

DOCUMENT CONTROL SHEET

CLIENT		CENTRAL RAILWAYS
CONSULTANT		MITES LTD.
PROJECT	Final Location survey for new railway line between Osmanabad to Solapur via Tuljapur	
TITLE	INCEPTION REPORT	
DOCUMENT NO.	RITES/UI/MUM/USM-SUR/76	Revision No. 0

Revision	Date	Checked & Prepared By	Reviewed By	Approved By
Original	01.11.2018	Deependar Singh, AM	P.V.Prathyusha DGM	Vijay Kumar JGM/C



Contents

1. INTRODUCTION	3
1.1 Background.....	3
1.2 Project Brief.....	3
1.3 Study Objectives	3
1.4 Services to Be Rendered.....	3
1.5 Detailed Scope of Services	4
1.6 Services & Facilities to be Provided by Client	4
1.7 Exclusions	4
1.8 Deliverables	5
2. PROPOSED STUDY METHODOLOGY.....	6
2.1 Approach and Methodology	6
2.2 Reconnaissance and Collection /Study of Available Data and Study Reports ..	6
2.3 Planning Norms and Governing Parameters.....	7
2.4 Engineering Surveys	9
2.5 Alignment Planning& Designing.....	9
2.6 Cost Estimates	10
3. Alignment options	11
3.1 OPTION-1: USMANABAD TO SOLAPUR VIA TULJAPUR	11
3.2 Option No 02:	14
3.3 Option No 03:	18
3.4 Alternative alignment analysis and selection criteria	21
3.5 Recommendations.....	24
4. SUBMISSION.....	25
4.1 SUBMISSION SCHEDULE	25



1. INTRODUCTION

1.1 Background

Reconnaissance Engineering cum Traffic survey for a new BG line from Solapur to Osmanabad is sanctioned by Railway Board vide blue Book item No. 46 of the year 15-16, 34 of the year 16-17 & 24 of the year 17-18. This survey is not appearing in blue book of 2018-19. This survey is prepared by Railway Board vide letter no 2018/W-1/Genl/Surveys/Umbrella/Project/Pt. dt 29/8/2018.

1.2 Project Brief

Central Railways asked to do the work of Final location survey for new railway line between Solapur-Tuljapur-Osmanabad to RITES Ltd.

As there is no rail connection between Solapur-Tuljapur-Osmanabad, alignment has been proposed from Solapur-Tuljapur-Osmanabad which passes through the district of Solapur & Osmanabad, administrative district in the Marathwada region of the state of Maharashtra in India. The proposed work consists of construction of new BG line from Solapur on Central railway to Osmanabad station. The new line passes through Ked Mardi, Tamalwadi, Malumbra, Raikhed, Tuljapur, Wadgaon, Sanjha & total length is 80.00 km. The whole line is within Maharashtra state. Almost entire section is approachable by roads. Construction materials like sand, stone & brick are available nearby at Tuljapur. Osmanabad Good quality murum is available along the alignment.

1.3 Study Objectives

The objective of this proposal is to provide consultancy services for engineering survey for finding feasibility for a new railway line. Investigation of engineering Survey will be comprehensive to secure information necessary for preparation of Report & Estimate to take suitable decision by railway for processing of a new railway line.

1.4 Services to Be Rendered

The services to be rendered under the proposed contract will include:

1. Reconnaissance survey
2. Identify probable feasible alignment
3. Identify probable alternative feasible alignment
4. Topographical survey
5. Final location survey on selected alignment



6. Preliminary Cost estimate for recommended alignment

1.5 Detailed Scope of Services

The services to be rendered under the proposed contract will include:

1. Collection and study of available Railway scaled plans, yard plans, index plans, longitudinal sections and railway boundary & land plan from client for the proposed work if any.
2. Collection of Google map, Digital Elevation Models (DEMs), Satellite imageries for designing and marking the alignment proposals
3. Reconnaissance survey for identify the feasibility of alignment
4. Route Alignment Proposals based on Google map
5. DGPS and topography survey for selected route alignment proposal
6. Alignment designing including profile and calculation of land acquisition details
7. Final location survey for approved alignment
8. Preliminary Cost estimate for approved alignment

1.6 Services & Facilities to be Provided by Client

During the course of study, Client shall provide but not limited to following:

- a. Existing scaled drawing / plans / yard plan / map / study report if any
- b. Present Operating plan and system specification, passenger & freight facilities and plan if available with railway
- c. Existing code of conduct / manuals/ reports etc. if applicable to work
- d. All co-ordination from concerned authorities likely to be involved
- e. Hassle free access of site for RITES officials or its survey team including vehicle movement facilities.
- f. Any approval if required

1.7 Exclusions

The Scope of Services do not include following:

- a) The study will not include geotechnical investigation
- b) Preparation of proposals for rehabilitation / resettlement of persons/ structures affected due to land acquisition for the project and land plans
- c) Detailed planning for maintenance facilities, EIA/SIA, EIRR/FIRR, implementation plan



- d) Preparation of feasibility report and tender documents and BOQ for detail engineering contracts
- e) Preparation of detailed yard plan, ESP, GAD and other drawings for structures.

