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Report of the Comptroller and Auditor General of India



RAIL LINK TO KASHMIR

**Union Government
(Railways)**
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Executive Summary

The Udhampur-Srinagar-Baramulla-Rail Link (USBRL) project is perhaps the most important and also the most challenging project taken up by the Indian Railways since Independence. The strategic importance of the project to the State of Jammu and Kashmir and to the nation as a whole cannot be over-stated, and this has been recognised as such by no less than the Hon'ble Prime Minister, when he declared this to be a project of 'National Importance'.

This project is expected to bring about socio-economic development of the State of Jammu and Kashmir through enhanced connectivity within the region and with rest of the country. The project was envisaged to provide an efficient all weather transportation channel that could function in adverse weather conditions and reduce the travel time to various destinations in and outside the valley considerably.

The project is very challenging, considering that the terrain is difficult and hostile, the weather conditions are tough, the security situation in the Valley is sensitive and the logistics support is not really the best. Also, this is the first time that the Indian Railways has taken up the construction of an entirely new line in an area which has not been mapped properly, does not have approach roads and where it would be difficult to transport the required construction material, tracks and other equipment.

Considering that the project has been declared to be of national importance, funds are provided for it from the Consolidated Fund of India rather than the operating surplus of the Indian Railways. The current outlay expected for this project is ₹ 19,565 crore.

In the above context, the Comptroller and Auditor General of India had decided to carry out a performance audit of the project with a view to assess to what extent the objectives of initiating the project had been achieved and whether the project had been/was being executed with the priority accorded to it by the Government of India.

The project with an alignment based on flat gradient of 1:100 connecting Baramullah up to Udhampur via Qazigund (292 kms.) was sanctioned in 1994-95 with a rough estimated cost of ₹ 1500 crore and was scheduled for completion by August 2007. However, the project suffered from weak planning resulting in huge delays in implementation with time and cost-over-runs. The section from Udhampur to Katra, scheduled to be completed in March 2003 was yet to be completed, i.e. a time overrun of 112 months as of July 2012, with the final completion and operationalisation being long away. In respect of the section from Katra to Banihal, scheduled for completion by August 2007, the progress till July 2012 has ranged from 12 to 14 per cent. The section from

Qazigund to Baramulla, scheduled to be completed in March 2003 could be completed and opened for traffic in phases from October 2008 to October 2009 i.e. after a time overrun of 67 to 79 months. The rail link as of July 2012 was thus, only within Kashmir, rather than to Kashmir.

The single most important reason for delay and other related problems in execution of the project is poor planning. Considering the difficult terrain especially the section between Katra- Qazigund, the Railways should have carried out a detailed survey of the area before deciding on the alignment and gradient that was to connect maximum neighbouring habitations. This alignment passed through various thrust areas and fault lines in the Himalayas, making the line vulnerable to seismic disasters. However, the planners failed to conduct due diligence by way of geo-technical investigations of the proposed alignment in a hitherto unexplored territory and relied entirely on aerial maps and satellite imagery. The final location survey was not drawn up before commencement of works. On the contrary construction works on the alignment were taken up simultaneously along with ground investigations resulting in uncertainty in progress as a result of difficult terrain and geological conditions. The uncertainty concerning technical feasibility of the alignment also impacted finalisation of land requirements, the design and drawing of bridges and tunnels, construction contracts for many of which were awarded to the contractors even before ground investigation was concluded. Despite the advice of numerous experts and consultants to the contrary, the Railways persisted with an alignment with a flatter gradient of 1:100 on the critical Katra-Qazigund section. This resulted in enormous difficulties in execution (which still remain to be fully addressed) leading to increase in time and cost. Subsequently, due to these difficulties, the Railways were forced to suspend work for more than a year on this section and amend the original alignment and gradient in some stretches. Consequently, several works executed on the original alignment had to be abandoned, resulting in foreclosure/termination of numerous contracts which had gone into arbitration with potentially huge liabilities for the Railways (currently estimated at over ₹ 1514.40 crore). Since the project was funded from the Consolidated Fund of India, these liabilities would be borne ultimately by the tax payer.

The Udhampur-Katra section, scheduled for completion in March 2003, was yet to be completed on account of collapse of a tunnel (T-1) and water logging of another tunnel (T-3). Thus, despite the completion of all other activities in this section, the line was not yet operational, depriving lakhs of pilgrims to the Vaishno Devi Shrine of cheaper and faster rail connectivity. With a time overrun of over nine years having been registered already and the target date of completion of this section revised to March 2013, it is doubtful whether the section would be ready by the revised schedule, considering the uncertainty involving the completion of tunnels T-1 and T-3.

In terms of financial management, the project left much to be desired. From an initial project estimate of ₹ 3077 crore, the USBRL project was now estimated to cost ₹ 19,565 crore. The initial detailed estimates were highly unreliable as the scope of works excluded cost of construction of 300 kms of approach roads and were based on insufficient investigation of the terrain and geology in the alignment area. This prevented institution of proper cost control and monitoring of expenditure incurred by executing agencies that are being reimbursed on cost plus basis.

Detailed scrutiny of accounts of executing agencies was not exercised by the Railway Administration while authorising reimbursements. The overall increase in cost over-run was of the magnitude of ₹ 16,488 crore (July 2012) - ₹ 9346 crore due to cost escalation, ₹ 3427 crore due to increased scope of work and ₹ 3715 for items not provided in the DPR. As the more critical section of the project between Katra and Banihal, now scheduled to be completed by 2017-18, has been progressed only up to 12 to 14 per cent (July 2012) and as complexities unfold during execution, the final cost of the project may rise manifold.

Chapter 1 Overview

1.1 Background

Jammu and Kashmir strategically situated close to the north western borders of India has traditionally enjoyed limited surface accessibility to rest of the country notwithstanding connectivity by air that mitigates the situation only partially. The roadlink through National Highway No 1A apart from being long, tortuous and difficult becomes particularly unreliable during inclement weather in winter and summer months. Apart from its security and socio-economic implication, this state of affairs has also had an impact on other aspects of life in the state, more particularly the Kashmir valley.

With a view to provide an alternative and reliable transportation system to and within Jammu & Kashmir, the Government of India envisaged a 345 km. long railway line that would extend the railway network in the country from the railhead at Jammu Tawi to Baramulla at the northern end of Kashmir valley. The rail link would traverse the Pir Panjal range of mountains from Udhampur to Qazigund and the Kashmir valley through the capital city of Srinagar. (*see map at page 65*) The initial stretch of 53 km line from Jammu to Udhampur was completed and operationalised in April 2005.

The entire 292 km line from Udhampur to Baramulla (USBRL-Udhampur-Srinagar-Baramulla-Railway Line) was declared by the Prime Minister in 2002 as a Project of National Importance and is one of the most challenging projects ever undertaken by the Indian Railways considering the extremely difficult terrain, weather conditions and the sensitive security situation prevailing in parts of the area. The project is being executed by three agencies viz., Northern Railway Construction Organization (NRCO), Konkan Railway Corporation Ltd (KRCL) and Irocon International Limited (IROCON). The 119 kms section from Qazigund to Baramulla (within the Kashmir Valley) was completed and operationalised in three phases, the last phase being operationalised in October 2009. The critical 168 kms section from Udhampur to Qazigund, has presented numerous challenges relating to gradient and alignment and is yet to be completed.

USBRL Project Objectives

The objectives of the project are to:

- *Strengthen the transportation network to the Kashmir valley by providing an efficient all weather transportation channel that could function in adverse weather conditions and reduce the travel time to various destinations in the valley considerably and*
- *Bring about socio-economic development of the State of Jammu & Kashmir.*

1.2 Estimated Cost of Project

The estimated cost of the project in 1994- 95, when administrative approval was given was ₹1500 crore. When the detailed project report was prepared in 1999-2000, the cost estimate doubled to ₹ 3,077.23 crore. By 2006-07, the estimated cost rose three-fold to ₹ 9,341.44crore and by 2010 the estimate, sanction for which was accorded in 2012, had escalated to ₹ 19564.83 crore.

The Railway Administration is however, still uncertain about the final cost of the project.

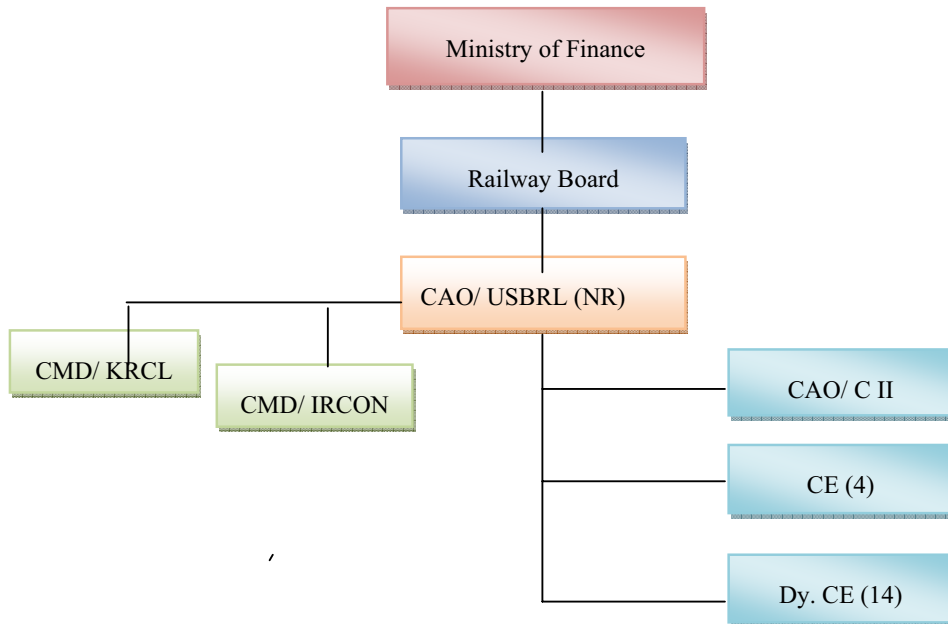
1.3 Project Management

The project is being implemented by three principal agencies, namely, Northern Railway Construction Organisation (NRCO), Konkan Railway Organisation (KRCL) and Irocon International Limited (IRCON), each responsible for distinct segments of the USBRL rail link.

The NRCO is responsible for coordinating the progress of the work by the other two agencies and reporting to the Railway Board. The Railway Board was responsible for technical guidance on selection of alignment and financial issues, besides co-ordination of overall progress.

As the project is being funded by the Government of India on strategic grounds, the Cabinet Committee on Infrastructure is responsible for according administrative approvals of project estimates. The Ministry of Finance is responsible for providing finances.

Organization Structure



Chapter 2 Audit Framework

2.1 Audit Objectives

Performance audit of the USBRL project was undertaken in view of the strategic nature of this rail link and its critical importance to the nation and the state of J&K. The focus of audit was principally on the progress of the still incomplete Udhampur-Qazigund section of the project which is the most challenging segment to be executed and constitutes over 80 per-cent of total project cost. The following were the main concerns sought to be addressed in the audit process–

- Planning strategy
- Project execution
- Financial Management.

2.2 Audit Scope and Methodology

The audit covered the project activities since its inception in 1994-95 to October, 2010. The facts and figures, subject matter of audit findings contained in this report have been updated to July 2012. Audit methodology involved scrutiny of the relevant documents in the Railway Board, the offices of the three executing agencies *viz.* NRCO, KRCL and IRCON, and the selected project sites. Discussions were held with the concerned officials at both Headquarters as well as at the project sites chosen for detailed scrutiny including those of tunnels, bridges etc., and an analysis of relevant data obtained from diverse sources. Joint inspection of the sampled sites was carried out with NRCO and KRCL officials and photographic evidence taken to substantiate audit findings, where required.

Audit findings were discussed with NRCO, KRCL and IRCON officials at various levels. The audit findings were subsequently reported to the Railway Board (March 2011) and their reply received (September 2011) has been verified through revisiting the relevant records at project sites. The reply of the Ministry and the comments thereon updated as of July 2012 has been incorporated in the Report at appropriate places.

2.3 Audit Sampling

Out of 2731 works contracts, 182 major contracts were selected for detailed audit scrutiny on considerations of financial materiality, other significant factors relating to planning and implementation.

2.4 Acknowledgement

We gratefully acknowledge the cooperation and assistance rendered by the Railway Administration, especially NRCO, IRCON and KRCL and their officials at Udhampur, Srinagar, Banihal, Reasi, Katra, Sangaldan, Delhi and Mumbai for their support and cooperation during the course of audit.

Poor Planning Strategy

The principal cause of delay in execution of the critical Udhampur- Qazigund section, in our opinion, was the under-estimation of the challenging geological terrain of the chosen alignment and the failure to carry out complete due diligence process¹, as laid down in the Engineering Code of Indian Railways, before deciding on the gradient and the alignment.

The project estimates were approved without seeking an assurance on the feasibility of construction of bridges and tunnels through a geologically heterogeneous terrain covering major seismic areas. The project estimates based almost exclusively on data obtained from aerial mapping of areas that were inaccessible on account of difficult terrain also overlooked the costs of constructing about 300 kms of approach roads required for servicing the project. The flat gradient of 1:100 adopted for the alignment of the rail link was expected to yield maximum geographical coverage in terms of neighbourhood habitations in the region but also carried maximum geological risks. However, no feasibility studies in terms of preliminary surveys and geo-technical investigations duly followed by a final location surveys were carried out before deciding on the alignment and actual commencement of works. Difficulties have been encountered in the designing and construction of major bridges across Anji and Chenab rivers on account of their inconvenient locations and instability and steepness of the hill slopes abutting the rivers. The alignment also required constructions of 109 kilometres of tunnels (81) requiring 162 number of tunnel portals which posed problems of safety in terms of rescue and relief operations and security of installations. These issues raised by the construction agencies involved in the execution of the work were not properly resolved at the initial stage. RITES were engaged to carry out pre- construction geo-technical investigations of the alignment within pre-specified parameters limiting the scope of available options for decision on viability of the alignment and the project.

The lack of authoritative finding on the constructability of the alignment clearly had the potential to create a discord between the construction agencies and Northern Railway that eventually resulted in stoppage of work leading to a belated constitution of an Expert Committee for reviewing the alignment. Owing to huge commitments for a prolonged period already made in terms of time and resources on the project, the Committee recommended continuance of the alignment with modifications and further studies on problem areas. Thus, the project authorities pursued a high cost strategy by not carrying out proper due diligence process to evaluate the possible risks of

¹ See Annexure I page no 70-71

² 'Khad' refer to dry bed of a seasonal river.

covering a very vast and uncertain geological terrain leading to uncontrolled costs and abandonment of works due to difficulties in the alignment.

3.1 Survey requirements

An important aspect of quality of planning is due consideration at the initial stage of material risk factors likely to impact on project execution and steps for mitigation. As per the Engineering Code, the administrative sanction for a new Line Project should be accorded after conducting investigations that include Reconnaissance and Preliminary Engineering Survey of few alternative alignments and selecting the best from financial and operating point of view. The selection of the gradient is not the only criterion but other factors such as level of traffic, speeds envisaged including mode of traction, etc are material considerations influencing unit cost of bringing rail connectivity. The due process of consideration of the options leading up to the administrative sanction is required to be recorded and preserved in the Detailed Project Report (DPR). However, the technical sanction for commencing the execution of work should be accorded only on completion of extensive investigations and Final Location Survey of the selected alignment.

3.2 Udhampur-Qazigund Section

The alignment chosen by the Ministry of Railways to connect Baramullah with Jammu via Srinagar lies through Udhampur- Katra- Qazigund section (168 Kms) in the western corridor of the Pir Panjal mountain ranges and is located close to the Line of Control. The major cities /towns located in the western corridor of Pir Panjal range are Katra, an important pilgrim centre, Reasi a District Headquarters and the Salal hydel project, a tourist attraction.

The alignment under construction has a ruling gradient of 1:100 requiring a total height of 1100 metres to be gained between Katra and Qazigund. The terrain is characterized by steep hills and valleys of lesser Himalayas. The geophysical complexities of the terrain include active thrusts and fault lines like the Himalyan Frontal Thrust (HFT), Reasi, Sirban, Muree and Panjal (see map at Page 66). The alignment passes through major water bodies beyond Katra including Pie Khad, Anji Khad² and Chenab River. The geo-physical terrain spanning these thrusts and fault lines had remained unexplored owing to poor accessibility and scant population.

3.3 Selection of alignment

Decision on the alignment on the western corridor was taken without conducting necessary surveys and geo-technical studies.

