%)		[illegible]																	
Cash flow from Investment Activities																			
Capex	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Flow from Investment Activities			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cash flow from financing Activities																			
Equity Drawdown	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt Drawdown	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debt Repayment	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VGF Drawdown	INR Crores		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash From Financing Activities			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash balance																			
Cash brought forward	INR Crores		380.74	419.64	458.33	496.62	534.31	571.18	606.96	641.39	674.08	704.80	733.17	758.82	781.32	800.21	814.97	825.07	829.54
Addition	INR Crores		38.90	38.69	38.29	37.69	36.88	35.78	34.43	32.69	30.71	28.38	25.65	22.50	18.88	14.77	10.10	4.47	(2.78)
Cash Carried forward			419.64	458.33	496.62	534.31	571.18	606.96	641.39	674.08	704.80	733.17	758.82	781.32	800.21	814.97	825.07	829.54	826.76

PROFIT & LOSS STATEMENT

Note: DD

		01-Apr-22	01-Apr-23	01-Apr-24	01-Apr-25	01-Apr-26	01-Apr-27	01-Apr-28	01-Apr-29	01-Apr-30	01-Apr-31	01-Apr-32	01-Apr-33	01-Apr-34	01-Apr-35
Year Start		01-Apr-22	01-Apr-23	01-Apr-24	01-Apr-25	01-Apr-26	01-Apr-27	01-Apr-28	01-Apr-29	01-Apr-30	01-Apr-31	01-Apr-32	01-Apr-33	01-Apr-34	01-Apr-35
Year End		31-Mar-23	31-Mar-24	31-Mar-25	31-Mar-26	31-Mar-27	31-Mar-28	31-Mar-29	31-Mar-30	31-Mar-31	31-Mar-32	31-Mar-33	31-Mar-34	31-Mar-35	31-Mar-36
(All Numbers are in INR Crores)															
Profit and Loss															
Revenue by Project for SPV	INR Crores	-	-	40.27	48.33	56.97	65.71	79.79	94.42	97.25	100.17	103.73	112.00	115.36	118.82
Interest Income	INR Crores	-	-	-	0.58	1.48	2.40	3.50	4.73	6.14	7.57	9.03	10.56	12.11	13.67
Opex	INR Crores	-	-	(21.33)	(26.37)	(31.99)	(40.23)	(47.39)	(57.72)	(61.18)	(64.85)	(72.45)	(76.79)	(81.40)	(86.29)
PBDIT	INR Crores	-	-	18.95	22.70	26.49	31.87	35.89	41.43	42.21	42.89	45.31	45.77	46.07	46.20
Depreciation	INR Crores	-	-	(8.07)	(8.07)	(8.07)	(8.05)	(7.92)	(7.92)	(7.92)	(7.92)	(7.92)	(7.92)	(7.48)	(6.98)
PBIT	INR Crores	-	-	10.88	14.63	18.42	23.83	27.97	33.51	34.29	34.97	37.40	37.85	38.59	39.22
Interest (Expense)	INR Crores	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBT	INR Crores	-	-	10.88	14.63	18.42	23.83	27.97	33.51	34.29	34.97	37.40	37.85	38.59	39.22
Tax	INR Crores	-	-	(2.01)	(2.71)	(3.41)	(4.41)	(5.17)	(6.20)	(6.94)	(6.47)	(6.92)	(7.00)	(7.14)	(7.26)
PAT	INR Crores	-	-	8.86	11.92	15.02	19.42	22.80	27.31	27.35	28.50	30.48	30.85	31.45	31.96