1.8 Deliverables

Survey Report will be prepared & submitted in the form of Draft report covering various aspects as

- i. Characteristics of the project area
- ii. Analysis of alternatives
- iii. Route selection /Project description considering obligatory points such as gradient abstract, list of major / minor bridges, list of ROB/RUB
- iv. Preliminary alignment
- v. Preliminary abstract of Project estimation of cost
- vi. Final alignment along with recommendations based on the FLS including following details:
 - a) General map of the country marking alignment
 - b) Project Sheets: Scale 1 in 5000, ESP's: 1 in 1000
 - c) Index plan
 - d) Index plans and sections
 - e) Typical plans and cross section
 - f) Typical plans and station yards
 - g) Typical drawing of structures
 - h) Typical plans of junction arrangements

The deliverables will be in the form of report as given below along with required drawings as described above

1. Inception Report
2. Presentation on Draft feasibility report
3. Final Feasibility Report



2. PROPOSED STUDY METHODOLOGY

2.1 Approach and Methodology

- Immediately on award of work, a team comprising experts from different disciplines of railway infrastructure were mobilized to carry out study in a coordinated manner.
- Before taking up field survey, route alignment options were marked on Google earth and presented to client.
- Based on client suggestions on alignment route three options were selected and a team comprising of various railway experts conducted reconnaissance survey.
- Based on reconnaissance survey, data collected & suggestions taken from Central railway officials, Alternative alignment options are proposed.
- Alternative alignments along with their merits and demerits various constraints of the alignment will be presented for selection of preferred alternative in Inception report.
- After getting approval for alignment route from client, topography survey will be conducted at site. The survey team will carry out field survey with the help of 'Total Station'/DGPS for physical verification of suitable and feasible alignment.
- On the basis of field survey inputs collected from site, Draft Final location survey shall be submitted to Railway for approval.
- Further on approval of Draft Final location survey report, Final location survey report will be submitted.
- Final location survey will be conducted at site for the finalised alignment.

2.2 Reconnaissance and Collection /Study of Available Data and Study Reports

The RITES Team mobilized on the site carried out reconnaissance survey. The reports available with Central railway related to proposed route has been studied.

Some of the important items available and useful for the Study include;

- RECT report for the proposed route
- Details collected through Reconnaissance survey
- Terrain features of the proposed alignment options by developing DEM's (Digital elevation models) using global mapper's software.
- Study of Satellite imagery and Bing maps for route alignment proposals.
- Study of Google earth elevation details for route alignment proposals.

**FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO
SOLAPUR**



2.3 Planning Norms and Governing Parameters

Planning norms and Governing Parameters has been considered as per scope of work approved.

All the plans and proposals will comply with IRS Codes and Manuals, Indian Railways SOD 1676mm Gauge, Good Engineering practices and related instructions issued by IR. Tentative norms given in following table:

SR. NO.	DESCRIPTION	PROVISION
1	Standard of Construction	Group "D
2	Gauge	1676 MBC
3	Traction	Diesel
4	Loading Standard	25 T Loading
5	Maximum permissible speed in section	160 Kmph
6	Maximum degree of curvature	The Geometry of Track ie. degree of Curvature and Transition Length Should be according to the speed potential of 150 KMPH if due to constraints S.R section required. Then maximum degree of curvature should be 3.0 degree fully transition
7	Ruling Gradient	1 in 150 [Compensated] in plain area. In case of Ghat section it should be restricted to 1 in 60 Compensated] in case of excessive than as the alternative adopted 1 in 40 (Compensated)
8	Gradient in yards	Preferably level, generally be not steeper than 1 in 1200 or consistent with the prevailing gradient in existing yard.if any contain due to site conditions then 1 in 400 may be adopted.
9	Width of Formation	Bank : 7.85 m on straight Cutting: 7.85 m on straight (Excluding Drain Width) Width of bank and cutting may be increased suitably on curves based on extra clearance required on curves.

**FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO
SOLAPUR**



SR. NO.	DESCRIPTION	PROVISION
10	Side slopes Hard rock Soft Rock Murum	Hori : Vertical 1/4 : 1 1/2 : 1 1 : 1 2 : 1
11	Track Structure	i) Rail 60 Kg. First Class for main line & 52Kg 20 hand for Loop line. II) Sleeper MBC sleeper 1660 no, s per K.m in main.
12	Level Crossing	Level crossing should be avoided as far as possible by diverting existing pathway/Kuch village roads etc through ROB/RUB's, provision of limited height subways, merging one into road into the adjoining road etc. ROB/RUB to be provided at crossing of important roads.
13	Tunnels	No Tunnels
14	Length of Loops	751 m-CSR
15	Track Centers	5.300 m for Loop line.
16	Permissible Maximum Length of ruling Gradient in one stretch	No restriction
17	Maximum grade on Approach to main River	As far as possible consistent with site condition and not stepper then 1 in 150 compensated
18	Nos of Stations to be Opened initially	All proposed stations
19	Whether Provision to be made for future electrification	Electrification is proposed in this Survey
20	Obligatory Points	Proposed stations Solapur (Existing) and Osmanabad (existing)



2.4 Engineering Surveys

2.4.1. DGPS Survey

DGPS survey will be fixed along the selected alignment route from Usmanabad to Solapur. DGPS control points will be fixed at every 3 KM in pairs. In between every DGPS pairs Closed traversing will be done to ensure the accuracy of 1 in 100000.

2.4.2. Topographic survey

The topographic survey shall include picking up of all details and features as existing on ground 50m on either side of proposed center line of alignment. The survey shall be carried out by using latest survey instruments having required precision with computerized data capture facility like Total Station / EDMs / electronic Theodolite and auto levels. All data related to topography and features of the ground will be recorded using on board data loggers. Base drawings shall be created in electronic format in the scale of 1:1000 indicating existing ground features viz. Existing tracks, railway boundary, inspection sheds, yard buildings, signals, OHE masts if any, other electrical installations, roads, buildings, nallah, drains, culverts, bridges, level crossings, overhead utilities, kiosks/commercial installations, etc. Existing ground levels shall also be picked up.

2.4.3. Final Location Survey

After getting approval for finalized alignment, a final location survey will be conducted. In the final location survey, the alignment will be marked, stalked and pegged on the ground for DGPS co-ordinates.

2.5 Alignment Planning& Designing

- i. The route alignment (horizontal and vertical) will be plotted using alignment design parameters for the chosen track gauge, dimensions of the rolling stock, Indian Railways schedule of dimensions, other planned railway lines, yard locations, reversal requirements, integration with the existing track/yards etc. using Civil 3D / Open Rail Designer software.
- ii. The vertical profile of the alignment shall be so designed so as to keep Cutting and filling will be equal and to provide as flatter gradients as possible.
- iii. Land acquisition details will be proposed as per Engineering code & RDSO with sufficient width for drainage facility in cutting and filling section.