Qazigund is an obligatory point in the alignment being the gateway to Kashmir Valley from both western and eastern corridor (see map at page 67). Before the choice of location of the alignment fell on western corridor, the options based on reconnaissance and engineering cum traffic survey carried out by RITES in the eastern corridor in 1986-87 were considered. These consisted of three alternative gradients ranging from 1:40/50/100, the recommended option being 1:100 wherever possible and rest with 1:50/60 with an estimated cost of ₹ 776.94 crore entailing a route length of 150.75 kms after considering cost, speed potential, operation and maintenance factors. The Geological Survey of India (GSI), in 1994-95, also had recommended alignment through the eastern corridor as the same was located along the National Highway whereas the western corridor from Jyotipuram (Salal) to Banihal was largely inaccessible. Northern Railway subsequently (Feb 1994) submitted a proposal of three options- two through eastern corridor with gradients of 1:40 (120 kms) and 1:100 (198 kms) and third through western corridor with a gradient of 1:100(167 kms).³ For reasons not recorded in the Detailed Project Report (DPR) approved in 1999, these proposals overlooked the option in the eastern corridor recommended by RITES in the eighties.

The Ministry of Railways initially conveyed approval of the alignment passing through the eastern corridor with a steep ruling gradient of 1:40 (March 1994) only to reverse the same in the very next year (June 1995) on the ground of limited speed potential due to steeper gradient, higher consumption of motive power and requirement of catch siding⁴ (in case of slippage of train) in favour of the alignment through the western corridor with a ruling gradient of 1:100 covering Udampur-Baramula. The decision was justified on the ground that the western corridor permitted a flatter gradient touching important locations viz., Katra and Salal and would cover maximum neighbouring habitations. Technological advances in motive power and other safety features that were already in prevalence to negotiate steep gradients in the Indian Railways and elsewhere were ignored. Further, we observed that while opting for the western corridor vis-a-vis the eastern corridor, the relative inaccessibility of the western region including the geological uncertainty was not given due weightage vis-a-vis the eastern region which already enjoyed proximity to National Highway and the decision to cover maximum areas by opting for a flatter gradient was not consistent with the ground reality of the scant populations inhabiting the region. This pre-determined gradient option however was not derived from prior ground surveys/studies and precluded fair considerations of other viable alternatives being explored in the western corridor. We did not find evidence of due

³ Refer to Annexure II page No.72.

⁴ 'Catch siding' refer to a siding along a steep railway grade so placed as to catch run away wagon/ train.

consideration being given to critical issues of constructability, safety and security aspects including financial viability at the time of selection of alignment in the western corridor.

The selected alignment covered maximum number of fault lines and active thrust areas out of which 30-40 kms of route lengths run either through or parallel to such fault lines posing construction risks. The alignment was also close to Salal dam, a source of seismic tremors. Major rivers namely Chenab and Anji were passing through inconvenient locations including unstable slopes that required construction of mega bridges of complex design. In all, the alignment entailed construction of 81 tunnels and 69 major bridges, one of them located over the Chenab river with a height of 363 metres above bed level & width of 1063 metres. Moreover, the alignment had a large portion of uninhabited and inaccessible terrain that required the construction of about 300 kms of approach roads.

However, no preliminary surveys and geo-technical investigations as prescribed under the relevant codes were carried out to ensure the feasibility/constructability of the selected alignment. The Expert Committee later constituted by the Railway Board in 2008 to review the alignment issues also acknowledged that the decision to commence works was taken without the benefit of detailed geo-technical examination. Thus, the decision to deliver maximum rail connectivity was not supported by due diligence process.

The complex and uncertain geology of the region warranted utmost care in conducting necessary feasibility studies so as to mitigate costs on account of uncertainty. On the contrary the project authorities relied exclusively on the data from the satellite imagery of the region obtained from National Remote Sensing Organisation and aerial photographic maps of Geological Survey of India that were not validated with inputs by way of foot-by-foot surveys and other geo-technical investigations of the sub-strata between Katra- Qazigund. The requirement of Final Location Survey for staking of the alignment on the ground and for confirmation of the detailed estimates before their approval was dispensed with until at a later stage. Thus, the abstract estimates of ₹ 1500 crore on which administrative sanction had been obtained in 1994-95 and the project estimates incorporated in the DPR sanctioned in 1999/2000 for ₹ 3077 crore as well as the projected date of completion of the work (Aug 2007) were of doubtful reliability. Moreover, these had completely omitted the material factor of cost of constructing approach roads and also the costs of safeguarding large number of tunnel portals and bridges.

Despite the fact that the alignment had not been properly investigated, the Railway Board gave a 'go-ahead' to commence work by including part of the alignment i.e. section between Udhampur-Katra in March 1995 and contract

work was commenced in 1998 by Northern Railway. Later, in February 1999, Railway Board sanctioned commencement of work on the section Qazigund-Baramullah. It was, thus, clear that the Railway Administration had planned to commence works on the alignment from both ends without investigating the most difficult portion between Katra - Qazigund. Administrative and technical sanctions were thus accorded by Railway Board without adhering to the due diligence process as laid out in the Railway Codes.

When the matter was taken up with the Ministry in March 2011, the Ministry accepted (September 2011) that the abstract estimates were based on aerial surveys carried out and ground surveys were not carried out on account of inaccessible terrain. It was decided that the works would be allowed to commence along with surveys and investigations to be carried out by the contracted agencies, as this course would yield visible progress on the ground and the option for completion of all investigations would have entailed 2-3 years of delay before commencement. However, the course adopted was counter-productive as the same ignored the costs of risks of committing resources without conducting due diligence and was in total violation of prescribed procedures that mandated necessary ground surveys before commencement of works. In a project of such magnitude and complexity, a period of two to three years' investigation of the terrain was indispensable to chalk out a well-founded plan of action.

The Ministry also contended that in 1994, the Railway Board had never approved the proposals of Northern Railway of two gradients of 1:40 and 1:80 for Udhampur to Qazigund and Qazigund to Srinagar respectively. However, audit found that the Expert Committee later constituted (2008) had expressed in its Report that the Board vide their letter dated 29 March 1994 had conveyed its decision for selecting alternative-I i.e. 1:40 gradient through eastern corridor that was later reversed, as already mentioned above.

The Ministry further replied that the various thrust areas and water bodies through which the chosen alignment was passing would be a common feature in the case of any other options and have to be necessarily crossed, whichever the alignment. Also, it was argued that it was not correct that the alignment lay through maximum thrust areas or fault lines. On the question of line through eastern corridor, it was argued that the ruling gradient would never exceed 1 in 50 and the flatter gradient could not be achieved.

These arguments do not hold good for the reason that the chosen alignment resulting from a decision on gradient of 1 in 100 should have been properly investigated, for a clearer appreciation of the terrain and the substrata, the relative stable and weak areas, the positioning of the alignment through the thrust areas/fault lines that would have yielded a more realistic magnitude of the scale of construction costs involved including the safety and security aspects. The lack

of due diligence in conducting a detailed investigation of the uncertain and complex terrain in the interests of expediency reflected a short-sighted approach and lack of fair application of professional standards.

3.4 Construction Strategy

The pre-construction surveys that should have preceded technical sanctions were actually taken up after the commencement of works and proceeded hand-in-hand.

When the project was declared as one of national importance to be funded by Government of India (2002), Railway Board, in December 2002 i.e. even before the Final Location Survey- a pre-requisite for commencement of works- had been conducted, entrusted the execution (role of engineer) of this section (barring 5 Km beyond Katra assigned to NR) to two Public Sector Undertakings under the overall control of NRCO (Northern Railway Construction Organisation). Section Katra-Laole (120 KM), deep inside the Pir Panjal mountains, was assigned to Konkan Railway Corporation (KRCL) while Laole-Qazigund (44 Kms) entrusted to Ircon International Limited (IRCON). The arrangement stipulated that the agencies shall get pre-construction surveys undertaken through RITES in respective sections assigned to each agency, preparatory to works commencement. Consequently, RITES, for the first time carried out geo-technical investigations of the selected alignment on Katra- Qazigund stretch by stretch that constituted a pre-construction survey. RITES were expected to focus their efforts on pre-selected parameters and IRCON and KRCL were expected to work in association with RITES who would hand over segments investigated for construction work in piecemeal fashion. This strategy entailed the high risk of works being abandoned or discard of the assets created in the event of the route being rendered unworkable. This approach also highlighted the fact that the authorities had not made due allowances for contingencies that might call the alignment itself into question. The construction agencies were expected to proceed with commencement of works simultaneously with investigation and were not expected to come up with alternative options. We noted that RITES recommended a few modifications in the alignment with some qualifications on the risk of construction along active thrust areas, but no safety issues were addressed. We also noticed that the confirmatory drilling was confined to drilling of one borehole on each tunnel portal. However, considering the diversity of the terrain, the investigations carried out were inadequate and required further investigations subsequently.

The Ministry, in their response, reiterated that the strategy was to pursue investigation and construction simultaneously for achieving quick visibility of progress of work. The reply was, however, silent on the implications of following a high risk strategy with a high probability of becoming counter-productive in the

absence of thorough investigation and assurance on the viability of the alignment. The reply that their approach fulfilled the codal provisions indicated total disregard of professional norms and inability of the Railway Board in enforcing compliance with the standards laid down in the Engineering Code.

The lack of authoritative finding on the constructability of the alignment resulted in discord between the construction agencies engaged and the railway authorities on continuing constructions on the pre-determined alignment.

3.5 Workability of the alignment

A chronology of major events is given below bringing out discord between the construction agencies and the Ministry.

Chronology of Major Events after project commencement

Period	Event
December 2002	Contracts for construction (including survey) were awarded to KRCL and IRCON based on “paper alignment” ⁵
September 2003	After field study undertaken by it with assistance from IIT Mumbai, KRCL proposed change in alignment (on a “straight line” basis), with a steeper gradient of 1:50. It also suggested setting up of a Committee of Experts. The proposals were not agreed to by Railway Board on the ground that a flatter gradient more than 1: 30 was not possible.
August 2007	Railway Board ordered NRCO to award a section of the line (km 100.868 to km 120) to IRCON, which was originally awarded to KRCL. Again in Oct 2011, NRCO had proposed withdrawal of a part stretch km.61-km191 from KRCL. Pending decision on the proposal, Railway Board had ordered(June 2012) that KRCL shall not enter into any fresh financial commitments on the stretch.
December 2007	NRCO suggested fresh alignment survey along with geological feasibility with 1:50 gradient, and holding execution of works under existing contracts in abeyance.
July 2008	Railway Board decided to suspend work on the sections from km 30 to km 34 and km 52 to km 144 till a final decision on alignment was taken.
October 2008	Railway Board decided to suspend work on the entire alignment from km 30 to 144, and re-examine the sites of the Anji and Chenab bridges, since their location was

⁵ ‘paper’ alignment’ refers to an alignment marked on paper without field studies.

	problematic.
September 2009	Alignment was amended by Railway Board

3.6 Alternative proposed by KRCL and NR

After a detailed study of the paper alignment provided by Railways and based on its own experience of construction and operation of Konkan Railway Project and opinion of expert agencies like Geological Survey of India and IIT Mumbai, KRCL proposed (September 2003) a re-working of the alignment on account of the following factors:

- Major stretches of the alignment passed through a number of Himalayan thrust areas and long portions of track running parallel to and within the thrust areas, which could cause grievous natural disasters during construction as well as during operation and maintenance;
- The alignment consisted of a number of major bridges, of which bridges at Anji Khad and Chenab River were gigantic and no such bridges had ever been built in India before;
- The Salal Dam was in close vicinity and was likely to cause minor reservoir induced tremors, which had been observed in Himalayan region; and
- The alignment contained sharp and reverse curves and also deep cuttings in approaching the Tunnel portals.

Considering the above, KRCL apprehended that in case of any damage to the bridges, repairs would be very difficult and the line will have to remain closed for lengthy periods. Further, it was felt by KRCL that in the absence of proper geotechnical studies, the expenditure incurred on the stretch would be infructuous, in case the alignment proved unworkable at a later stage. In view of above, they proposed a straight alignment through long tunnels with a gradient of 1:50.

KRCL further stated that the alternative alignment put forward by it would result in cost saving by ₹ 5000 crore due to reduced length, elimination of major bridges, reduction in number of portals and reduction in deep cuttings in slopes. A comparative position of Northern Railway alignment and the alignment proposed by M/s KRCL in Katra-Qazigund section is given below.

Alignment proposed by Railways (in violet) and KRCL (in red)

KATRA - QAZIGUND

COMPARATIVE STATEMENT

S.No.	Technical Features	N. Rly Alignment	Proposed Alignment
Engineering			
1	Route Length	138 Km	71.5 Km
2	No. of lines	Single	Twin Single Lines
3	No. of Major Bridges	62 (2 Critical)	3 (Simple)
4	Bridges Minor	132	3
5	Tunnel No.	76 (152 Portals)	4 (8 Portals)
	Length km	87.2	68
6	New Road construction (in Kms.)	300	60
7	Stations	9	5
Geo-technical			
8	i) No. of lineaments (Shear Zones)	14	3
	ii) Track running parallel to thrust (in Kms.)	26	Nil
9	Proximity to Reservoirs / Dam	5 Km.	10 Km.
Environment			
1	Open cut & susceptibility landslide (in Kms.)	20.8	3
2	Distance from snow line (in Kms.)	16	19
3	Land reqd.	10,000 kanals	1500 kanals
Project Management			
1	Cost	Rs 8500 cr	Rs. 6153 cr
2	Time frame	11 years	8 years
3	Expected finished cost	Rs 12582 cr	Rs 8177 cr.
Operational			
1	Security and reliability	Risky & unreliable	Reliable.
2	Operation & Maintenance	Complex & Intensive	Simpler & mostly maintenance free
3	Average Speed	30 KMPH	60 KMPH
4	Travel time	4 - 5 Hours	1 Hour 15 mints.



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KRCL's proposal was not agreed to by the Railway Board as it involved a steeper gradient. KRCL, in its letter to the Chief Administrative Officer (CAO), NRCO in September 2003, suggested setting up a Committee of Senior Experts to examine the alternative proposal and take a view in the matter.

However, the Railways did not agree to the suggestion of KRCL to adopt an alternative alignment with a projected gradient of 1:50 and asked it to expedite the work on the original alignment. The Board was of the opinion that KRCL proposal did not represent the ground reality and the gradient would actually be of the order of 1:30. Thereafter (2003), KRCL took up the assigned work as per the original alignment given by the Railways.

In this regard, we noted that KRCL, despite strong misgivings about the workability of the alignment, proceeded to execute works many of which failed/were abandoned which indicated lack of professionalism on the part of KRCL.

Subsequently, in December 2007, NRCO reported to the Railway Board that KRCL and IRCON were facing the following difficulties in execution of the project from Katra to Qazigund:

- Ruling gradient of 1:100 had resulted in increase in the route length to 148 kms against a straight distance of 75 kms;
- About 44 per cent of the track was on curves; there were 66 tunnels with a total length of 112.35 kms, constituting 76 per cent of the total route length; 45 out of the 66 tunnels were on curves; and out of 132 tunnel portals, 77 were on curves or within 200 mtrs of curves.
- The alignment required 119 bridges, with two very large arch bridges of spans 460 mtrs (Chenab) and 260 mtrs (Anji);
- Serious problems in tunnelling work had been encountered in KRCL portion from Km.30 to Km 52 and from km. 131 to 144 in IRCON's portion.

NRCO also reported to the Railway Board that after examining the section in detail, a gradient of 1:50 was considered feasible and that double line or twin single lines would be a more feasible option to carry out relief and rescue operations in case of emergencies in tunnels which were more than 3 km in length. Based on this assessment, NRCO further requested Board to approve fresh alignment survey along with geological feasibility and hold the execution of works under the existing contracts under abeyance, since further execution would lead to infructuous expenditure in case new alignment with a gradient of 1:50 was adopted. The difficulties communicated by various construction agencies, experts, then Member Engineering and Northern Railway with the existing alignment with a ruling gradient of 1:100 to the Railway Board are placed in the Box. These had inter alia, highlighted security risks and problems of stability and safety and constructability and maintenance of structures.