Note: CC

		01-Apr-36	01-Apr-37	01-Apr-38	01-Apr-39	01-Apr-40	01-Apr-41	01-Apr-42	01-Apr-43	01-Apr-44	01-Apr-45	01-Apr-46	01-Apr-47	01-Apr-48	01-Apr-49	01-Apr-50	01-Apr-51	01-Apr-52
Year Start		01-Apr-36	01-Apr-37	01-Apr-38	01-Apr-39	01-Apr-40	01-Apr-41	01-Apr-42	01-Apr-43	01-Apr-44	01-Apr-45	01-Apr-46	01-Apr-47	01-Apr-48	01-Apr-49	01-Apr-50	01-Apr-51	01-Apr-52
Year End		31-Mar-37	31-Mar-38	31-Mar-39	31-Mar-40	31-Mar-41	31-Mar-42	31-Mar-43	31-Mar-44	31-Mar-45	31-Mar-46	31-Mar-47	31-Mar-48	31-Mar-49	31-Mar-50	31-Mar-51	31-Mar-52	31-Mar-53
(All Numbers are in INR Crores)																		
Profit and Loss																		
Revenue by Project for SPV	INR Crores	122.38	126.05	129.83	133.73	137.74	141.87	146.13	150.51	155.03	159.68	164.47	169.40	174.49	179.72	185.11	190.66	196.38
Interest Income	INR Crores	15.23	16.79	18.33	19.88	21.37	22.85	24.28	25.68	26.96	28.13	29.33	30.35	31.25	32.01	32.60	33.00	33.16
Opex	INR Crores	(91.46)	(96.95)	(102.77)	(108.93)	(115.47)	(122.40)	(129.74)	(137.53)	(145.79)	(154.52)	(163.80)	(173.62)	(184.04)	(195.08)	(206.79)	(219.20)	(232.35)
PBDIT	INR Crores	46.15	45.89	45.40	44.66	43.64	42.32	40.67	38.64	36.21	33.03	30.00	26.13	21.70	16.65	10.92	4.47	(2.78)
Depreciation	INR Crores	(6.99)	(6.98)	(6.99)	(6.98)	(6.99)	(6.98)	(6.96)	(6.48)	(6.48)	(6.48)	(6.48)	(6.48)	(6.49)	(6.49)	(6.48)	(6.48)	(6.48)
PBIT	INR Crores	39.16	38.91	38.42	37.68	36.66	35.34	33.71	32.16	29.73	26.55	23.52	19.65	15.21	10.16	4.44	(2.01)	(9.26)
Interest (Expense)	INR Crores	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBT	INR Crores	39.16	38.91	38.42	37.68	36.66	35.34	33.71	32.16	29.73	26.55	23.52	19.65	15.21	10.16	4.44	(2.01)	(9.26)
Tax	INR Crores	(7.25)	(7.20)	(7.11)	(6.97)	(6.75)	(6.54)	(6.24)	(5.95)	(5.50)	(4.97)	(4.35)	(3.64)	(2.81)	(1.88)	(0.82)	-	-
PAT	INR Crores	31.92	31.71	31.31	30.71	29.90	28.80	27.48	26.21	24.23	21.58	19.17	16.01	12.40	8.28	3.62	(2.01)	(9.26)

PROJECTED BALANCE SHEET

Year Start	01-Apr-22	01-Apr-23	01-Apr-24	01-Apr-25	01-Apr-26	01-Apr-27	01-Apr-28	01-Apr-29	01-Apr-30	01-Apr-31	01-Apr-32	01-Apr-33	01-Apr-34	01-Apr-35
Year End	31-Mar-23	31-Mar-24	31-Mar-25	31-Mar-26	31-Mar-27	31-Mar-28	31-Mar-29	31-Mar-30	31-Mar-31	31-Mar-32	31-Mar-33	31-Mar-34	31-Mar-35	31-Mar-36
(All Numbers are in INR Crores)														
Balance Sheet														
Fixed Assets														
Gross Fixed Assets	-	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00
Less: Accumulated Depreciation	-	-	8.97	16.74	24.21	32.25	40.77	48.05	56.01	63.32	71.84	79.76	87.24	94.22
Net Fixed Assets	-	232.00	223.03	215.26	207.79	199.75	191.23	183.95	175.99	168.68	160.16	152.24	144.76	137.78
Current Assets														
Cash & Bank Balance	-	-	16.93	36.52	60.01	87.48	118.19	153.42	189.29	225.70	264.91	302.86	341.75	380.74
Total Assets	-	232.00	240.06	252.75	267.80	287.22	310.02	337.33	365.28	393.78	424.26	455.10	486.58	518.52
Shareholder's Equity														
Equity	-	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00
Retained Earnings	-	-	8.06	20.75	35.80	55.22	78.02	105.33	133.28	161.78	192.26	223.10	254.58	286.52
Total Equity	-	232.00	240.06	252.75	267.80	287.22	310.02	337.33	365.28	393.78	424.26	455.10	486.58	518.52
Term Loan	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Debt	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Liability	-	232.00	240.06	252.75	267.80	287.22	310.02	337.33	365.28	393.78	424.26	455.10	486.58	518.52
Ok	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Year Start	01-Apr-22	01-Apr-36	01-Apr-37	01-Apr-38	01-Apr-39	01-Apr-40	01-Apr-41	01-Apr-42	01-Apr-43	01-Apr-44	01-Apr-45	01-Apr-46	01-Apr-47	01-Apr-48	01-Apr-49	01-Apr-50	01-Apr-51	01-Apr-52	01-Apr-53
Year End	31-Mar-23	31-Mar-37	31-Mar-38	31-Mar-39	31-Mar-40	31-Mar-41	31-Mar-42	31-Mar-43	31-Mar-44	31-Mar-45	31-Mar-46	31-Mar-47	31-Mar-48	31-Mar-49	31-Mar-50	31-Mar-51	31-Mar-52	31-Mar-53	
(All Numbers are in INR Crores)																			
Balance Sheet																			
Fixed Assets																			
Gross Fixed Assets	-	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00
Less: Accumulated Depreciation	-	101.20	108.19	115.17	122.19	129.14	136.12	143.08	149.56	156.05	162.53	169.02	175.50	181.99	188.47	194.95	201.44	207.92	
Net Fixed Assets	-	130.80	123.81	116.83	109.84	102.86	95.88	88.92	82.44	75.95	69.47	62.98	56.50	50.02	43.53	37.05	30.56	24.08	
Current Assets																			
Cash & Bank Balance	-	419.64	458.33	496.62	534.31	571.18	608.56	645.35	674.00	704.60	733.17	758.62	781.32	803.23	814.37	825.07	829.54	826.76	
Total Assets	-	550.44	582.14	613.45	644.15	674.04	702.84	730.31	756.52	780.75	802.64	821.61	837.82	853.22	858.50	862.12	860.11	850.84	
Shareholder's Equity																			
Equity	-	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00
Retained Earnings	-	318.44	350.14	381.45	412.15	442.04	470.84	498.31	524.52	548.75	570.64	589.61	605.82	621.22	626.50	630.12	628.11	618.84	
Total Equity	-	550.44	582.14	613.45	644.15	674.04	702.84	730.31	756.52	780.75	802.64	821.61	837.82	853.22	858.50	862.12	860.11	850.84	
Term Loan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Debt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Liability	-	550.44	582.14	613.45	644.15	674.04	702.84	730.31	756.52	780.75	802.64	821.61	837.82	853.22	858.50	862.12	860.11	850.84	
Ok	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