- iv. All efforts shall be made to minimize the dislocation of the people, structures and utilities.

2.6 Cost Estimates

Preliminary capital cost estimates for various components such as land, rolling stock, civil works, track formation depots, stations/terminals, electro-mechanical system etc., shall be worked out based on the latest rates of respective items duly updated to current levels.



3. ALIGNMENT OPTIONS

Alignment alternative studies were conducted based on following major criteria:

- Avoid/Minimize Forest areas and Wildlife Sanctuaries
- Avoid passing through areas already under planning / development
- Minimize route through irrigated/ two-season crop area
- Maximize route through barren land
- Use existing Right of Way or Government lands wherever available
- Minimum distance from habitations / gaathan areas to be more than 150m
- Alignment to have least number of curves and minimum radius to be 2000m
- Minimize Railway over Bridges (RoB)
- Avoid/minimize crossing water bodies

THREE alignment options were proposed based on above criteria and alignment description given below:

3.1 OPTION-1: USMANABAD TO SOLAPUR VIA TULJAPUR

In this option, Alignment is proposed to connect Solapur to Usmanabad Via Tuljapur. There are 10 stations considered in the total section. The category & facilities provided as per requirement. Out of these 10 stations 2 is existing i.e., Solapur and Osmanabad station, out of remaining 8 stations, 8 will be block stations. Stations details are given below Table:

SR. NO	STATIONS	C/L OF STATION	CATEGORY	INTER – STATION DIST.
1	Solapur	0	Existing	0
2	Khed	9485	Block	9.485
3	Mardi	18200	Block	8.715
4	Tamalwadi	22850	Block	4.65
5	Malumbra	35150	Block	12.3
6	Raikhel	44800	Block	9.65
7	Tuljapur	53600	Block	8.8
8	Wadgaon	60600	Block	7.0
9	New Usmanabad	73100	Block	12.50
10	Osmanabad	83034	Existing	9.934



Alignment Description

- Total length of alignment is 82.5 Km.
- It is proposed to take off from dead end of existing siding at Solapur. And connection in UP and DN main line no. 2 through a proposed 1 in 12 crossover and further connecting in main line through existing crossovers.
- Alignment runs along the existing line from take off point at Solapur to 1.1 Km then alignment turns on right side and crosses NH65 (Solapur-Pune highway) near 4.225 Km.
- After crossing NH 65 Alignment runs straight and takes a slight left to avoid crossing from habitation area of Bale and Bhogaon village and reach to proposed Khed station at Ch 9.485 km.
- From Khed station alignment runs straight and crosses Mardi village from Right side of alignment and GIB (Great Indian Bustard Sanctuary) falls on left side of alignment. It is not possible to take alignment from right side of Mardi village because Ekruk Lake falls on right side of Mardi village.
- Alignment reaches to proposed Mardi station at chainage 18.200 Km.
- Alignment continue straight and reaches to Proposed Tamalawdi station at ch 22.850 km.
- After Tamalwadi station alignment continue straight up to 2 km and takes a left turn and then takes a right turn to avoid major water bodies near IRB toll palaza at NH 52 (Solapur-USmanabad highway). Alignment crosses NH 52 Near 29.200 Km.
- Alignment takes a left turn and runs straight along to NH 52 and reaches to proposed Malumra Station at Ch 35.150 km.
- After crossing Malumra station alignment runs parallel to NH 52 approx. 4 km and takes right turn and reaches to proposed Raikhel station at ch 44.800 km.
- 2 nos of tunnels are proposed. Approx. length is 1.5 km in between chainage 46.0 km to 48.0 km.
- Alignment takes a left turn and crosses Akkalkot-Naldurg-Tuljapur road near ch 47.650 Km.
- Alignment runs straight and Tuljapur falls on left side of alignment, then alignment takes a left turn to avoid major water bodies and reaches to Proposed Tuljapur station at Ch 53.600 km.
- Alignment runs along the NH52 by taking a right turn and left turn, reaches to proposed Wadgaon station at Ch 60.600 km.
- Alignment runs straight up to 68.0 Km and takes a right turn to avoid habitant area near 69 Km, after that alignment runs straight and reaches to proposed New Usmanabad station at ch 73.100 km.
- Alignment runs straight and takes two left turn and crosses NH 52 near Ch 82.200 km.

FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO SOLAPUR



- There are two tracks proposed from proposed New Usmanabad station to existing Usmanabad station, one alignment takes left turn and connect in sand hump of existing Up & Dn loop line, Further connections done by yard remodeling and shifting existing crossovers. The 2nd Alignment takes right turn and connect in proposed Doubling line from Usmanabad to Yedashi.