Risks with the Existing Alignment on Katra- Qazigund Section have not been fully addressed

The risks on account of curved alignment, greater number of tunnel portals, greater number of major/special bridges, doubtful stability and security risk etc. have not been addressed and continue to persist:

- *CAO/NRCO's concerns (December 2007) relating to the problems with the existing alignment, involving a flatter gradient of 1:100 and his request for permission to carry out detailed investigation for a direct line from Katra to Qazigund with a gradient of 1:50 were not agreed to by the Railway Board.*
- *Dr. Golsar of M/s Geo Consult (a member of the Expert Committee), in a meeting with Railway Board in October 2008 opined that the present alignment had very major shortcomings, which would result in serious problems for stability, safety, rescue and restoration, constructability and operational/maintenance. He felt that a gradient of 1:50 would ensure stability and safety due to reduced length of curves, favourable conditions of terrain and geology in valleys between the main mountain ridges of the area, and reduced size of bridges and that, such an alignment would also minimize skirting and cross the fault lines at a favourable angle.*
- *The then Member Engineering, in his detailed analytical note in November 2008, also recommended a straight alignment with steeper gradient to ensure stability and safety.*
- *Shri E. Sreedharan, Managing Director, Delhi Metro Rail Corporation Limited, vide his letter dated May 2009 to the Expert Committee, pointed out that the existing contour alignment would not be stable and the high bridges would be highly vulnerable from security point of view and had suggested that direct route through long tunnels, cutting across fault zones should be adopted with a ruling gradient of 1:40.*
- *Shri AK Verma, Chief Engineer, Northern Railway who worked on the project for two years, examined the various geological reports, visited the project sites extensively and also examined similar hilly projects overseas had submitted in his presentation to the Expert Committee in January 2009, that the existing alignment lacked a sound underlying concept for safety and viability and was not feasible, as the alignment is passing through thrust zones, consists of high bridges, tunnel portals are located on curves, curves in tunnels restrict the visibility at critical locations, high maintenance cost due to higher number of bridges and tunnel portals and higher security risk due to high bridges etc. and suggested a modified alignment with 1:50 gradient.*

Pursuant to extensive deliberations in this regard in February 2008, Railway Board decided (July 2008) to suspend the work between km 30 to km 34 and km 52 to km 144 till a final decision on alignment was taken. The Board also decided to belatedly engage an internationally accredited agency⁶ in Oct 2008 for expert advice on the suitability of the alignment from geological considerations. At the same time, considering that the location of Anji and Chenab bridges was problematic, Railway Board decided to examine the sites of these bridges and hence the work on the entire alignment from km. 30 to km 144 was suspended.

This was followed by constitution of an Expert Committee by the Railway Board in December 2008 under the Chairmanship of Shri M. Ravindra, ex-CRB to review the alignment.

The international consultant was asked to work around the current alignment or to suggest an alternative alignment subject to certain mandatory parameters like gradient 1:60 and obligatory points namely Reasi station near Anji Khad bridge, Salal station at Chenab bridge and Sangaldan station to be covered, where works were already underway and planned along the existing alignment. Accordingly, the Consultant submitted options but felt that had he been given a free hand, he could have provided an optimal solution.

The Expert Committee recommended (June 2009) acceptance of the realignment with a gradient up to 1:60 as suggested by M/s Amberg as well as adoption of suitable remedial/protective measures in the areas already under construction and was constrained to observe that no alternative alignment could be considered at this stage in view of the commitments already made on the public exchequer apart from public expectations on the rail connectivity. Despite the Committee's recommendations, the Railway Board ruled in favour of adoption of ruling gradient of 1:80 on the ground that catch sidings were required for steeper gradients. However, these issues had been considered by the Expert Committee who had acknowledged the existence of much steeper gradients on Indian Railways and the use of high powered locos dispensing with requirement of catch sidings. The suspended work was recommenced by KRCL, wherever, the realignment was not involved (September 2009). Though, a decision regarding location of Anji Bridge on Katra- Reasi section was taken in April 2010, the actual works could not commence, as the Ministry was reconsidering the issue in favour of another location(July 2012).

⁶ 'Internationally accredited agency' refer to Amberg Engineering, Switzerland who are a specialised engineering designer for underground structures.

3.7 Modified Alignment

The Railway Board approved modifications in the alignment in certain stretches (85 out of 138 kms between Katra and Qazigund), with associated changes in gradient (1:80 instead of 1:100). The realignment of Katra- Qazigund effected a reduction of 21 Kms of route-lengths and number of tunnels to 29 and major bridges to 34. The decision resulted in abandonment of 15 tunnels measuring 3.5 Km and 8 bridges both together valued ₹ 226.39 crore as discussed under Chapter on Execution of Works. The changed alignment represented only piecemeal changes in different parts of the Katra – Qazigund sections and did not comprehensively factor in the wholesale changes suggested by the experts consulted by the Committee (who suggested a change in alignment and steeper gradient in the interests of safety and stability of the line). While the modified alignment reduced the total distance and number of bridges and tunnels to be constructed, the Expert Committee recommended further field investigations in respect of unstable locations and highlighted need for provisioning of twin tube tunnel along the entire alignment. The Ministry, in reply stated that constructability, safety and stability issues had been adequately addressed both initially and at subsequent stages. The assertion of the Ministry is not factually correct as the issues of constructability of the alignment were not debated before the selection of the alignment and subsequent investigations conducted by RITES and M/S Amberg revealed problem areas requiring further investigation. Audit also noted that the Railway Board belatedly took a decision in September 2010 to incorporate provision of twin tunnel for tunnel length of more than three Kms, where geological conditions necessitated. As the Railway Board further opted for modified alignment with a gradient of 1:80 instead of 1:60 recommended by the Expert Committee, assurance on issues of constructability, maintainability and safety still remained. Two sketches depicting sections of modified alignment vis-a-vis existing alignment between Katra – Dharam (executed by KRCL) and Dharam – Banihal (executed by IRCON) are placed at Page Nos. 68 and 69. The physical progress being very slow as of July 2012 (ranging from 12 to 14 per cent in Katra – Banihal section (km.30-km150), the project is unlikely to be completed within the rescheduled time frame of 2017.

3.8 Impact of inadequate studies

The uncertainty arising from lack of geo-technical investigations before decision on alignment and subsequent decision to combine investigation and execution of works contracts resulted in adverse consequences in terms of time delays with cost over-runs, besides assets being abandoned as summarised under:

- Preparation of designs and drawings of tunnel portals and bridges was delayed and in some cases, the design had to be changed, leading to time and cost over runs.
- Ten tunnels in KRCL jurisdiction and five tunnels in IRCON jurisdiction had to be abandoned due to the alignment passing through thrust areas or parallel to thrust areas.
- Four tunnel portals collapsed during construction. .
- The alignment from km 52 to km 62 had to be changed in 2006 due to the enormity of the height of the bridges and long spans, thus rendering an expenditure of ₹ 15.42 crore infructuous. With the change in alignment in this section once again in 2009, the works already executed in tunnel No.9 have been abandoned, resulting in infructuous expenditure of ₹ 3.70 crore.
- The changes in alignment, as a result of final decision conveyed (Sep 2009) would also result in fresh acquisition of land on re-aligned stretches. The actual area of land required and the expenditure involved can be assessed only after freezing the alignment and issuing the final awards by the land acquisition authorities. Besides cost overrun, further time overrun due to the land acquisition process cannot be ruled out.

Financial impact on account of suspension of works / foreclosure of contracts.

- *Railways had to suspend the work in the Katra-Banihal section for over a year (July 2008 to September 2009), resulting in abandoning the executed works amounting to ₹ 226.39 crore.*
- *Due to midway suspension of work, contractors have claimed damages on account of idle manpower/ machinery and cost of financing etc. As of July 2012, claims amounting to ₹ 57.24 crore have been admitted.*
- *Prolonged suspension period led to termination of contracts that had been awarded between 2003 and 2005. The extra financial impact in respect of six works, which were retendered during 2010 was ₹ 1097.34 crore. The actual cost and extra financial impact on remaining works will be known only after these works are retendered and awarded afresh.*

NRCO stated that they had saved about ₹ 2000 crore by reducing the length of the line by 21 kms as a result of change in alignment. This contention however ignores the fact that the purported savings were claimed after effecting changes

in alignment at a very delayed stage and would have to be weighed against the overall time and cost over-runs and losses attributable to poor planning strategy and lack of due diligence. The response of the Ministry that the best course of action was taken considering the ground reality of inaccessible terrain and disturbed security situation however overlooked the fact that suitable options were not explored by conducting due diligence for technical feasibility before selection of the alignment. After the administrative approval of the project in 1994-95, no action was initiated to undertake geo-technical investigations of the alignment sanctioned for more than eight years till December 2002 when the construction contracts were awarded. The Ministry in their reply admitted that geological problems had been encountered during tunnelling and suspension of work was ordered to avoid further controversy.

3.9 Land Acquisition/ Forest clearance

Land availability for construction of tunnels, bridges and not the least for construction of approach roads were vital to ensure timely commencement of works and their completion. The piecemeal approach adopted for conducting investigations of the alignment and finalising land requirements was not in accordance with the prescribed policy governing execution of works. This strategy resulted in indents being placed in part portions investigated while there was uncertainty in regard to remaining stretches pending investigations and hampered execution of contracts for lack of final determination/non-availability of land. Moreover, the strategy resulted in discard of the land acquired, as discussed in the succeeding paragraphs, when the alignment had to be modified.

The terms of the contract between Railways and KRCL/IRCON envisaged that land required for execution of the project was to be provided by the Railways to the latter. Further, where the acquired land belonged to the Forest department, the necessary clearances were also to be obtained by the Railways. However, as seen from a scrutiny of the records and execution of the contracts, there were huge delays in acquisition of the required land for laying the line and carrying out the associated works like construction of approach/feeder roads, buildings – both officers and staff quarters and other protection works. In fact, non-availability of the required land and lack of the requisite clearances was one of the primary reasons for termination/ foreclosure of contracts in Leg III (Qazigund-Baraamullah). In respect of Leg II (Katra-Qazigund), the problem had not yet been addressed adequately as of July 2012, as can be seen from the details given below:-

(Figures in hectare)

Executing Agency	Total land required	Land acquired	Balance yet to be acquired
KRCL	828.11	555.06	273.05
IRCON	386.37	317.63	68.74
Total	1214.48	872.69	341.79

Non-Acquisition of Required Land

341.79 hectare of land, amounting to 28.14 per cent of the total requirement, was yet to be acquired by Railways as of July 2012.

After submission of indents by KRCL/IRCON, the time taken by NRCO in providing the land ranged from 15 to 57 months. Works in the Sangaldan and Khari areas especially, were affected badly due to this delay. To avoid further delay and expenditure on idle manpower/machinery, the contractor had to arrange the land on lease basis from private land owners and claimed ₹ 1.54 crore on account of lease rent paid to the land owners. The lease rentals in regard to lands taken on lease would be additional to the costs of land acquisition.

Analysis by audit revealed that,

- the time taken for obtaining forest clearance ranged from 10 to 56 months;
- due to delayed acquisition/forest clearance, contracts for 8 tunnels and 14 bridges in IRCON portion had to be foreclosed and the progress of works at 12 tunnel sites and 8 bridge sites in KRCL area was hampered by 9 to 35 months.
- due to non finalisation of Final Location Survey in the stretch from Km 31 to 38, Km 53 to 56, Km 58 to 87 and Km 110 to 125, the land requirement could not be identified.

In reply, the Ministry stated that the land acquisition was time-consuming and some works were awarded in anticipation of land being available to meet the tight schedule of completion. In these circumstances, there was no alternative but to foreclose some contracts where land could not be made available. The Ministry further contended that most of the land required was owned by the state government that would be exchanged with those already acquired and now not required. Audit observed that the exchange details were yet to be worked out and the decision of the state government for the exchange proposal was yet to be received. Out of 1214.48 hectares of land acquired so far, 178.16 hectares

became redundant needing exchange/return to the original owners. Audit noticed that out of 93 Kms of route length, which was affected by the realignment, the Final Location Survey in 54.59 Kms. route length was yet to be completed. Hence the complete land indents for these stretches could not be placed.

Lack of adequate planning and a clear time frame for land acquisition/forest clearances contributed to the delay in award of contracts and execution of works and contractor's claims for idle resources.

3.10 Designs and Drawings

Rules envisage that contracts for works should not be awarded unless all plans, drawings and estimates are approved/ sanctioned by the competent authority. Rules also provide that due care is exercised in conducting necessary soil and site investigation before finalisation of design and drawings. For special works, complete sets of drawings should be prepared and made available for reference by the intending tenderers before inviting bids. However, KRCL and IRCON, construction agencies awarded contracts for construction of tunnels and bridges and proof consultancy though the GAD⁷ (General Arrangement Drawings)of the bridges were not ready for the simple reason that the site was still under exploration. In particular, the proof consultancy contracts in respect of Anji and Chenab bridges had to be foreclosed due to non-finalization of designs. In consequence, fresh contracts at higher cost were awarded resulting in an avoidable extra expenditure of ₹ 3.58 crore. Similarly, in the stretch between Banihal and Qazigund (km 164 to km 168) the contracts for retaining walls of formation had to be foreclosed and re-awarded at higher rates resulting in cost over-run of ₹ 26 crore that included extra expenditure of ₹11.67 crore.

The Ministry, in their reply stated that in complex projects drawing and design work cannot be taken up/ completed beforehand and in fact proceeds along with the execution of work. The Ministry however, did not clarify why even GAD were not completed before awarding the contracts but admitted that the design and drawings needed to be revised as the tenders had not incorporated the technical requirements that were later added resulting in change in scope of work.

⁷ 'GAD' refer to the broad parameters of the proposed structure based on which further design/drawing are prepared

Chapter 4 Project Execution

4.1 Overview

The USBRL project was included in the Pink Book for the year 1994-95 at an anticipated cost of ₹ 1500 crore. The work was to be completed by August 2007.

To ensure completion within the targeted date, the project was divided into three legs and execution of the project for each leg was entrusted to a different agency as detailed below:

Salient Features	Leg – I Udhampur – Katra	Leg – II Katra – Qazigund	Leg – III Qazigund – Baramulla	Total
Length	25 km	143 km	124 km	292 km
No of stations	2	11	15	28
Major Bridges	9	42	63	114
Minor Bridges	29	58	739	826
Maximum height of Bridge	85 mtrs	359 mtrs	13 mtrs	-----
Longest Tunnel	3.15 km	10.96 km	-----	----
Longest span	154 mtrs	465 mtrs	45 mtrs	-----
Executing agency	NRCO	NRCO/KRCL/IRCON	IRCON	

The status of progress (July 2012) relating to each of the legs is given below:

Leg	Section	Executing Agency	Date of award	Scheduled date of completion	Status
Leg I	Udhampur-Katra	0 to 25 km (Katra) NRCO	March 1995	March 2003	Incomplete
Leg II	Katra-Qazigund	25 to 30 km (Katra + 5) NRCO	November 2002	August 2007	Incomplete
		30 to 100.868 km (Katra to Dharam) KRCL	December 2002		Incomplete
		100.868 to 168 km (Dharam to Qazigund) IRCON	December 2002		Incomplete
Leg III	Qazigund-Baramulla	168 to 292 km IRCON	February 1999	March 2003	Operationalized in October 2009

Status of different legs of USBRL

4.2 Leg – I -Udhampur – Katra

As mentioned in Para 4.1.1, the execution of Leg I was entrusted to NRCO. NHPC (National Hydro Power Corporation) was engaged to carry out surveys and RITES for geo-technical investigations of the entire portion and the agencies submitted their Reports in 1997 and 2001 respectively.

NRCO awarded 169 work contracts for the Udhampur - Katra section. Of these, audit selected 21 major work contracts, all the contracts above ₹ 5.00 crore, for detailed audit scrutiny as given below:

Cost of work	Total No. of works	No. of works selected
Above 10 crore	7	7
5 to 10 crore	7	7
1 to 5 crore	09	06
Below 1 crore	146	01
Total	169	21

Out of 21 major works selected and reviewed, only one contract was completed within the stipulated date of completion. Eleven works were completed with delays ranging between 9 and 97 months. Four works were terminated/foreclosed and 4 works were still in progress as of July 2012. Out of 21 works, 14 works were delayed from 29 months to 123 months.

As can be seen above, Leg I from Udhampur to Katra, which was scheduled to be completed in March 2003, was yet to be completed as of July 2012. All the tunnels and bridges in this section had been completed except T1 and T3.

Udhampur – Katra Section not complete due to Tunnels T-1 and T-3

The main reasons for non completion of the Udhampur - Katra section (which would have benefited lakhs of religious tourists to the Vaishno Devi shrine) were the collapse of Tunnel No. 1 (T-1) and water logging in Tunnel No. 3 (T-3).