PROJECT RETURNS

Morbi ICD																	
Year Start		01-Apr-22	01-Apr-23	01-Apr-24	01-Apr-25	01-Apr-26	01-Apr-27	01-Apr-28	01-Apr-29	01-Apr-30	01-Apr-31	01-Apr-32	01-Apr-33	01-Apr-34	01-Apr-35	01-Apr-36	01-Apr-37
Year End		31-Mar-23	31-Mar-24	31-Mar-25	31-Mar-26	31-Mar-27	31-Mar-28	31-Mar-29	31-Mar-30	31-Mar-31	31-Mar-32	31-Mar-33	31-Mar-34	31-Mar-35	31-Mar-36	31-Mar-37	
Financial Year		FY-2023	FY-2024	FY-2025	FY-2026	FY-2027	FY-2028	FY-2029	FY-2030	FY-2031	FY-2032	FY-2033	FY-2034	FY-2035	FY-2036	FY-2037	
Returns																	
PROJECT IRR																	
EBITDA	INR Crores	-	-	18.95	22.70	26.49	31.87	35.89	41.43	42.21	42.89	45.31	45.77	46.07	46.20	46.15	
Capital Expenditure (Equity and Debt)	INR Crores	-	(232.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	
Less: IDC	INR Crores	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pre-Tax Free Cash Flow to Firm	INR Crores	-	(232.00)	18.95	22.70	26.49	31.87	35.89	41.43	42.21	42.89	45.31	45.77	46.07	46.20	46.15	
Tax	INR Crores	-	-	2.01	2.71	3.41	4.41	5.17	6.20	6.34	6.47	6.82	7.00	7.14	7.28	7.25	
Post-Tax Free Cash Flow to Firm	INR Crores	-	(232.00)	16.93	19.99	23.08	27.47	30.71	35.23	35.88	36.42	38.49	38.78	38.93	38.95	38.90	
Pre-Tax Project IRR		14.4%															
Post-Tax Project IRR		12.3%															

Morbi ICD																					
Year Start		01-Apr-22	01-Apr-38	01-Apr-39	01-Apr-40	01-Apr-41	01-Apr-42	01-Apr-43	01-Apr-44	01-Apr-45	01-Apr-46	01-Apr-47	01-Apr-48	01-Apr-49	01-Apr-50	01-Apr-51	01-Apr-52	01-Apr-53			
Year End		31-Mar-23	31-Mar-39	31-Mar-40	31-Mar-41	31-Mar-42	31-Mar-43	31-Mar-44	31-Mar-45	31-Mar-46	31-Mar-47	31-Mar-48	31-Mar-49	31-Mar-50	31-Mar-51	31-Mar-52	31-Mar-53				
(All Numbers are in INR Crores)																					
Returns																					
PROJECT IRR																					
EBITDA	INR Crores	-	48.15	48.69	45.40	44.33	43.64	42.32	40.67	38.84	35.21	33.35	30.00	26.13	21.72	16.65	10.92	4.47	12.759		
Capital Expenditure (Equity and Debt)	INR Crores	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Less: IDC	INR Crores	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Pre-Tax Free Cash Flow to Firm	INR Crores	-	48.15	48.69	45.40	44.33	43.64	42.32	40.67	38.84	35.21	33.35	30.00	26.13	21.72	16.65	10.92	4.47	12.759		
Tax	INR Crores	-	7.35	7.20	7.11	6.57	6.78	6.54	6.24	5.55	3.50	4.97	4.35	3.64	2.51	1.88	0.82	-	-		
Post-Tax Free Cash Flow to Firm	INR Crores	-	38.80	39.69	38.29	37.55	36.86	35.78	34.43	32.55	31.71	28.38	25.65	22.50	19.22	14.77	10.10	4.47	12.759		
Pre-Tax Project IRR		14.4%																			
Post-Tax Project IRR		12.3%																			

ANNEXURE II
TYPICAL PLAN AND DRAWINGS

List of Drawings	
Sr. No	**Description**
1	Engineering Scale Plan
2	L-Section/ Plan & Profile