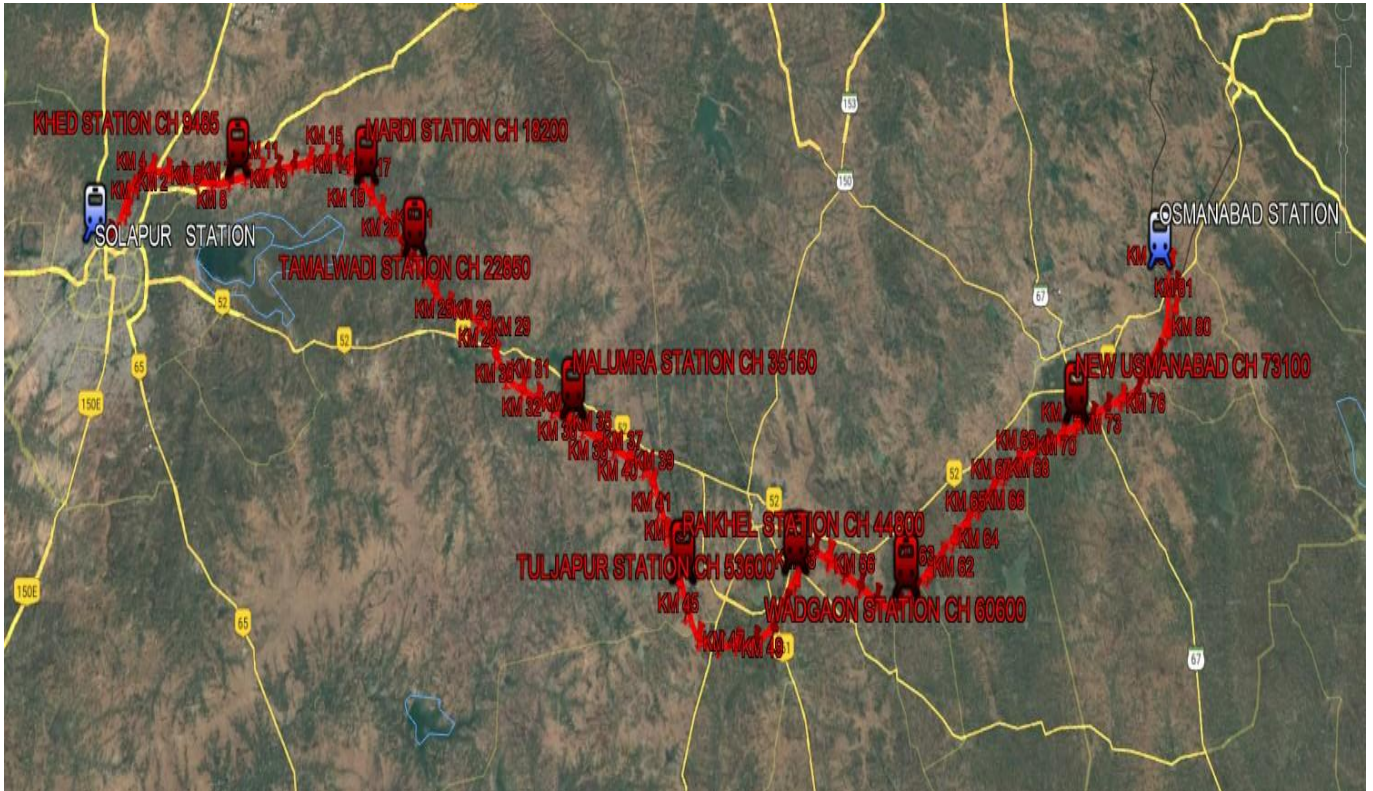


Figure No.1 Alignment Proposed as option 1

FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO SOLAPUR

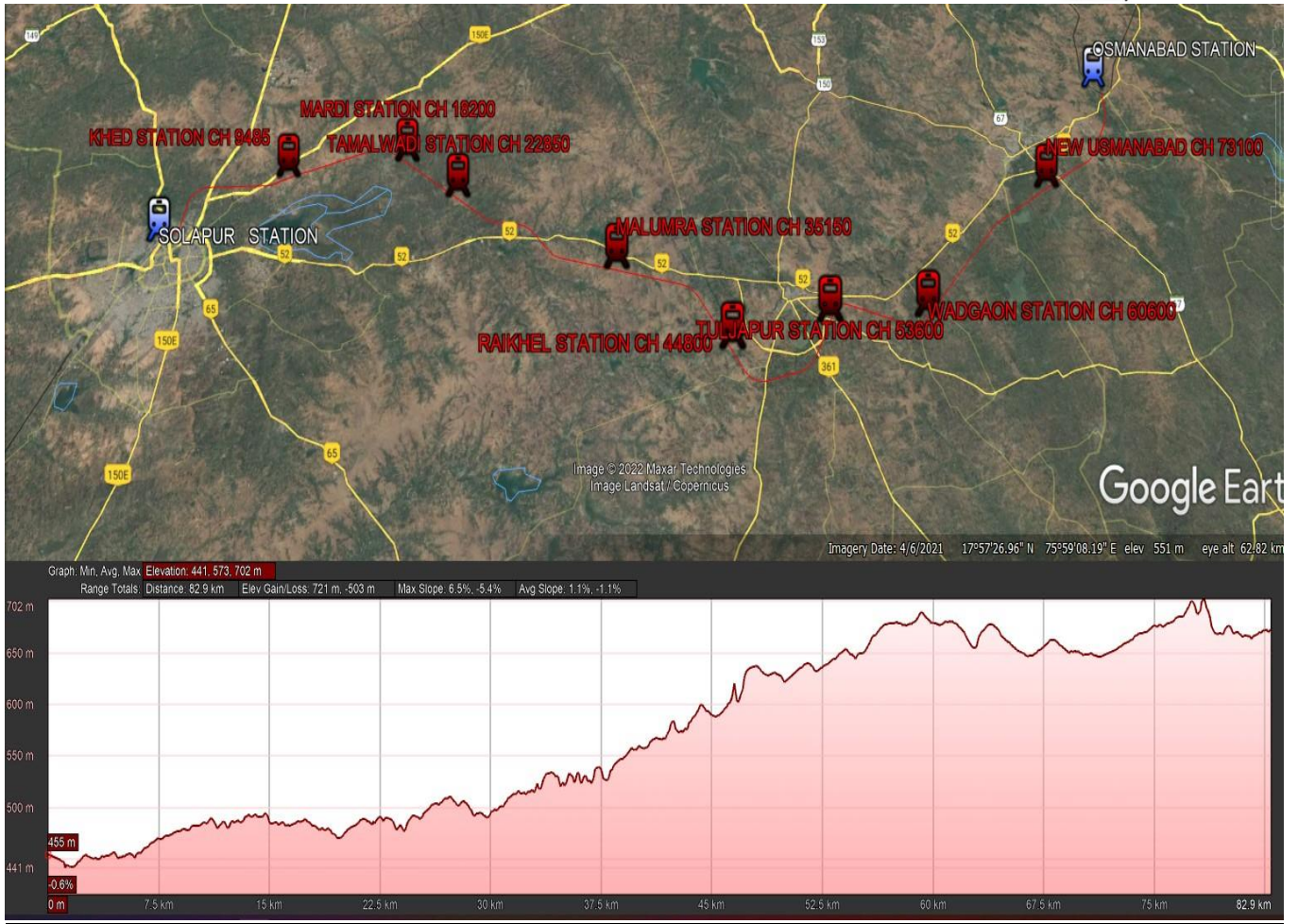


Figure No.2 Alignment and route elevation of Proposed as option 1

3.2 OPTION NO 02: USMANABAD TO SOLAPUR VIA TULJAPUR

There are 10 stations considered in the total section in the approved alignment option. The category & facilities provided as per requirement. Out of these 10 stations 2 is existing i.e., Solapur and Osmanabad station, out of remaining 8 stations, 8 will be block stations. Stations details are given below Table:

SR. NO	STATIONS	C/L OF STATION(M)	CATEGORY	INTER – STATION DIST.(KM)
1	Solapur	0	Existing	0.000
2	Khed	9150	Block	9.150
3	Mardi	19000	Block	9.850
4	Tamalwadi	23000	Block	4.000
5	Malumbra	32500	Block	9.500
6	Raikhel	44900	Block	12.400

**FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO
SOLAPUR**



SR. NO	STATIONS	C/L OF STATION(M)	CATEGORY	INTER – STATION DIST.(KM)
7	Tuljapur	53000	Block	8.100
8	Wadgaon	58700	Block	5.700
9	New Usmanabad	67850	Block	9.150
10	Osmanabad	78300	Existing	10.450

Alignment description

- Total length of alignment is 78.30 Km.
- It is proposed to take off from dead end of existing siding at Solapur. And connection in UP and DN main line no. 2 through a proposed 1 in 12 crossover and further connecting in main line through existing crossovers.
- Alignment runs along the existing line from take-off point at Solapur to 1.1 Km then alignment turns on right side and crosses NH65 (Solapur-Pune highway) near 4.400 Km.
- Alignment passing through habitant area after crossing NH65.
- After crossing NH 65 Alignment runs straight reach to proposed Khed station at Ch 9.150 km.
- From Khed station alignment turns right and crosses Mardi village from Right side of alignment. Alignment crosses GIB (Great Indian Bustard Sanctuary).