During the construction of T-1 (costing ₹ 95.13 crore), deformation in the ribs was noticed (December 2002) but NRCO's efforts to rectify the deformation failed and portions of the tunnel finally collapsed (November 2006), blocking the tunnel completely. The damaged portion of the tunnel was abandoned and a fresh contract for construction of 1800 meter tunnel on realigned stretch was awarded on January 2010 at a total cost of ₹ 91.74 crore excluding the cost of steel and cement which were to be provided by NRCO. This tunnel scheduled to be completed in June 2012 is now rescheduled to be completed in March 2013. .

T-3 (2.48 kms long tunnel costing ₹ 55 crore), was taken up for construction in September 2001 and was completed in April 2008. However, water started seeping in during construction of this tunnel (July 2003) and acquired huge proportions as days passed by. All efforts of NRCO to trace the source of water failed. Finally, RITES was assigned (August 2009) at a cost of ₹ 2.92 crore the task of suggesting remedial measures amounting to ₹ 20.11 crore to make the tunnel operational. The contract for remedial measures has since been awarded in April 2012 for completion in August 2012 at a cost of Rs. 5.86 crore. Despite completion of stations, bridges and all the remaining five tunnels in this Section with a time over-run of nine years, Leg – I is not yet operational.,

Leg-I involved a length of 25 km of track, seven tunnels involving 10.30 km and 9 major bridges. Work on this section was taken up in March 1995 and was targeted for completion by March 2003. However, as of July 2012, although most of the works of the section had been completed, this section could not be operationalized due to the collapse of tunnel T-1 and water logging in tunnel T-3. The details in this regard are discussed below:

4.2.1 Tunnel T-1

T-1 on Udhampur-Katra section is 3111 mtrs long. It is on the critical path for the opening of Udhampur – Katra section and its non-completion has delayed the project for about 10 years. M/s. Patel Engineering Co. Ltd. was awarded this work in May 2000 at a cost of ₹ 33.53 crore and given a period of 30 months for completion.

- In December 2002, when the work was executed to the extent of 40 per cent and a sum of ₹ 15.38 crore had already been incurred, it was noticed that the ribs of the tunnel were deformed. CMRI Roorkee was consulted on payment of ₹ 0.14 crore but the measures suggested were not successful and the tunnel ribs continued to deform.
- Later, WAPCOS was consulted and as per their recommendations, rectification work was awarded to M/s Apex Encon Projects Pvt. Ltd. in June 2006 at a cost of ₹ 7.49 crore. However, the tunnel continued to deform and in November 2006, side and arch collapsed blocking the tunnel completely.
- M/s Geo-Consultant-RITES (a JV of RITES and Geo-Consultants) who, in August 2007, were given a ₹ 4.97 crore consultancy contract, for suggesting measures for rectification of the situation, suggested diversion of the tunnel.
- Finally, in January 2010, NRCO awarded the work for construction of 1800 meter long tunnel in parallel to the existing tunnel to M/s Tantia-CCIL(JV) as suggested by M/S Geo-Consultants-RITES at a cost of ₹ 91.74 crore excluding the cost of steel and cement, which are to be provided by NRCO.

Field Visit by Audit in July 2010 to Tunnel T-1 on Udhampur – Katra Section

Audit team visited this tunnel on 23 July 2010 and the status of the tunnel along with the parallel tunnel as of this date is given below:



Face of demolished T1 blocked with gunny bags



Reconstruction work of T1 portal 2 in progress

This tunnel originally scheduled for completion by June 2012 is now rescheduled for completion by March 2013. The total amount expended on the collapsed and later abandoned tunnel measuring 1800 metres was ₹ 95.13 crore out of which ₹ 53.51 crore was rendered infructuous.

The Ministry responded that the deformation of tunnel ribs and collapse of the tunnel was on account of geological factors which could not be assessed in initial stages in spite of detailed survey and investigation carried out. The reply is not

factually correct as both the expert agencies (M/s NHPC & RITES) had, in their Geo- technical investigation Reports pointed out that the alignment adopted for the tunnel was passing through very weak rock and anticipated serious difficulties in tunnelling and had recommended soft ground tunnelling methodology. Instead of opting for best international consultancy ab-initio, NRCO adopted a piece-meal approach during December 2002 to June 2006 by hiring CMRI Roorkee first then WAPCOS and an international consultant who recommended horse-shoe shaped tunnel design that was later adopted for the diversion tunnel. Besides, NRCO had allowed the contractor to proceed with further excavation despite continued deformation of T-1 which had to be demolished (June 2006), rendering the expenditure infructuous. Further, in spite of the deformation and final collapse of the tunnel in June 2006, NRCO awarded the contract for ventilation, illumination and power supply to M/s C. Doctor & Co. Pvt. Ltd. at a cost of ₹ 8.96 crore. The contractor supplied the material worth ₹ 6.79 crore but could not erect it as the deformed tunnel had already collapsed. The possibility of deterioration of the material while the tunnel was under construction could not be ruled out.

4.2.2 Tunnel T-3

This tunnel is 2480 mtrs long. Work relating to this tunnel was awarded to M/s. Skanska Cementation at a cost of ₹ 24.08 crore in September 2001 with date of completion (DOC) of 30 months (March 2004). Execution had to be stopped during monsoon of 2004 and 2005 for a long spell, resulting in cost escalation. During the execution, there was heavy inflow of water inside the tunnel (July 2003) ranging from 175 ltr. per second to 1125 ltr. per second. The work had to be stopped for 36 months and was completed in April 2008 at a cost of ₹ 55 crore, excluding cost of cement & steel supplied by the Railways., This involved delay of 49 months and a cost overrun was ₹ 31 crore . However, due to water logging in the tunnel, it was un- usable even as of July 2012.

Field Visit by Audit Team to Tunnel T-3 in July 2010

We visited this site on 23 July 2010 and found the tunnel water logged, as can be seen from the photographs on that date, given below.



Despite the fact that heavy ingress of water started during construction (June 2003), instead of tackling the ingress of water, the contractor was allowed to complete the tunnelling work by allowing water to flow into tunnel through weep holes. An expenditure of ₹ 21.59 crore was incurred on temporary arrangements and draining of water through weep holes. Audit observed that early indications of heavy water presence in the tunnel were already available with the administration through Geo technical Report by M/s NHPC (1997) and report by RITES on basis of geo-technical investigations (2001). Subsequent inspections of the tunnel carried out by the Executive Director (Mining Operations) and further studies conducted by RITES confirmed the presence of a buried channel. These further studies should have preceded commencement of tunnelling and remedial measures taken instead of being addressed, when water logging overwhelmed tunnel construction.

RITES were given a ₹ 2.92 crore consultancy contract in August 2009 to suggest alternative arrangements for making the tunnel operational who finally recommended in February 2011 remedial measures at an estimated cost of ₹ 20.51 crore, the contract for which has been awarded in April 2012 at a cost of Rs. 5.86 crore, which is scheduled to be completed in August, 2012. However, the progress of work as of July 2012 was not satisfactory (five per cent) and the work was held up due to heavy discharge of water from tunnel.

As with T-1, though the tunnel could not be operationalised due to water ingress, the contract for ventilation was awarded (March 2007) to the same contractor (M/s C. Doctor & Co. Pvt. Ltd) at a cost of ₹ 8.22 crore. The contract had been completed (December 2010) at a cost of ₹7.69 crore. For working the ventilation system, 100 KVA connection was obtained from J&K Electricity Board from March 2010 onwards and additional expenditure was being incurred on ventilation and power on a regular basis while the tunnel was yet to be operationalised.

While acknowledging the existence of a buried channel, Railway Administration failed to indicate why the fact brought to light by RITES as early in 2001 had been ignored until the tunnel construction resulted in water ingress.

4.3 Leg - II - Katra - Qazigund

4.3.1 Overview

Leg II from Katra to Qazigund is being executed by three agencies viz. NRCO, KRCL and IRCON. The work awarded in December 2002 was scheduled to be completed in August 2007.

Five km stretch from Katra incomplete

Construction of the five km stretch from Katra towards Qazigund was the responsibility of NRCO. Out of two tunnels and one major bridge, only one tunnel (tunnel T-8 & 9) had been completed and other two works (tunnel T-10 and major bridge at Banganga river) were in progress as of July 2012. In respect of Tunnel T-10 demolished during construction, the rectification work awarded at a cost of ₹.10 crore was in progress.

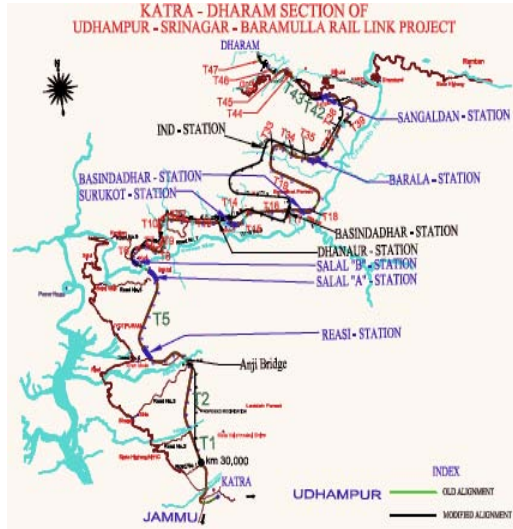
In the KRCL portion from km. 30 to km. 100.868, the issue of alignment had been under dispute since the inception of the project. KRCL had consistently held the view that construction of the railway line based on the paper alignment provided by NRCO was not feasible as it passed through thrust areas or was parallel to thrust areas, the alignment had sharp and reverse curves and deep cuttings⁸ in approaching the tunnel portals. During execution of works, numerous problems were encountered in tunnelling and construction of bridges and a number of works had to be abandoned mid-way and work on the entire section had to be suspended in July 2008 pending review of the alignment. After various studies carried out by an international expert consultancy firm and a High Powered Committee under the Chairmanship of ex Chairman Railway Board, the alignment had been re-fixed in certain sections. Due to abnormally long suspension period from July 2008 to September 2009, most of the contracts (except contracts for Chenab bridge and Sangaldan area) were foreclosed. Out of foreclosed contracts, four works had been re-awarded at a higher cost, the financial implications of which have been discussed in the subsequent paragraphs. In the stretch from km. 61 to km. 87, work could not be awarded for want of finalisation of Final Location Survey (FLS) and Railway Board's instructions of June 2012 not to enter into any further financial commitments.

In IRCON's portion from Dharam to Qazigund, the situation was similar except for tunnel T-80 at Banihal and a portion of Zone IV (please refer to para 4.3.3.2). The contract in the stretch from km. 100 to km. 125 could not be awarded for want of finalisation of FLS, the contracts from km. 128.560 to km. 142 had to be foreclosed due to non availability of land, the works from T- 67 to T-74 had to be abandoned after execution on account of change of alignment and the progress of works from km. 164 to km. 168 was hampered on account of repeated revision of drawings and design of cross section of the earth formation.

Thus, despite spending ₹ 4050.92 crore and the lapse of over 9 years since the award of the projects to NRCO, KRCL and IRCON, and time overrun of nearly 5 years, Leg –II of the project was far from completion. Considering the changes in alignment and designs & drawings in some cases and other difficulties faced, it was doubtful that this Leg would be completed within the revised timeframe of 2017-18.

⁸ 'deep cuttings' refers to permanently open excavation carried out to make Railway formation.

4.3.2 Leg II: Katra – Dharam Section-KRCL portion



Being the trickiest section in the entire project, this section involved a length of 71 km of track, 31 tunnels and 51 bridges which after change in alignment has now been revised to 17 tunnels covering 60.45 km and 20 major bridges.

KRCL awarded 47 work contracts pertaining to this section out of which, 15 work contracts were selected for detailed audit scrutiny as per the details given below:

Contracts costing (₹)	Total No. of works	No. of works selected
Above 10 crore	15	10
5 to 10 crore	06	01
1 to 5 crore	14	04
Below 1 crore	12	-
Total	47	15

Out of the 15 major contracts selected for review, none of the contracts was completed as of July 2012; nine contracts were foreclosed and six contracts were in progress. The delay in execution of these works ranged between 41 months and 101 months.

4.3.2.1 Progress of Tunnels

Tunnelling works in a stretch of approximately 60.45 kms were to be executed by KRCL in Katra-Dharam section from km. 30 to km. 100.868. The contracts for tunnels T-13 to T-15 in the stretch from km. 61 to km 87 could not be awarded as the FLS of the revised alignment on which these tunnels lie was yet to be completed and the construction of approach roads was in progress. Subsequently, in June 2012, the Ministry decided that KRCL should not enter into any further financial commitment on the stretches from Km. 61 to Km. 91 and Km. 33.09 to

Km. 39. For execution of tunnels in the remaining section, 12 contracts were awarded by KRCL to various agencies as detailed below:

Out of the total tunnel length of 33.65 kms (for which contracts were awarded), only 15.96 kms (47.43 per cent) tunnelling could be executed after incurring an expenditure ₹ 902.37 crore (62.66 per cent) as against original contractual value of ₹ 901.44 crore (100.10 per cent) as of July 2012. The detailed physical and financial progress of construction of tunnels in this section is given below.

Tunnel No.	Date of award of contract	Name of Agency	Contract Amount (₹ in crore)	Target date of completion	Expenditure (₹ in crore)
T-1	17.05.03	M/s Progressive Constructions Ltd.	45.74	16.01.06	40.67
Balance work	01.03.11	(Contract foreclosed in Oct 2007) M/s Apex Encon Projects Pvt. Ltd	61.99	01.07.13	00.32
T-1 Adit	13.05.10	M/s Bhumi Geo Engg. Pvt. Ltd.	6.67	31.12.11	5.31
T-1 Rectification	03.02.10	M/s Bhumi Geo Engg. Pvt. Ltd.	14.08	30.09.11	14.38
T-2	12.12.03	M/s Shaktikumar M.Sancheti Ltd. (foreclosed in October 2007)	133.07	26.12.06	27.60
T-3	29.01.04	M/s NPCC ((foreclosed in Jan 2010)	79.01	29.07.07	72.44
Balance work	15.11.10	M/s UAN MAX Infra Ltd.	59.17	14.11.12	29.94
T-5	03.01.04	M/s NPCC (foreclosed in Jan 2010)	152.29	31.12.06	72.43
Balance work	18.10.10	M/s Apex Encon Projects Pvt. Ltd	207.29	17.10.14	6.82
T-6-12	12.02.04	M/s. UAN Raju-IVRCL Constn. JV (foreclosed in August 2009)	156.82	31.10.06	94.26
Balance work	21.9.10	M/s ITD Cementation India Ltd.	189.41	20.01.14	27.66
T-13 to T-15	Contracts not awarded				
T-38-47	13.10.05	M/s AFCONS Infrastructures Ltd. (work is in progress)	334.52	28.04.08	510.54
Total			1440.06		902.37
Total Tunnel length			33645.92 m	% of total line	
Physical progress			15962.59m	47.43 per cent	
Total contractual cost			1440.06		
Expenditure incurred			902.37	62.66 per cent	

As of July 2012, out of total tunnelling length of 60.45 kms, the physical progress was only 15.96 kms i.e. 26.40 per cent at a cost of ₹ 902.37 crore (62.66 per cent of the total revised contracted amount) despite lapse of more than nine years since the award of work to M/s KRCL. Out of six contracts awarded for construction of six tunnel works, five contracts were foreclosed and the balance works were awarded at a higher cost on account of difficulties in the alignment resulting in suspension of work. The revised target date of completion of works ranged between September 2011 to October 2014.

The Ministry admitted that the mismatch between physical and financial progress was on account of the fact that the DPR had not considered the issue of approach roads and other ancillary works relating to tunnel construction.

4.3.2.2 Audit findings - Tunnels

Audit findings relating to delay in execution of tunnels and contract management including review of alignment and abandoned works etc. in the Katra-Dharam section are discussed in detail below:

Work	Details	Observations
Tunnel T-1	<p>A major slide occurred in February 2005 at portal P-2 of T-1.</p> <ul style="list-style-type: none"> • 19.75 meter long false tunnel got partly twisted and partly collapsed. 75 meters main tunnel was also damaged. • Five meters of the tunnel collapsed in July 2007. • 378 meters of tunnel (Katra end portal) were deformed and a fresh contract awarded for its rehabilitation at a cost of ₹ 14.08 crore. • There was heavy ingress of water in the tunnel as can be seen from the photograph given below. Arrangements have been made for regular dewatering and ₹ 3.58 crore has been paid in this regard so far. 	<p>The portal P-2 could not be rehabilitated until as late as in June 2007 (28 months). The alignment had been changed and portal P-2 of T-1 was abandoned, rendering the expenditure of ₹12.50 crore infructuous.</p> <p>The contract was foreclosed in March 2010 after incurrence of ₹ 40.67 crore as against contractual cost of ₹ 45.74 crore. The part balance work had been awarded to two contractors at a cost of ₹ 68.66 crore, resulting in extra financial impact of ₹ 63.59 crore. The contract for a part of tunnel (approximately 600 meters) was yet to be awarded.</p> <p>The Railway Administration stated that audit contention of infructuous expenditure of ₹ 12.5 crore was not correct in view of overall savings on account of reduction of length and height of piers of Pie Khad bridge on revised alignment. The contention was not acceptable as the factual difficulties in the existing alignment reported by KRCL in</p>



Tunnel T – 1 water logged

The firm claimed a further amount of ₹9.86 crore for dewatering the tunnel during the period from November 2007 to February 2010. The matter was in Arbitration.

its Report (September 2003) on the basis of investigations, were ignored and acted upon belatedly (2008).



TUNNEL T1/P1 REZIFICATION WORKS IN PROGRESS (PHOTO ON 21/07/2010)



Dewatering activity in progress in T-1

Tunnel T-2

A shear zone comprising highly crushed and saturated material was encountered in April 2005 while constructing this tunnel, which resulted in heavy inflow of crushed material and ingress of water under high pressure. Experts from India and abroad suggested detailed geo-technical and geo-physical investigations. The problem could be tackled only in March 2006

Tunnelling work was restarted by adopting the methodology suggested by experts and against expected progress of 1976 meters

Due to poor geological conditions, slow progress and high tunnelling cost, the work was stopped and contract was foreclosed in October 2007.

With the alignment being modified in 2009, the works already executed were abandoned, rendering the expenditure of ₹ 37.65 crore infructuous.

Due to failure in completion of work of approach road to T-2 P-2, the same had to be got done through other contractors (M/s K.S. Construction and M/s Jagar Singh Constructions) at higher rates resulting in extra expenditure of ₹ 18.11 crore. The amount had not been so far

	<p>during 13 months, only 21.75 meter could be tunnelled (April 2006-May 2007) at a cost of ₹ 15 crore.</p> <p>Portal P-2 of T-2 was demolished twice first in March 2007 and again in May 2007 and had to be abandoned ultimately.</p>	<p>recovered from the contractor.</p> <p>The work on new alignment could not be awarded for want of decision on location of Anji khad bridge, which was finalized with a time-lag of 21 months as late as in April 2010</p> <p>Even after finalization of location of Anji bridge, the contract for execution of T-2 was yet to be awarded (July 2012).</p> <p>The Railway Administration stated that the infructuous expenditure was only ₹ 19.28 crore for the reason that the remaining expenditure was on approach road etc. The contention of Railway Administration was not acceptable for the reason that besides expenditure on tunnel amounting to ₹ 25.22 crore, an amount of ₹12.54 crore was incurred on construction of approach road for T-2 P-1, which also stood abandoned.</p>
<p>Tunnel T-3</p>	<p>Tunnel T-3 was awarded to M/s NPCC Ltd., at a cost of ₹ 79.01 crore but was foreclosed in January 2010 due to long suspension period, after incurring an expenditure of ₹ 63.27 crore. There was heavy ingress of water in this tunnel, as can be seen from the photograph of this tunnel as of 22 July 2010 given below.</p>	<p>Since suspension of work, an amount of ₹ 4.40 crore (July 2010) was paid for dewatering and a further amount of ₹ 4.71 crore was claimed by the firm for the period from January-December 2008. The matter was pending with the Arbitrator.</p> <p>A sum of ₹ 0.59 crore was also paid to another contractor on account of dewatering after foreclosing of contract of M/s NPCC Ltd.</p> <p>Based on an interim award by the Arbitrator, a sum of ₹ 6.49 crore (against the claims of Rs. 85.16 crore) had been paid to the contractor.</p> <p>For balance work of the tunnel, the contract had been awarded at a cost of ₹ 59.17 crore. The extra financial impact on this account was ₹ 52.60 crore.</p>
<p>Tunnel</p>	<p>Cavities and collapses were reported at various locations in the</p>	<p>The cavities were tackled from time to time by incurring an expenditure of</p>



Tunnel T-2 abandoned



T-5

tunnel during the period from March 2005 to January 2006. Again in February 2006, the loose rock started falling along with trickling of water.

As per hazard report prepared by the joint team comprising Advisor, Geology, an ex-official of GSI and Asst. Ex. Eng. KRCL in July 2006, a shear zone exists along the tunnel just above the rib line.



Tunnel T-5 during suspension period

₹ 14.23 crore.

Though RITES in its report of February 2004 concluded that the Katra side portal was located near Reasi Thrust and the initial reach of one km is parallel to Reasi Thrust, yet the contract was awarded without detailed geo-technical investigations, which were subsequently got done in June 2009.

The rib supports of the tunnel had been deformed; the cost of rectification thereof had been assessed by M/s KRCL as ₹ 8.90 crore.

The contract had been foreclosed in January 2010 after execution of work costing ₹ 72.43 crore due to the long suspension period on account of review of alignment.

For completion of balance work of the tunnel, contract had been awarded at a cost of ₹ 207.28 crore. This had resulted in extra financial impact of ₹ 127.41 crore. As against a claim of ₹ 84.98 crore, the Arbitrators had awarded an award of ₹ 27.36 lakh, which had been challenged by the contractor in the District Court at Reasi.

Tunnels-
T-6 to T-12

As mentioned in the table above, due to change in alignment, contract in respect of all the seven tunnels was foreclosed in August 2009.

Tunnel portal P-1 of tunnel T- 7 had already collapsed in January 2006 due to sliding down of overburden and the portal face was finally abandoned in April 2006.

The alignment was changed in May 2006 and the works executed on old alignment in the stretch containing Tunnels T-6 to T-9 had to be abandoned, rendering an expenditure of ₹ 15.42 crore infructuous. The alignment was again changed in September 2009 on the recommendations of M/s Amberg, an international consultant engaged by IRCON rendering a further amount of ₹3.70 crore infructuous.

The work was foreclosed in August 2009



Portal T6 P1, which is unstable



Portal T-6 P2, which was abandoned



Portal T-7 P2, which was abandoned

due to review of alignment. For execution of the balance work of the tunnels, contract had been awarded at a cost of ₹ 189.41 crore. This had resulted in extra financial impact of ₹ 126.86 crore. A sum of ₹ 10.19 crore on account of excess payment of PVC, mobilization advance, rectification of damages in the tunnel, damage of forest/canal and crop compensation etc. was yet to be recovered from the contractor.

The Railway Administration stated that planned bridges and tunnels were not found feasible when the officials visited the site after the approach road was constructed. This lends credence to audit findings that construction contracts should not have been awarded without proper geo-technical investigations.

Portal T-7 P1, which was abandoned



Portal T-8 P1, which was abandoned

**Tunnels-
T-38 to T-47**

While the excavation at portal 2 of T- 42 was in process, a major land slide occurred in September 2006, destroying 23 shops and 25 houses. The occupants of these establishments were provided

A sum of ₹ 1.43 crore was paid to NHPC on account of consultancy services for rectification of deformed ribs of tunnels. By combining T-42 and T-43, a part of tunnel T-43 at portal P1 side had to be

temporary accommodation at a cost of ₹ 15 lakh and the portal was abandoned. The Expert Committee appointed by Railway Board under the chairmanship of Sh.M.Ravindra (ex-CRB) concluded that the whole area was on slope debris and the work was being done without proper geo technical investigations.

To overcome the problem, the line had been realigned, combining T-42 and T-43.

The ribs of six tunnels (T-39, T-40, T-41, T-43, T-44, T-45 and T-46) got deformed, which were rectified from time to time at a cost of ₹ 10.12 crore by providing Self Drilling Anchors and Swellex Bolts as recommended by NHPC⁹, who were engaged for consultancy.

Photograph of portal T43 P1as of 22 July 2010 is given below:



Portal P-1 of T -43 abandoned

abandoned rendering an expenditure ₹ 8.20 crore infructuous.

Further due to change in alignment at T – 39 and T-40/41, the already executed work had to be abandoned rendering an expenditure of ₹ 6.44 crore infructuous.

As of July 2012, out of total scope of tunnelling of 10223 m, only 6036.55 m (59.05 per cent) tunnelling had been achieved after incurring an expenditure of ₹ 510.54 crore (152.62 per cent vis-à-vis the contracted amount).

The Railway Administration stated that by realignment, there was a saving of ₹ 90 crore and that the tunnel from P1 side of T-43 would be utilized as ‘Escape adit’ for safety purpose in case of emergency. The contention was not acceptable for the reason that had alignment been adopted after proper investigation of the terrain, this problem could have been addressed initially. As per Railway Board’s orders, no escape adit is required for the tunnels up to length of three kms whereas the total length of combined tunnel T-42-T-43 was only 2595 metres i.e. less than the prescribed norm.

4.3.2.3 Progress of Bridges

There were 46 major bridges (revised to 20 due to change in alignment) including two special bridges at Anji Khad and Chenab River, in the section from km. 30 to km.100.868 being executed by KRCL. Out of these, only four contracts for construction of 19 bridges could be awarded during the period from August 2004 to October 2006. Contracts for major bridges in the stretch from km. 61 to km. 100.868 could not be awarded (July 2012) on account of incomplete Final Location Survey, non approval of GADs and Railway Board’s decision of June

⁹ National Hydro Power Corporation

2012 to stop fresh financial commitments in respect of part stretch km.61- km.191 in view of proposed part withdrawal of works from KRCL.

The status of major bridges, as of July 2012, in this section is detailed below:

Bridge* No.	Length (Mtrs)	Status
34	45.70	GAD not approved
35	657	Work suspended
35 Pt-II	97.80	Work suspended
38	125	Work stopped by contractor
39	477.15	Not yet started
42	16.90	In progress
43	777.00	Not yet started
44	1315.00	In progress
53 to 88	1567.90	Not yet awarded

* The missing serial numbers in the table above are minor bridges or bridges which have been omitted due to change in alignment.

Out of 4 contracts awarded for construction of 15 major bridges, one contract (7 bridges) has been foreclosed on account of change in alignment, one contract (Anji Bridge) had to be foreclosed due to prolonged suspension of work. Two contracts(7 bridges) were in progress out of which construction of two bridges could not be started for want of drawings, one bridge could not be started for want of approved GAD, another bridge was suspended on account of fresh review of alignment and the work of Chenab Bridge was held up for want of work front due to non approval of design of deck of viaduct and Arc Bridge.

Thus, out of 20 major bridges which were to be executed after revision of alignment, work was in progress at only 2 bridges i.e. Bridge No. 42 and 44 (Chenab Bridge).. The work of Chenab Bridge was also suffering due to non availability of enough work fronts due to lack of approved drawings, designs etc. Thus, even after incurring an expenditure of ₹ 205.80 crore, the progress of bridges was retarded due to delays in finalisation of GADs/designs that in turn arose due to difficulties in the existing alignment leading to review of proposed locations.

4.3.2.4 Audit findings – Bridges

In a number of cases, the contracts had been awarded without ensuring preliminary requirements such as availability of clear site, approved GAD, etc resulting in contractual disputes. The Ministry admitted that contract for nine bridges between km 50-62 had to be foreclosed due to location of bridges posing construction risks and problems in maintenance and change in alignment. The details of these cases are discussed below:

**Bridge
Nos. 34
to 43**

The contract for bridges from 34 to 43 except bridge no. 35 (Anji bridge) were awarded to one contractor as a package. The work on bridge No. 34 at Pie Khad between tunnel T-1 and T-2 was suspended due to proposed change in alignment and finally abandoned in October 2008 on account of change in alignment

The contractor could not progress on other bridges also, as the drawings of bridge nos. 35 pt.II, 39, 41, and 43 were made available to him only in February/March 2008 while these should have been made available by Nov 2006. Only minor works in foundations of bridge nos. 35(pt.-2), 38, 40 and 42 were executed. The financial progress was only ₹ 10.45 crore (4.58 per cent) when the contract was terminated in August 2009 .

The contract has since been revived in February 2010 and the contractor has submitted the drawings of bridge no.41 and piers of bridge no. 38 but the work has not progressed, as no agency was available for proof checking.

The contractor lodged a claim for ₹ 164.20 crore on account of delayed forest clearance, non issue of approved drawings and stoppage of work at pie khad bridge. The matter was in arbitration

The execution of Br. Nos. 34, 39 & 43 was yet to be taken up (July 2012) as the GADs of these bridges were yet to be finalized (July 2012).

Abandonment of bridge No. 34 at Pie Khad resulted in infructuous expenditure of ₹ 0.50 crore



New location of pie khad bridge

The Railway Administration made haste in awarding the contract without much readiness with the drawings and design which were supplied belatedly. However, the contract was terminated inexplicably though the poor performance of the contractor was largely due to Railway Administration's failure in supplying the drawings and the revival of the contract was in fact a vote of confidence in the ability of the contractor to perform the contract. The lack of professionalism resulted in the matter ending up in litigation.

KRCL's failure in not engaging an agency for proof checking would result in further time overrun and contractor's claims for idle time. In reply, the Ministry stated that all-out efforts would be made to avoid delays on account of proof checking and approval of drawings.

<p>Bridge Nos. 48 to 58</p>	<p>These bridges are located between Km. 53.728 and Km. 61.015. Due to existence of bridges with long spans the alignment on this section was changed twice first in April 2006 and again in September 2009. The work of construction of these bridges except bridge nos. 54 & 55 was stopped (21 April 2006) by KRCL pending decision on realignment of the stretch. Even at bridge nos. 54 & 55, work could not be executed as the general arrangement drawings (GAD) of these bridges could be approved only in February 2007 i.e. well after the expiry of the stipulated completion period. Due to reduction in the scope of work (from 11 bridges to 5 bridges), the contract was foreclosed in March 2007 after execution of works to the tune of ₹ 1.29 crore, which was rendered infructuous.</p>	<p>Besides infructuous expenditure of ₹ 1.29 crore, the contractor lodged claims for ₹ 10.45 crore in arbitration on account of idling of resources due to suspension of work and reduction in the scope of work. The nil award was challenged by the contractor in the High Court of Delhi where the matter was pending. The contracts for works relating to bridges Nos. 53 to 61 (which were to be executed after change in alignment) were yet to be awarded (July 2012). This would result in further time/cost overrun.</p> <p>In response, the Railway Administration stated that the alignment had to be realigned as the existing one posed problems in construction and maintenance. The Ministry replied that the claims were being contested in the court.</p>
<p>Special bridge on Anji Khad</p>	<p>The length of this bridge is 657 mtrs and is among the two most crucial bridges in this section (the other being Chenab bridge). The stability of foundation of main span of this bridge (arc bridge) was questioned by various agencies.</p> <p>KRCL awarded construction contract to M/S Gammon- Archirdron in September 2004 the scope of which included responsibility to provide suitable bridge drawing and design. The geo-technical investigations of the site carried out by M/s DBM (September 2005) on behalf of KRCL had revealed the presence of sheer zone in the foundation region. However, KRCL raised the issue with the contractor only in August 2007. It was also seen that the contractor was also in the know of the fact of presence of</p>	<p>As per review meeting of the Railway Board dated 11th September 2003, KRCL hastened to award the contract for the bridge even before conducting the geo-technical investigations. Also, the issue of bridge design was taken up with the contractor nearly after 18 months since doubts about the location were raised in the Geo-technical Report. Predictably, this resulted in the contractor denying responsibility for choice of alignment with faulty conditions along/under the alignment.</p> <p>The work of execution of bridge suffered on account of non availability of approach road at Reasi side (395 days), non availability of forest clearance and permission for cutting the trees (499 days), changes in design (869 days) and</p>

sheer zone as evident from the communication of reply to KRCL dated 19th October 2007, whereby all responsibility for faulty conditions along/under the alignment was disowned.

As per a Report of Geological Survey of India (March 2008), the main pillar which will hold the arch section of the bridge is located on sheared dolomite and about 50 meter stretch of the section along the left bank of khad is highly sheared dolomite.

The work was suspended on account of uncertainty of stabilization of the foundation in July 2008 after incurring an expenditure of ₹ 37 crore.