- Alignment reaches to proposed Mardi station at chainage 19.00 Km.
- Alignment continue straight and reaches to Proposed Tamalawdi station at Ch 23.00 km.
- After Tamalwadi station alignment continue straight up to 2 km and takes a left turn and reaches to proposed Malumra station at Ch32.500 Km.
- Alignment takes a right turn then takes a left turn and reaches to proposed Raikhel station at 44.90 Km.
- A tunnel of 7.0 km is proposed between Tuljapur and Raikhel station.
- Alignment crosses Tuljapur from left side and reaches proposed Tuljapur station at ch 53.000 Km.
- Alignment takes a left turn and crosses Akkalkot-Naldurg-Tuljapur road near ch 47.650 Km.
- Alignment runs straight and Tuljapur falls on left side of alignment, then alignment takes a left turn to avoid major water bodies and reaches to Proposed Tuljapur station at Ch 53.600 km.
- Alignment takes a left turn and runs parallel to NH52 and reaches to proposed Wadgaon station at ch 58.700 km.
- Alignment crosses NH 52 near ch 62.450 km. and reaches to New Usmanabad station at ch 67.850 Km.
- Alignment passes through MIDC area between 74.000 Km to 75.000 Km.

FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO SOLAPUR



- Alignment runs straight up to 68.0 Km and takes a right turn to avoid habitant area near 69 Km, after that alignment runs straight and reaches to proposed New Usmanabad station at ch 73.100 km.
- Alignment runs straight and takes two left turn and crosses NH 52 near Ch 77.720 km.
- There are two tracks proposed from proposed New Usmanabad station to existing Usmanabad station, one alignment takes left turn and connect in sand hump of existing Up & Dn loop line, Further connections done by yard remodeling and shifting existing crossovers. The 2nd Alignment takes right turn and connect in proposed Doubling line from Usmanabad to Yedashi.