The Expert Committee appointed for review of alignment, could not come to a conclusion on the stability of the site and recommended a number of tests to be conducted to ensure the stability of site before re-commencement of work. Based on further investigations, Railway Board decided to retain the original location in April 2010 and gave clearance to recommence work.

KRCL foreclosed the contract in August 2010 on account of prolonged suspension period. Contract for balance work was yet to be awarded (July 2012) for the reason that the alignment on the stretch was again under review.

change in are design etc.

After suspension of work, the contractor dismantled the structures constructed at site of work at a cost of ₹ 2 crore. The contractor failed to reconstruct these structures. A sum of ₹ 0.43 crore was recoverable from the contractor on account of forest clearance in respect of land diverted to contractor and defective construction of Pier no. 19, which had to be dismantled, the cost of which worked to ₹ 0.12 crore. Thus, the amount of ₹ 2.55 crore due from the contractor was yet to be recovered (July 2012). Further, a sum of ₹ 13.78 crore on account of excess payment to the contractor and ₹ 0.39 crore on account of excess over bank guarantees in respect of Mobilization Advance was yet to be recovered.

The contractor lodged a claim for ₹ 111.69 crore on account of idling of man power/machinery, financing cost and uncovered escalation etc. The NIL award given by Arbitrator has been challenged by the contractor in the Supreme Court of India. The matter is pending with the hon'ble court..

In reply, the Ministry stated that the suitability of the bridge location was decided by KRCL in consultation with NRCO and the role of contractor was to design suitable foundation and the presence of highly sheared dolomite would be factored in the design of arch foundation. They also stated that further studies as recommended by the Expert Committee had been carried out based on which the Board decided to recommence



View of Anji Bridge site (22.07.2010)



Pier P 19 in dismantled condition

work in April 2010.

However, the performance of the contract was hampered principally because the necessary investigations were not carried out before the commencement of work. This is also reflected in the fact that the contract for execution of balance work was yet to be awarded for lack of decision on the section of the alignment being reviewed afresh (July 2012).

Chenab bridge

Similar to the Anji Bridge, stabilization of foundation of the main arc bridge was also questioned by experts appointed by the Board and the contractor.

After award of work, the contractor stated that the topography of the area falling within the foundation base of pier 40 i.e. Katra end abutment of the bridge, was highly undulating and the foundation was losing touch with ground due to existence of two nallahs on upstream and downstream of the centre line of alignment.

The Technical Advisory Board was of the view that the foundation should be so designed as to take the thrust away from the arc without causing instability in the supporting rock mass.

The consultant firm, Amberg felt

Work on this bridge suffered on account of delay in finalization of Design Basis Note (DBN), revision of DBN mid-way (contractor claimed ₹ 3.25 crore on account of expenditure on re-designing of the bridge), delay in finalization of design of super structure of bridge, delay in approval of slope stability analysis of main valley slopes and excavation methodology, change in alignment in viaduct, delay in forest clearance and land acquisition and delayed availability of approach road.

The work was almost at stand still as the contractor had no work front due to non-availability of approved drawings of deck portion, foundations protective works, earth work in foundations and bearing pedestals. Even after the lapse of more than eight years, the design of the

(February 2009) that the issue of stability of slope of Chenab bridge needed to be studied by the relevant experts in the field.



Via duct portion of Chenab Bridge-
photograph of suspension period

bridge was yet to be finalized (July 2012).

During the period from 2011-12 onward, the contractor could execute the work to the value of ₹ 0.22 crore only. The extended date of completion of contract had already expired on 31st March 2012, but the contractor had yet to apply for its extension (July 2012).

Had the complete geo technical studies been conducted before award of contract, suspension of work for want of stabilization of foundations, delay in execution of work and resultant arbitration claims amounting to ₹308.16 crore in respect of this bridge alone could have been avoided.

The Ministry replied that the work for the entire section was suspended to address the issues raised by various agencies and stated that GAD (arch portion) would be finalised in time and further studies were carried out to confirm the slope stability during the suspension period. As of (July 2012), the design of arch bridge was yet to be finalised.

4.3.2.5 Contractor claims

Besides the suspension period claims amounting to ₹ 57.24 crore, admitted by KRCL, the contractors had gone to arbitration for their claims amounting to ₹ 1170.71 crore on account of idling of resources, delay in approval of drawings, revision of arc span of Chenab bridge, change in DBN, non availability of approach roads, dewatering of tunnels and non revision of rates beyond original completion period etc. In three cases, the Arbitrators had awarded a sum of ₹6.84 crore in favour of contractors.

4.3.3 Leg-II: Dharam - Qazigund section- IRCON portion

For execution of the project from Dharam to Qazigund (Km. 100.868 to 168.000), the route length was divided into seven zones as detailed below:

Sr.No.	Zone	Chainage
1	0	KM 100.868-119.940
2	I	KM 119.940-128.560
3	II	KM 128.560-134.360
4	III	KM 134.360-142.000
5	IV	KM 142.000-152.000
6	V	KM 152.000-164.000
7	VI	KM 164.000-168.000

Contracts for execution of tunnels, bridges, earthwork and station buildings etc. were awarded zone wise.

Out of the 100 works spanning Zone II to VI awarded by IRCON for this project, audit selected 21 major work contracts having regard to their financial materiality for detailed scrutiny as detailed below:

Cost of work (₹)	Total No. of works	No. of works selected
Above 10 crore	20	12
5 to 10 crore	07	02
1 to 5 crore	30	06
Below 1 crore	43	01
Total	100	21

Out of the 21 major works selected for review, 6 works were complete; 11 works were foreclosed and the remaining 4 works were in progress as of July 2012. The delay in execution of these works ranged from 3 months to 80 months. None of the contracts was completed by the stipulated date of completion.

Audit observations relating to this Leg of the project executed by IRCON are as follows:

4.3.3.1 Land management.

- For construction of line from Dharam to Qazigund, 386.37 hectares of land was required to be handed over to IRCON by NRCO. The latter took 5 to 51 months to hand over the land to IRCON. As of July 2012, 68.74 hectares (17.79 percent) of land was yet to be provided by NRCO to IRCON. The complete indents for execution/forest clearance of land on revised alignment were yet to be placed due to non finalization of FLS. This would further delay the completion of the project.

4.3.3.2 Work management.

Zone -II

The contract for construction of zone II (km 128.560- 134.360) works (tunnels, bridges, earth work, etc.) was awarded (June 2006) to M/s BTS Brahmaputra Consortium Ltd. JV at a total cost of ₹ 157.19 crore. The contract was to be completed within 36 months i.e. by 18 June 2009 but due to non-provision of clear land by NRCO/IRCON, the contractor found the rates unworkable due to cost escalation. Since the Railway Administration refused to compensate for the losses, the contract was foreclosed in March 2008 after execution of work costing ₹ 0.29 crore. The contractor filed a claim of ₹ 10.34 crore on account of expenditure incurred by him on plant and equipment, manpower, infrastructure development, lease rent paid to private land owners, office and residential accommodation etc. IRCON agreed to pay ₹ 1.87 crore, which was not acceptable to the contractor and the matter was pending with the Arbitrators (July 2012).

Zone -III

- The work relating to 11 bridges, 5 tunnels (T-67 to T-71) and crossing stations of Zone III (km 134.360 – 142.00) was awarded to M/s Jai Prakash Associates Ltd. in February 2004 at a total cost of ₹ 168.45 crore to be completed by February 2007. The work could not be completed due to non-provision of clear land by NRCO/IRCON and the contract was foreclosed in April 2007 after execution of work to the tune of ₹ 27.82 crore. A claim of ₹ 35.71 crore was lodged by the contractor on account of idling of manpower, equipment, infrastructure etc. against which the Arbitrators had declared an award of ₹ 21.82 crore in favour of contractor. The award had been challenged in the High Court of Delhi. The matter was yet to be finalized (July 2012).
- The construction of balance work of tunnels and other civil works was awarded to M/s Bhumi Developers (India) Pvt. Ltd. at a cost of ₹ 41.71 crore in May 2007 to be completed by May 2009. In March 2008, IRCON instructed the contractor to stop the work at tunnel no. 69 and 70 on the ground that geotechnical investigations were to be conducted on this stretch. The work was finally foreclosed in July 2008 pending alignment review after execution of work to the tune of ₹ 1.99 crore. A claim for ₹ 9.48 crore was lodged by the contractor on account of idling of manpower, machinery etc. The matter was pending with the Arbitrators (July 2012).
- The balance work of bridges was also awarded to M/s Bhumi Developers (India) Pvt. Ltd. in August 2007 at a cost of ₹ 13.23 crore with a stipulation to complete the work by February 2009. The contractor submitted in January 2008 that the work could not be taken up due to blockade of roads on account of landslides. As the alignment of the entire Katra-Banihal section was under

review and all works were stopped, this contract was also foreclosed in July 2008. The contractor had lodged a claim for ₹ 4.08 crore on account of idling of resources etc. The matter was pending with the Arbitrators (July 2012).

- The works on revised alignment from Dharam to Arpinchala (Km 100.868 to km. 125) were yet to be awarded (July 2012).

The Ministry replied that the revised alignment had been agreed to in principle and the process of geo-technical investigations/finalisation of tunnels and placing of land indents as per revised alignment was underway.

Zone -IV

- A contract for construction of civil works including seven tunnels (72 to 78), 19 bridges and earthwork etc. under zone IV (km. 142 to 152) was awarded to M/s Hindustan Construction Company Limited in September 2003 at a cost of ₹ 169.03 crore to be completed by September 2006. The contract was extended up to September 2007, June 2008 and June 2009 on account of delay in handing over land, supply of drawing of bridges, stoppage of work by Forest department, non supply of explosives and non provision of security at sight etc. In March 2008, the scope of work was reduced by withdrawing the work of four tunnels and seven bridges due to proposed change in alignment and the contract value was reduced from ₹ 169.03 crore to ₹ 125 crore. The work has been completed at a cost of ₹ 156.38 crore (July 2012) involving a time over-run of 69 months and cost over-run of ₹ 31.38 crore. Similar to the other works, the contractor of this work had also claimed a sum of ₹ 88.47 crore on account of idling of equipment and manpower, financing cost, loss of profit, non-revision of rates and non assessment/payment of geological over break etc. The claims were yet to be settled as of July 2012.
- Consequent upon foreclosure of contracts for construction of tunnels and bridges in Zone III and withdrawal of a number of works from Zone IV, the contracts with initial cost of ₹ 337.48 crore were re-awarded at a cost of ₹ 1064.36 crore resulting in additional financial impact of ₹ 726.88 crore.

Zone -V

- For execution of tunnel No. 80 (10.960 kms.) in zone V (km. 152.600 to 163.960) in Pir Panjal Mountains, IRCON awarded 3 contracts to HCCL (costing ₹ 413.96 crore) and one each to Bhumi Developers (₹ 17.24 crore) and Gammon & Sew (JV) (₹ 22.59 crore). HCCL could not complete the assigned work relating to the tunnels due to delay in handing over site, collapse in Access tunnel at ch. 765, increase in scope of work due to change in support system to retain the tunnel strata and the construction methodology on the advice of the Consultant, delay in supply of drawings, delay due to excess seepage in tunnel etc. Despite extensions, the work was yet to be

completed as of July 2012. The contractors lodged a claim for ₹ 160.30 crore, which were yet to be finalized as of July 2012.

Zone - VI

- Zone VI (km 164– 168) starts from the North portal of Tunnel-80. The Earth work including slope protection, surface drainage, side drains and catch water drains etc. was awarded to four contractors at a cost of ₹22.27 crore. Due to the failure of IRCON and RITES in designing the retaining walls before award of contracts, the drawings had to be revised again and again and eventually the three contracts had to be foreclosed after execution of work to the tune of ₹ 2 crore. The contract for balance work was awarded at higher cost (₹24.36 crore) and the contractual cost of one work (package E6E) had to be revised from ₹ 10.80 crore to ₹ 21.91 crore. Thus, non finalization of drawings before award of work and its revision mid way resulted in extra financial impact of ₹ 26 crore, which included ₹11.67 crore as excess expenditure on account of execution of balance work at higher cost besides contractor's claims of ₹ 4.21 crore on account of idling of men and machinery, advance to suppliers, frequent changes in drawing, hire purchase of land for dumping of excavated material, non availability of land for drain etc. The work, which was scheduled to be completed by January 2008, was yet to be completed as of July 2012.

The Ministry stated that the revision of drawings mid way was necessitated as the original tender had not included items, a technical requirement but found necessary during construction. The contention was not acceptable for the reason that contracts were awarded without proper field work. Had proper survey been conducted, the full depth of deep cuttings would have been known to the Railway and the actual scope of work awarded accordingly determined.

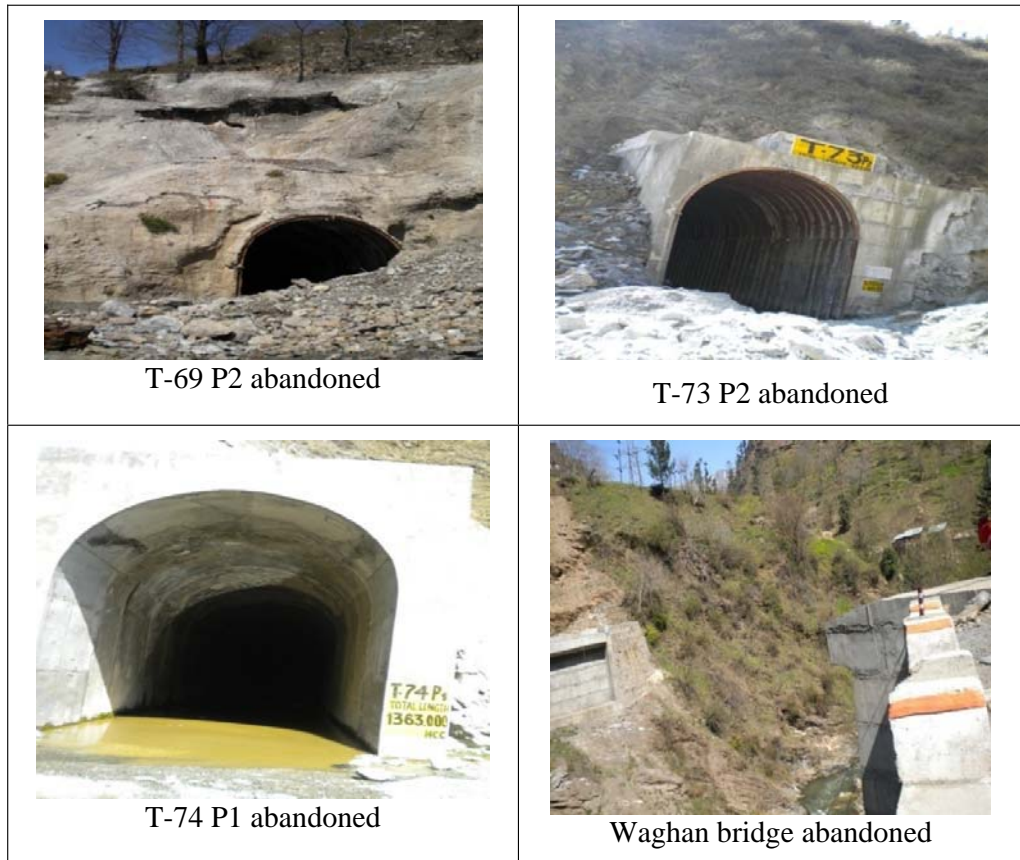
As in the case of KRCL, the alignment in IRCON portion from km.100.868 to km.144 was changed and works already executed had to be abandoned rendering the expenditure amounting to ₹ 128.14 crore infructuous. Some of the important tunnels/portals in this section, which were abandoned due to change in alignment, are given below:



T-67 P2 abandoned



T-68 P1 abandoned



- Despite Railway Board’s instructions of February 2008, to engage an internationally accredited agency for review of alignment from Katra to Banihal, IRCON awarded (July 2008) contract for realignment of section from km.137 to km.144 to RITES. The contract had to be foreclosed (February 2009) and the contract for the entire stretch from Katra to Banihal was awarded to M/s Amberg (October 2008). This had resulted in infructuous expenditure of ₹ 1.20 crore paid to M/s RITES.

Railway Administration stated that the work done by RITES had been utilized in fixation of alignment of T-74 R. The contention was not acceptable as the activities done by RITES were also covered in the scope of work assigned to M/s Amberg and were paid for.

The status of various tunnels and major bridges in this section of the project (July 2012) is given below:

Tunnel No.	Length (Mtrs)	Status
T-48	10200	Yet to be awarded
T-49	3410	Yet to be awarded
T-50	5480	Yet to be awarded

T-51	3190	Yet to be awarded
T-52	700	Yet to be awarded
T-74R	8600	Contract awarded
T-77	350	Completed
T-77A	760	Completed
T-77B	180	Work suspended
T-77C	150	Work suspended
T-78	800	Completed
T-80	11000	In progress

Bridge* No.	Status
1 to 6	Not yet awarded
121(New No. 7)	In progress
138	In progress
139	In progress
140	In progress
141	In progress
142	In progress
144	In progress
145B	In progress
147	Completed

**The missing serial numbers in the table above are minor bridges and bridges which have been omitted due to change in alignment*

4.3.4 Leg – III - Qazigund - Baramulla

4.3.4.1 Overview

Leg III from Qazigund to Baramulla had been opened for traffic in three phases from October 2008 to October 2009 as against the targeted date of completion of 31 March 2003. Against the sanctioned estimate of ₹ 906.33 crore (revised to ₹ 3658.70 crore in January 2012), an expenditure of ₹ 3071.86 crore had been incurred on executing this Leg as of July 2012. This section involved 119 km track with 63 major bridges and 739 minor bridges. There are no tunnels in this section. Contract for execution of this section was entrusted to IRCON in February 1999 with a stipulation to complete it by March 2003. IRCON completed the work relating to the track and stations during November 2007 to August 2009 and the line was operationalised during the period October 2008 to October 2009. However, work relating to residential quarters, rest houses,

RPF/GRP barracks and development of peripheral works in the station and yard were yet to be fully completed as of July 2012.

The main reasons for delayed completion of the project in this section were as follows:

- Inadequate survey/field work before award of contracts, resulting in abnormal increase in the scope of work, foreclosure of contracts and completion of the work by re-awarding at higher rates;
- Delay in acquisition of land;
- Delay in preparation and approval of drawings etc. which led to foreclosure of a number of contracts. The works were got executed by re awarding the contracts at higher rates;
- Revision of design of bridges; and
- Kidnapping and killing of IRCON engineer; etc.

4.3.4.2 Poor Contract Management

IRCON awarded 1741 work contracts with regard to this section of the project. Audit examined 83 contracts, keeping in view financial materiality and other significant factors.

Cost of work (₹)	Total No. of works	No. of works selected
Above 10 crore	38	9
5 to 10 crore	21	9
1 to 5 crore	244	55
Below 1 crore	1438	10
Total	1741	83

Out of the 83 contracts selected for review, only 43 works were completed and 40 contracts were foreclosed/ terminated as of July 2012. The delay in execution of these works ranged from 3 months to 75 months. None of the contracts was completed within the stipulated date of completion.


4.3.4.3 Bridges

Considering the large number of bridges involved in this section, IRCON divided the total number of bridges (802) into 41 packages (major and minor bridges separately) and allotted contracts package-wise.

As mentioned above, audit reviewed 83 contracts in this section including nine bridge packages, which involved construction of 42 major bridges and 148 minor

bridges. The work relating to all these bridges was awarded to various agencies during the period from February 2003 to October 2007 with a stipulation to complete them between December 2004 and April 2008. However, as mentioned in the box above, none of the bridges was completed within the targeted date. The main reasons for delays were non provision of clear site, non fixing of foundation depth of wells, increase in scope of work, alignment problems, frequent revision in designs and drawings etc.

Package No	No. of Bridges	Awarded cost (₹ in crore)	Amount paid (₹ in crore)	Due date of completion	Actual date of completion	Remarks
6	9	22.05	32.67	Feb 2005	Foreclosed in July 2005	<ul style="list-style-type: none"> • Time overrun was over 3 years • Cost overrun was ₹ 40.55 crore
6A		38.45	29.93	Dec 2006	May 2008	<ul style="list-style-type: none"> • The drawings of well cap P-1, P-9 & P-10 of bridge number 5-A were revised and already cast well caps had to be dismantled resulting in infructuous expenditure of ₹ 0.45 crore. Similarly, the already constructed shafts of P-7 and P-8 had to be dismantled on account of revision of drawings, resulting in infructuous expenditure of ₹ 0.20 crore. • Extra expenditure due to award of balance work at higher rate was ₹ 6.77 crore Reasons for time/ cost overrun <ul style="list-style-type: none"> • non-provision of clear site; • non-payment of compensation to land owners; • revision in scope of work; • changes in design and drawings; and • Alignment problem in Bridge No. 8
7	14	12.13	20.72	Feb. 2005	May 2007	<ul style="list-style-type: none"> • Cost overrun of ₹ 7.59 crore Reasons for time/cost over-run <ul style="list-style-type: none"> • Non payment of compensation to land owners; and • Increase in scope of work.
8	17	15.53	23.78	Feb 2005	Foreclosed in Dec. 2006	<ul style="list-style-type: none"> • Time overrun was over 3 years • Cost overrun was ₹ 17.11 crore
8A		9.16	8.86	Sep 2006	May 2008	<ul style="list-style-type: none"> • Poor planning and improper supervision had resulted in abandonment of pier P-1 and Abutment A-1 of bridge number

						<p>44 rendering the expenditure of ₹ 0.87 crore infructuous.</p> <ul style="list-style-type: none"> • Extra expenditure due to award of balance work at higher rate was ₹ 2.69 crore 
						<p>Reasons for time/ cost overrun</p> <ul style="list-style-type: none"> • non-provision of clear site; • non-payment of compensation to land owners; • revision in scope of work; and • changes in design and drawings. <p>The Railway Administration stated that the Wells of pier and abutment got tilted after construction in spite of requisite geo-technical investigation. On the other hand, M/s RITES contended that the present problems associated with wells could have been obviated had the construction been planned based on results of suggested investigations & proper construction supervision They favoured further geo-technical investigations to be performed before decision on plugging/abandonment of the wells.</p>
9	7	7.91	21.59	Feb 2005	July 2008	<ul style="list-style-type: none"> • Time overrun was over 3 years • Cost overrun was ₹ 13.68 crore <p>Reasons for time/ cost overrun</p> <ul style="list-style-type: none"> • non-provision of clear site; • non-payment of compensation to land owners; • revision in scope of work; • Change in design and well depth; and • Increase in the height of abutment due to revision of gradient.
15 15A balance	148	7.03 14.67	25.36 10.57	Dec 2004 Nov 2006	Foreclosed in 3/ 2006 Aug 2008	<ul style="list-style-type: none"> • Time overrun was over 3 years • Cost overrun was ₹ 28.90 crore • Extra expenditure due to award of balance work at higher rate was ₹ 1.30 crore

work						Reasons for time/ cost overrun <ul style="list-style-type: none"> • non-payment of compensation to land owners; • finalisation of design and drawings; and • change in construction method from pre-cast to cast-in-situ. Railway Administration stated that the time/cost overrun was mainly due to additional minor bridges. This clearly indicated that the contract for construction of minor bridges was awarded without proper survey regarding scope of work, which resulted in foreclosure of contract and award of balance work at higher rates.
FOB 3	1	2.24	Nil	June 2007	Terminated in August 07	<ul style="list-style-type: none"> • Time overrun nearly 4 years • Cost overrun of ₹ 2.87 crore
FOB 3R		2.39	0.16	April 2008	Foreclosed in May 2008	<ul style="list-style-type: none"> • Non-finalization of drawings
FOB (R2) 3		2.01	2.50	Dec. 2008	April 2011	
FOB (R1) 3		2.00	2.45	Dec. 2008	January 2007	

The Railway Administration stated that the changes in the design and drawings were necessitated because of unforeseen social factors like avoiding places of religious importance as Burial grounds, access roads, preservation of Chinar trees etc. The contention is not justified for the reason that had proper survey/field work been done before award of contracts, these factors could have been taken care of at the initial stage.

4.3.4.4 Staff Quarters

Audit reviewed one (Q2) out of 24 packages of contracts for construction of staff quarters. This package involved 164 staff quarters at 3 stations (Budgam, Pampore, and Kakapore). Contract for this package was awarded to M/s Wani & Co. in November 2003 at a total cost of ₹ 7.44 crore to be completed by February 2005. The completion period was extended to February 2006 on account of delayed issue of drawings to the contractor and non availability of clear site. As of February 2006, only 50.54 per cent work costing ₹ 3.78 crore was executed

and the contract was foreclosed in March 2006 without any financial implications on either side. The balance work of these quarters was awarded to four agencies at a cost of ₹ 8.22 crore, i.e. an increase of ₹ 4.56 crore over the originally contracted cost. Two of the contractors completed the construction of Type I and IV staff quarters at Budgam in March 2008 at a cost of ₹ 4.26 crore. The balance work for Type II and III staff quarters in Budgam, and Type I, II and III in Kakapore and Pampore was got executed by six agencies at a cost of ₹ 6.38 crore and completed in April 2009. Thus the work costing ₹ 7.44 crore could be completed at a cost of ₹ 14.42 crore i.e. an extra avoidable expenditure of ₹ 6.96 crore and the work was delayed by over 50 months. The main reasons for the delays were awarding the contracts without ensuring the basic requirements like provision of clear land and approved designs and drawings.

The Railway Administration stated that the value of contracts revised after the closure of Q-2 Package was due to the increase in scope of work like boundary wall, septic tanks etc., which was not correct as had the clear site and approved drawings been provided, time/cost overrun could have been avoided.

4.3.4.5 Office Buildings

Out of 6 packages of contracts awarded for construction of Office Buildings at Qazigund, Baramulla and Budgam, audit reviewed 3 packages (OB-6, OB-7 and OB-8). These packages involved 11 Office Buildings. Audit observations regarding these contracts are as follows:

Pac kage No	Details of the work	Remarks
OB-6	<p>Contract for construction of office buildings (AEN office, subordinate cum officer's rest house, senior subordinates office and health unit grade-III) at Qazigund station was awarded in October 2006 to M/s G.R. Naqvi & Co. at ₹ 2.39 crore to be completed by June 2007 (later extended to December 2007). The contract was terminated on account of poor progress in July 2008 after execution of work amounting to ₹ 0.87 crore.</p> <p>The balance work (package 6R) was re-awarded in August 2008 to M/s Construction Engineers at ₹ 3.38 crore</p>	<ul style="list-style-type: none"> • Time overrun was 57months • Extra expenditure due to award of balance work at higher rate was ₹.2.27 crore • Though, the contract under OB 6 was terminated on account of poor progress by the contractor, yet the risk & cost amount was not recovered from the contractor. <p>Delay due to</p> <ul style="list-style-type: none"> • non-availability of land ; • non-provision of health unit in lay out plan; • change in scope of work; • Non finalization of construction drawings;

	<p>with a stipulation to complete by December 2008, however, the work was completed in April 2012 at a cost of ₹ 4.97 crore.</p>	<ul style="list-style-type: none"> • Amarnath land dispute and • Assembly Elections etc. <p>The Railway Administration stated that the extra expenditure was on account of sudden increase of price of steel, delay in making land available, increase in scope of work and these resulted in the foreclosure of contract. The contention was not factually correct for the reason that the contract was terminated due to poor progress of the contractor whereas the next tender was not invited as risk and cost tender resulting in non-recovery of amount of ₹2.27 crore.</p>
<p>OB-7</p>	<p>Construction of Subordinate cum officers' rest house, Senior subordinate office complex and health unit grade-III at Baramulla station was awarded to M/s G. R. Naqvi & Co. in October 2006 at a cost of ₹ 2.61 crore, to be completed by June 2007 (later extended to June 2009). The contract was finally foreclosed (June 2008) after execution of work to the tune of ₹ 2.65 crore.</p> <p>The part work of this package (package 7R) was awarded to M/s ASG & Co. in October 2008 at ₹ 2.23 crore with a stipulation to complete by March 2009. The work was completed in March 2011 at a cost of ₹ 1.76 crore.</p>	<ul style="list-style-type: none"> • Time overrun of 45 months • Cost overrun was ₹ 1.80 crore • Extra expenditure due to award of balance work at higher rate was ₹.0.66 crore <p>Reasons for time/ cost overrun</p> <ul style="list-style-type: none"> • change in site of buildings; • non-availability of land/clear site; • delay in approval of drawings; • poor weather and law and order; and • Bad weather conditions.
<p>OB-8</p>	<p>Contract for construction of Construction Office and Officer/Sub-Ordinate Rest House at Budgam station was awarded to M/s Hi-Tech Engineers in April 2007 at a cost of ₹ 3.17 crore, to be completed by December 2007 (later extended to May 2008). The Railway Administration revised the structural steel roof truss drawings and by that time the rates of</p>	<ul style="list-style-type: none"> • Time over run was 29 months • Cost overrun was ₹ 2.37 crore • Extra expenditure due to award of balance work at higher rate was ₹.0.64 crore <p>Reasons for time/ cost overrun</p> <ul style="list-style-type: none"> • change in cope of work; • non-availability of drawings; and • Unrest in Kashmir Valley because of land dispute of Amarnath Yatra.

	steel increased. As the contractor refused to execute the truss work at contracted rates, the contract was foreclosed in June 2008 without any financial implications on either side after execution of work to the tune of ₹ 1.00 crore.	
OB-14	The balance work of construction of Subordinate Rest House (package OB 14) was awarded to M/s Mohd. Ashraf Gilkar at a cost of ₹ 2.37 crore in September 2008 to be completed by February 2009. The completion period was extended to December 2009. The work was completed in May 2010, at a cost of ₹ 2.84 crore,	The Railway administration accepted the facts in respect of O.B.8,14 & 16.
OB-16	The balance work of Construction Office and Officer's Rest House (package OB 16) was awarded to M/s M.N. Enterprises, at a cost of ₹ 1.86 crore in December 2008 and was scheduled to be completed by April 2009. The completion period was extended up to September 2009. The work was completed at a cost of ₹ 2.14 crore.	

4.3.4.6 Station Buildings

Audit reviewed one (SB-3) out of 4 packages of contracts awarded for construction of station buildings. This package involved 4 stations at Pattan, Sopore, Hamre and Baramulla. The work relating to construction of these station buildings was awarded to M/s Star Constructions in November 2003 at a cost of ₹3.62 crore, to be completed by February 2005. The Railway Administration failed to provide the approved drawings and the work was closed in July 2005 without any financial liability on either side after execution of work costing ₹1.5 lakh only.

The balance work (package SB-3R) was awarded to the same contractor in December 2005 at a cost of ₹ 6.56 crore i.e., extra financial impact of ₹ 2.94 crore with a stipulation to complete the work by March 2007. Subsequently, in July 2007, the work relating to construction of station building at Hamre was withdrawn from the scope of the contract due to land dispute and the contract was foreclosed after expenditure of ₹ 4 crore, as the contractor could not complete the

remaining work even up to the extended period of November 2007. The balance work at Baramulla, Sopore and Pattan was got executed by three other agencies at a cost of ₹ 2.15 crore and was completed in August 2008. The balance work of Hamre (along with other misc. work of Platform) was got executed by M/s M.A. Gilkar at a cost of ₹ 1.54 crore (November 2009). The overall cost overrun in the construction of this package of buildings was ₹ 4 crore and the time overrun 42 months.

The Ministry admitted that the work was delayed basically due to non-handing over the site to the contractor and political unrest in valley.

4.3.4.7 Development works of stations/yards

For awarding contracts for execution of development works like water supply, sewage system, storm water drainage and earth work etc. at stations and yards of the Qazigund – Baramulla section, the whole work was divided into 5 packages. All these packages were reviewed in audit. The contracts for these works were awarded to five firms at a aggregate cost of ₹ 14.29 crore. Since IRCON could not provide the relevant drawings to the contractors despite the expiry of the contractual period, the contracts were foreclosed without financial implications on either side. Audit noted that the drawings, in turn could not be provided due to delay in approval of lay-out of circulating area, revision required in respect of external development plans, etc.

These works were then got executed by re-awarding to 25 other agencies at a cost of ₹ 47.05 crore, i.e., a cost overrun of ₹ 32.76 crore. As of July 2012, 5 of these contracts were foreclosed and 20 works were completed.

Thus, IRCON's failure to get the drawings prepared from RITES who were engaged for the purpose and get them approved from Northern Railway, eventually resulted in a cost overrun of ₹ 32.76 crore and time over run of 74 months upto July 2012 .

The Ministry stated that the time/cost overrun was on account of non finalization of passenger amenities on the stations, revision of requirements by Northern Railway, delay in decision making regarding provision of Sewage treatment plan/Septic tank and revision of scope and increase in the rates of steel etc. While admitting the huge time delay, the Board failed to explain the reasons thereof which eventually led to delay in provision of approved drawings and resulted in foreclosure of contracts and execution of the balance work at higher rates.