Figure No.3 Alignment Proposed as option 2

FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO SOLAPUR

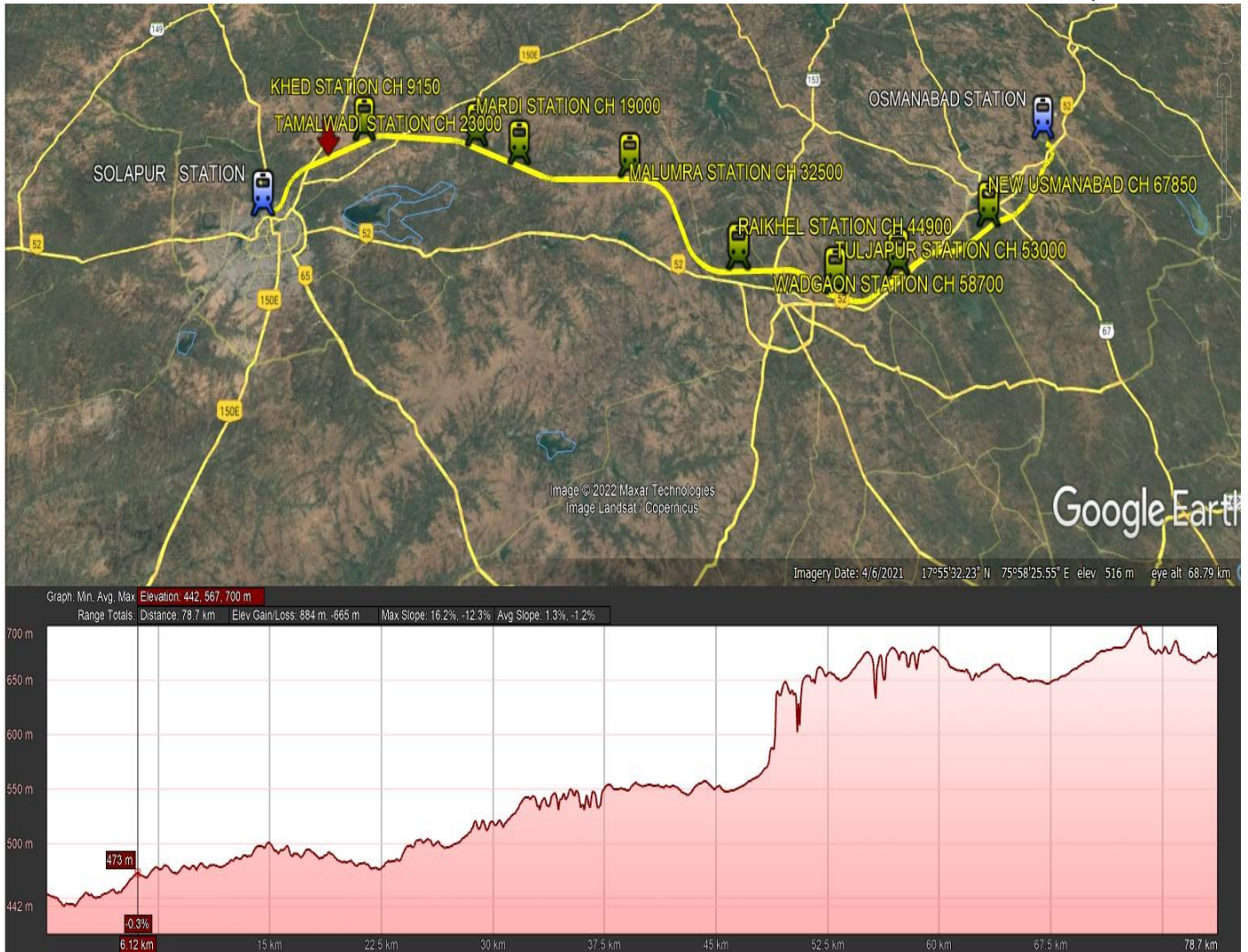


Figure No.4 Alignment and route elevation of Proposed as option 2

**FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO
SOLAPUR**



3.3 OPTION NO 03: USMANABAD TO SOLAPUR VIA TULJAPUR

There are 10 stations considered in the total section in the approved alignment option. The category & facilities provided as per requirement. Out of these 10 stations 2 is existing i.e., Solapur and Osmanabad station, out of remaining 8 stations, 8 will be block stations. Stations details are given below Table:

SR. NO	STATIONS	C/L OF STATION(M)	CATEGORY	INTER – STATION DIST.(KM)
1	Solapur	0	Existing	0.000
2	Khed	9485	Block	9.485
3	Mardi	18200	Block	8.715
4	Tamalwadi	22850	Block	4.650
5	Malumbra	35150	Block	12.300
6	Raikhel	44800	Block	9.650
7	Tuljapur	52425	Block	7.625
8	Wadgaon	59800	Block	7.375
9	New Usmanabad	77000	Block	17.200
10	Osmanabad	88200	Existing	11.200

Alignment description

- Total length of alignment is 88.200 Km.
- It is proposed to take off from dead end of existing siding at Solapur. And connection in UP and DN main line no. 2 through a proposed 1 in 12 crossover and further connecting in main line through existing crossovers.
- Alignment runs along the existing line from takeoff point at Solapur to 1.1 Km then alignment turns on right side and crosses NH65 (Solapur-Pune highway) near 4.225 Km.
- After crossing NH 65 Alignment runs straight and takes a slight left to avoid crossing from habitation area of Bale and Bhogaon village and reach to proposed Khed station at Ch 9.485 km.
- From Khed station alignment runs straight and crosses Mardi village from Right side of alignment and GIB (Great Indian Bustard Sanctuary) falls on left side of alignment. It is not possible to take alignment from right side of Mardi village because Ekruk Lake falls on right side of Mardi village.
- Alignment reaches to proposed Mardi station at chainage 18.200 Km.
- Alignment continue straight and reaches to Proposed Tamalawdi station at ch 22.850 km.
- After Tamalwadi station alignment continue straight up to 2 km and takes a left turn and then takes a right turn to avoid major water bodies near

FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO SOLAPUR



IRB toll palaza at NH 52 (Solapur-USmanabad highway).Alignment crosses NH 52 Near 29.200 Km.

- Alignment takes a left turn and runs straight along to NH 52 and reaches to proposed Malumra Station at Ch 35.150 km.
- After crossing Malumra station alignment runs parallel to NH 52 approx. 4 km and takes right turn and reaches to proposed Raikhel station at ch 44.800 km.
- 2 nos of tunnels are proposed. Approx. length is 1.5 km in between chainage 46.0 km to 48.0 km.
- Alignment takes a left turn and crosses Akkalkot-Naldurg-Tuljapur road near ch 47.650 Km.
- Alignment runs straight and Tuljapur falls on left side of alignment, then alignment takes a right turn to avoid major water bodies and reaches to Proposed Tuljapur station at Ch 52.425 km.
- Alignment runs straight and reached to proposed Wadgaon station at ch 59.800 Km.
- Alignment takes a left turn and reaches to Proposed New Usmanabad station at ch 77.000 Km.
- Alignment takes left turn and crosses NH 52 at ch 87.700 Km and reaches to existing Usmanabad station.
- There are two tracks proposed from proposed New Usmanabad station to existing Usmanabad station, one alignment takes left turn and connect in sand hump of existing Up & Dn loop line, Further connections done by yard remodeling and shifting existing crossovers. The 2nd Alignment takes right turn and connect in proposed Doubling line from Usmanabad to Yedashi.

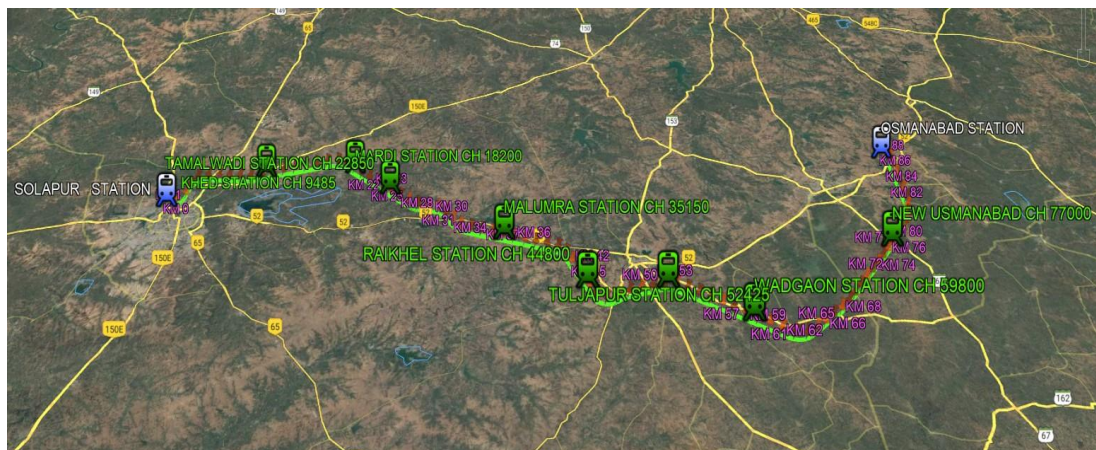


Figure No.5 Alignment Proposed as option 3

FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO SOLAPUR

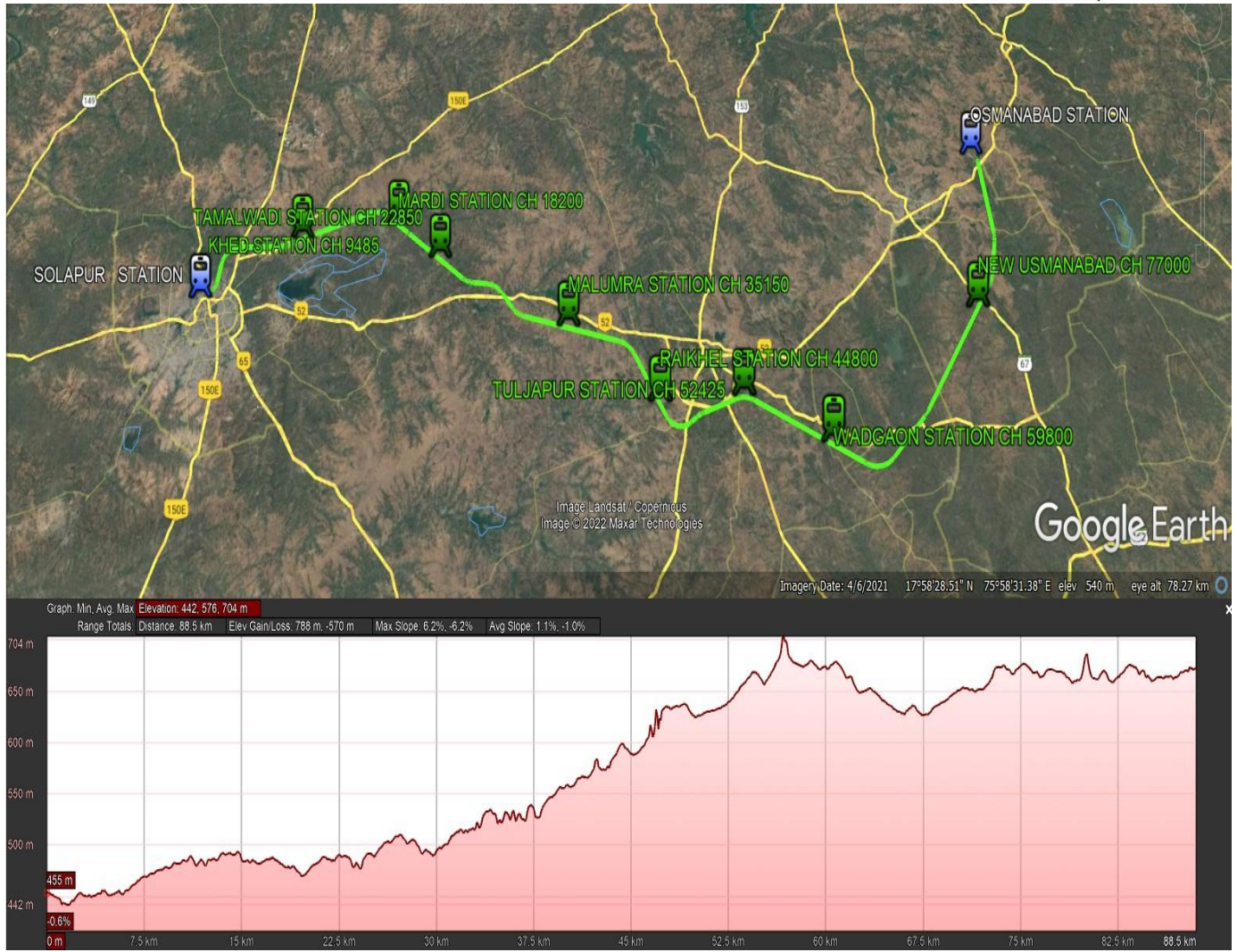


Figure No.6 Alignment and route elevation of Proposed as option 3



3.4 ALTERNATIVE ALIGNMENT ANALYSIS AND SELECTION CRITERIA

Selected three alignment options were analyzed based on following criteria:

- 1)** Environmental and Social Aspects
- 2)** Engineering Aspects
- 3)** Indicative Cost

Salient features of the selected alternative alignments:

SL.NO.	PARAMETERS	Option 1	Option 2	Option 3
1	Total alignment length, KMs	82.59	78.31	88.2
2	Land width (m)	76.94	76.94	76.94
3	Area of Land required in Ha	633.62	614.59	712.56
4	Agricultural land in % (Ha)	293.21	344.75	483.64
5	Barren land in % (Ha)	337.22	238.71	224.39
6	Forest land /open scrub in % (Ha)	3.19	31.13	4.53
7	Defence land (km)	0	0	0
8	Tunnel length (%)	1.50	7.50	1.50
9	Railway Crossing	50.00	40	60.00
10	Major Bridges (nos.)	25	20	35
11	Tunnel Cost (in Rs. Crores)	23.52	117.6	23.52
12	Civil Engineering Cost Rs. Lakhs	72397.99	77897.99	77315.69
13	Electrical Engineering Cost Rs. Lakhs	17210.49	16318.60	18379.53
14	Mechanical Engineering Cost Rs. Lakhs	446.33	423.20	476.65
15	Signaling & Telecommunication Engineering Cost Rs. Lakhs	8455.38	8017.20	9029.72
16	Environmental related works Cost Rs. Lakhs	668.85	634.19	714.28
17	Security Charges (0.25%)	227.44	215.65	242.89
18	Total Cost Rs. Lakhs	99406.49	103506.84	106158.75

Subsequently, detailed comparative analysis of selected three options have been carried out based on engineering, environmental & social and indicative cost aspects and were ranked against various criteria as tabulated below:



3.4.1. Comparative Analysis of 3 Alternatives Alignments - Environmental and Social Aspects

PATICULARS	DETAILS		
	Option 1	Option 2	Option 3
Alignment (KM)	82.59	78.31	88.20
Relative Marking	95	100	89
Agricultural Land, %	46.28	56.09	67.87
Relative Marking	100	82	68
Forest Land, %	0.50	5.06	0.64
Relative Marking	100	10	79
Barren Land, %	53.22	38.84	31.49
Relative Marking	100	73	59
Total Marking	395	265	295

As per environmental and Social Aspect, Option 2 is ranked least as it passes through GIB Sanctuary (3 Km) and Option 1 is ranked highest as it is passing through Barren land and requires minimum acquisition of Forest land.

3.4.2. Comparative Analysis of Three Alternatives Alignments Based on Engineering Aspects

PARAMETERS	DETAILS		
	OPTION-1	OPTION-2	OPTION-3
Alignment	82.59	78.31	88.2
Relative Marking	95	100	89
Major Horizontal curves, (Nos.)	21	21	19
Relative Marking	90	90	100
Tunnel Length, (km)	1.5	7.5	1.5
Relative Marking	100	20	100
RUB, (Nos.)	19	15	30
Relative Marking	79	100	50
ROB, (Nos.)	19	15	20
Relative Marking	79	100	75
Minor, (Nos.)	25	15	25
Relative Marking	60	100	60
Major Bridges, (Nos.)	12	15	20
Relative Marking	100	80	60
Total Marking	603	590	534

FINAL LOCATION SURVEY FOR NEW RAILWAY LINE BETWEEN USMANABAD TO SOLAPUR



As per criteria for Environmental & Social Aspect and engineering aspects, Option No. 1 scored highest marks as it has least tunnel length, requires less forest land acquisition, avoids acquisition of GIB sanctuary and passes through Barren land. Option No.2, is ranked least as Tunnel length of 7 KM is required at Tuljapur Area.

3.4.3. Comparative Analysis of Three Alternatives Alignments Based on Indicative Cost

ALIGNMENT	ALIGNMENT LENGTH	TOTAL COST	TOTAL MARKING
OPTION-1	82.59	99406.49	100
OPTION-2	78.31	103506.8392	96
OPTION-3	88.2	106158.75	94

Indicative costs were worked out land requirement, structures and number of bridges required. In cost analysis too, Option 1 scores the highest while Option 3 scores the least marks as length is more. Although length of Option 2 is less, Cost of this option increases as it requires 7.5 Km of tunnel.

Alignment Rank Matrix

Sr no.	parameters	Weights	Option 1	Option 2	Option 3
1	Alignment Length	10%	9.48	10.00	8.88
3	ROB	5%	4.00	5.00	4.10
4	RUB	5%	3.80	5.00	4.00
5	Major Bridges	5%	4.00	5.00	4.50
6	Minor Bridges	5%	4.90	5.00	4.30
7	Tunnel length	10%	10.00	6.00	10.00
8	Forest Land	20%	20.00	2.06	14.09
9	Agriculture Land	10%	10.00	8.51	6.06
10	Barren Land	15%	15.00	10.62	9.98
11	Buildings and quarters	5%	5.00	5.00	5.00
12	Approx. Civil Cost	10%	9.48	10.00	8.87
	Total Rank %		95.66	72.18	79.78



3.5 Recommendations

Option one is most preferable option according to scoring matrix & comparative analysis of three options.

- Option one is passing through minimum agriculture land and maximum barren land. The forest area affected in Option one is reserved forest.
- No water bodies are affected. Area required for construction purpose is less for Option one.
- Option two is passing through Great Indian Bustard sanctuary and requires maximum forest land area.
- Option three is the longest and requires more number of ROB & more number of structures will be affected. Based on cost analysis, Option one scores the highest while Option two scores the least marks.

Hence Option one has been recommended.



4. SUBMISSION

4.1 SUBMISSION SCHEDULE

the submission schedule will be as given in the RFP. The submission schedule is represented in **Table 4.1** for ready reference:

Table 4.1: Submission Schedule

S.N.	Description	Time
1	Submission of Inception Report	D+1 month
2	Submission of Draft Survey report	D+2 month
3	Submission of Final location survey report	After 2 months from approval of Draft report

D- Date of receipt of LOA (06.09.2019)