As can be seen from the foregoing paragraphs relating to execution of Leg – III of the USBRL project by IRCON, although this line was completed and operationalised by October 2009, there were numerous works that were yet to be completed. Several contracts had been foreclosed, numerous others had to undergo changes, there were abnormal time and cost over runs and several works yet to be completed (July 2012).

Chapter 5 Financial Management

The USBRL project was included in the Pink Book for the year 1994-95 at an anticipated cost of ₹ 1500 crore. This amount was later enhanced to ₹ 3077.23 crore in 1999-2000 and to ₹ 9341.44 crore in 2006-07 and had subsequently been revised to ₹ 19565 crore as of July 2010. Being a project of National Importance and funded by Ministry of Finance, the revised cost estimates required the approval of the Cabinet Committee on Infrastructure (CCI). While the overall cost of the project kept increasing at periodical intervals, the anticipated cost of each leg of the project as revised from time to time, is given below.

(₹ in crore)

	Leg-I Katra - NRCO	Leg – II Katra-Qazigund			Leg-III Qazigund- Baramulla IRCON
		Katra -30 km NRCO	Km 30-100.868 KRCL	Km 100.868 - 168 IRCON	
Original estimates	189.42 Sept. 1996	68.78 Aug 2002	4959.65 Feb 2006	1622.84 March 06	661.99 1998-2001
First Revised estimates	540.16 July 2006	185.44 Nov 2009	-	-	2103.67 Sept 2006
Second Revised estimates	945.76*	14960.33*			3658.74*
Percentage increase	399.29	139.32			452.69
Actual expenditure	934.39	69.91	1769.29	2211.72	3071.86

* Approved by CCI on 4 Jan 2012.

The current estimated cost of the project was pegged at ₹19,565 crore and Railway Administration was uncertain about the final cost (July 2012).

The initial estimated cost of ₹ 1500 crore was not based on any criteria. The Detailed Project Report sanctioned for a total cost of ₹ 3,077.23 crore in 1999 had allocated merely ₹ 0.68 crore for survey purposes which went up to ₹445 crore in the revised proposals, attributed by the Ministry to price factor and scope. The DPR had omitted major components namely, cost of construction of approach roads, provision of security for guarding tunnel portals, etc though these factors had huge financial implications. As already emphasised in the earlier chapters, the project estimates were prepared without firming up selection of alignment on the basis of necessary ground investigations. The estimates therefore did not provide a reliable basis for cost control and project monitoring.

Considering this position, the Railway Administration's claim that they had saved ₹ 2000 crore on changes in alignment was without substance. In fact, as already pointed out (Para 3.7), the purported savings on account of reduction in scope of work due to omission of a number of major bridges following change in alignment should have been factored in during initial selection.

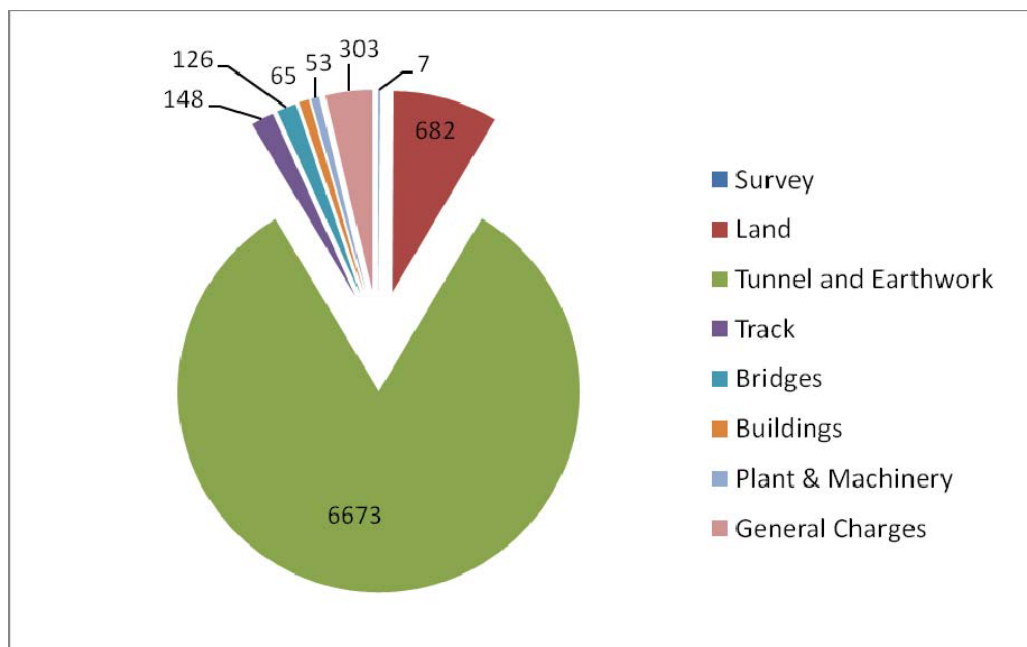
The latest estimated cost of ₹ 19,565 crore approved by CCI provided for total price escalation (₹ 9346 crore), increase in scope of work (₹ 3427 crore) and items not provided in DPR (₹ 3715 crore) which included element of profit of ₹1386 crore payable to KRCL and IRCON who were entrusted with part construction works on cost plus 10 per cent basis and access roads. Both these executing agencies submit a monthly statement of expenditure to NRCO for reimbursement. The Associated Finance of NRCO authorise reimbursement of the amount along with an amount equal to 30 per cent of the cost of the contracts awarded by the two executing agencies in terms of the agreement between NRCO and these executing agencies. As a regulatory measure, the Govt of India had prescribed admissible and non-admissible items for reimbursement of establishment expenditure incurred. However, the detailed scrutiny of accounts along with supporting documents was not exercised by NRCO leaving an unaddressed control risk. The Government of India till date had been sanctioning funds on half yearly on the basis of statement of accounts furnished by NRCO through Railway. As of July 2012, the total expenditure incurred on rail link to Kashmir was ₹ 8057.17 crore. Of this, ₹ 934.39 crore was incurred by NRCO on Udhampur–Katra section, while ₹ 4050.92 crore was incurred by NRCO, KRCL and IRCON on Katra – Qazigund section and ₹ 3071.86 crore was incurred by IRCON on Qazigund – Baramulla section. The actual progress achieved on the Katra (Km. 30)- Banihal (Km. 150) segment ranged from 12 to 14 per cent (July 2012) and as such, the actual costs are likely to be incurred will rise manifold. The year-wise budget allocation and expenditure there against is given below:

(₹ in crore)

Year	Budget allocation	Expenditure	Cumulative expenditure
1994-95	0.2	0.2	
1995-96	1	1	1.20
1996-97	17.5	17.41	18.61
1997-98	60	59.81	78.42
1998-99	36	36.67	115.09
1999-00	77	76.73	191.82
2000-01	73	72.71	264.53
2001-02	175	174.59	439.12
2002-03	350	344.91	784.03

2003-04	500	502.37	1286.38
2004-05	700	697.49	1983.87
2005-06	1000	999.83	2983.70
2006-07	850	849.90	3833.60
2007-08	900	896.39	4729.99
2008-09	600	611.37	5741.36
2009-10	880	879.55	6220.91
2010-11	1000	944.69	7165.60
2011-12	751	751.29	7916.89
2012-13 up to July 2012	100	140.28	8057.17

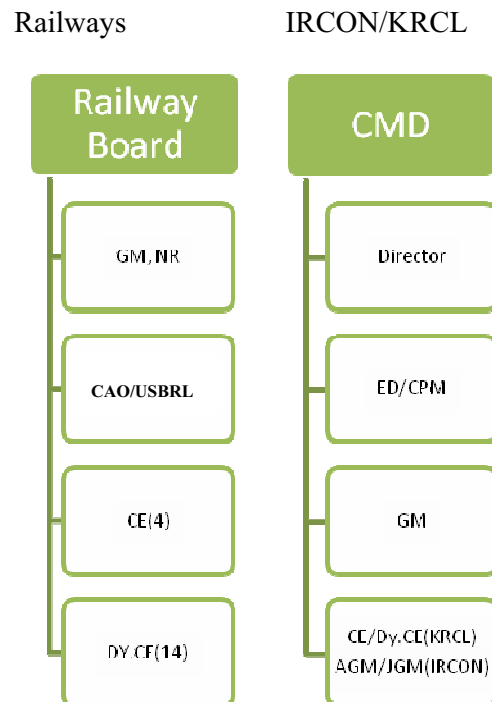
The detailed position relating to the expenditure incurred as of July 2012 on various components of the project is given below (₹ in crore):



Expenditure incurred in excess of the sanctioned estimates of the project pending post-facto approval was being booked under 'Adjustment Account' (an adhoc arrangement). As of July 2012, the amount booked in the accounts of NR was ₹ 4524.71 crore under the project head and ₹ 3532.46 crore under 'Adjustment Account' was awaiting debit to the final head of accounts subject to approval of the Govt. of India.

Chapter 6 Monitoring

A project of this magnitude cannot succeed unless a proper structure for monitoring is in place. As can be seen from the structure given below, there are clear lines of reporting and authority with regard to the project activities both in the Railways as well as in the two public sector undertakings entrusted with the execution of this project viz. KRCL and IRCON.



The overall in charge of the project is Member (Engineering) in the Railway Board. Chief Administrative Officer, Construction, Northern Railway (CAO/USBRL) is responsible for the day-to-day construction activities. As envisaged in the Agreement with the executing agencies, the latter are to submit reports on the progress of the execution of the project as well as their plans for the following month to CAO/ USBRL, NR on a monthly basis. CAO/ USBRL is to forward these reports along with his own assessment to the Railway Board. It is evident that conventional hierarchy based system of project management was followed. Decision making structure for this strategic project involved many layers and the CAO (USBRL Project) had limited autonomy in technical and financial matters. A project of this magnitude would have thus benefited from an independent project management structure with adequate authority to take appropriate decisions with Railway Board monitoring overall progress rather than the conventional hierarchy based process of decision making.

Although a separate post of CAO/USBRL was created exclusively to monitor this project, CAO/USBRL had not been entrusted with adequate authority to take decisions relating to the project – either financial or administrative. In fact, the Expert Committee constituted for reviewing the alignment in 2008 recommended greater financial powers to CAO/USBRL. As a result, quality of monitoring was found to be ineffective.

Audit scrutiny revealed that both KRCL and IRCON had been scrupulously submitting the progress reports regularly and CAO/USBRL had also been sending these reports to the Railway Board at prescribed intervals. However, considering that follow up action on issues where decision was required was not taken promptly, this exercise did not serve the intended purpose. Some of the specific instances where follow up action/decisions were not taken with the required urgency are given below.

- In Leg I (Udhampur to Katra), tunnel T-1 started deforming in December 2002. However, instead of ensuring the stability of the tunnel, the CAO/USBRL allowed the contractor to excavate until the tunnel was through which subsequently collapsed and had to be abandoned, rendering the expenditure incurred (₹ 53.51 crore) infructuous. As soon as the deformation of the tunnel was noticed, excavation should have been stopped for investigations.
- In T-3 of Leg I, heavy ingress of water started during July 2003. Here again, an early solution to the problem of water seepage due to a buried channel, fact of presence of which already known to the administration, was not sought which resulted in aggravation as the tunnel excavation was allowed to continue.
- Decision for suspension of work on Leg-II from Katra to Banihal was taken in February 2008. However, the decision was communicated only in July 2008. Further, the decision relating to realignment and restart of work was taken as late as in September 2009 resulting in numerous claims from contractors for the suspension period amounting to ₹ 251.68 crore, out of which the Railway Administration had admitted an amount of ₹ 57.24 crore. The total impact of this delay in terms of the cost and time overrun on the project could not be quantified at this stage because a number of works which were foreclosed were yet to be re awarded and the extra financial impact in respect of six works, which had been re awarded, was ₹ 1097.34 crore as of July 2012.
- KRCL submitted in March 2004 that the alignment from km. 52 to 62 was not feasible due to the existence of bridges of unmanageable spans. The proposal was approved as late as in May 2006.

- KRCL, after detailed investigations, submitted (May 2004) that the alignment in Pie Khad area was passing through the Reasi Thrust and proposed a revised alignment. However, approval to this request was accorded as late as in October 2008, resulting in infructuous expenditure amounting to ₹ 50.65 crore.
- Though the work for construction of tunnels in Sangaldan area was awarded in October 2005, contracts for construction of bridges in this sector were yet to be awarded.
- Contract for construction of tunnel T-77 B & C could be awarded as late as in June 2010 due to non finalization of design and the work on the stretch had again been suspended for further review of alignment.

As can be seen from the above illustrative instances, delay in decision making was one of the important reasons for the delays in the execution of the USBRL project.

In reply, the Ministry admitted that delays had occurred at the Board level and stated that the CAO/ USBRL had been given additional powers on the recommendations of the Expert Committee.

Chapter 7 Conclusion

The USBRL project is perhaps the most important project taken up by the Indian Railways since Independence. The strategic importance of the project to the State of Jammu & Kashmir and to the nation as a whole cannot be overstated. It is also the most challenging project for the Indian Railways so far, in terms of constructing a new line altogether in a rugged and hostile terrain, with an unfavourable security situation.

Considering the difficult and unexplored terrain of the region, the critical decision on selection of the alignment should have been preceded by requisite field investigations to establish its workability. The technical feasibility studies were essential to provide a realistic scale of the likely financial costs as also the scale of expertise involved in the construction of tunnels and bridges. Had the project authorities conducted due diligence during the initial stage including expert consultation, it would have been possible to minimise uncertainty on account of constructability paving the way for smoother implementation. The inadequacy of the project estimates thus heavily contributed to time and cost over-runs as well as major changes in scope of work as field investigations were taken up during construction. From the approved project estimates of ₹3077 crore in 1999-2000, the project was currently estimated to cost ₹ 19565 crore resulting in cost overrun of ₹16488 crore.

The deficient planning impacted various activities namely land acquisition and finalisation of design and drawings and resulted in stoppage of work for more than a year with foreclosure of contracts giving rise to claims and abandonment of works. Thus, the claim of the Ministry that the objective was to cause some progress on the ground even while the workability of the alignment was yet not proven was not sustainable as this strategy merely resulted in its continuing uncertainty with the end objective at risk, besides cost implications.

Additional financial impact on account of losses and claims arising from general planning failure is summarised below:

S.No.	Details	Amount in crore (₹)
1.	Loss on account of already executed assets	281.42
2.	Loss on account of idle men power/machinery paid to contractors during suspension period	57.24
3.	Foreclosure of contracts and reward the balance work at higher rates	1122.63
4.	Expenditure on rectification of defective works	194.37
5.	Delayed approval/mid way revision of drawings/design	62.34
6.	Contractor's claims	1514.40
7.	Overpayment/non recovery of Railway dues	26.52
	Total	3258.92

The only completed leg of the alignment was the section from Qazigund to Baramulla at a cost of ₹ 3071.86 crore (July 2012) that became operational in phases from October 2008 to October 2009. However, this only constituted a rail link within the Kashmir Valley, and not to Kashmir, as was the primary objective of the project. The critical section from Katra to Qazigund, originally scheduled for completion by August 2007 had now been rescheduled for completion by 2017-18. The attainability of this target was much in doubt as final location survey of sizable portion (54.59 kms.) of the alignment (117 kms.) was yet to be completed and overall physical progress of Katra – Banihal section being 12 to 14 per cent with total expenditure of ₹ 4050.92 crore. The completion of the section from Udhampur to Katra (scheduled for March 2003) which would have benefited lakhs of pilgrims to the Vaishno Devi Shrine could not be assured despite lapse of 17 years and an investment of ₹ 934.39 crore (July 2012).

Considering the expectations of the nation in terms of providing the citizens of the valley a faster and cheaper transportation mode, it is important that the Railway Administration takes appropriate steps to ensure that the project is monitored closely so as to complete it within the revised time and budget. For this purpose the Ministry may consider putting in place an implementation structure headed by a Chief Administrator Officer to be invested with necessary executive and financial powers with the Railway Board monitoring the overall progress.

This report was issued to the Railway Board (March 2011); their reply received (September 2011) has been incorporated suitably.

(B. B. PANDIT)

New Delhi

Deputy Comptroller and Auditor General

Dated:

Countersigned

(VINOD RAI)

New Delhi

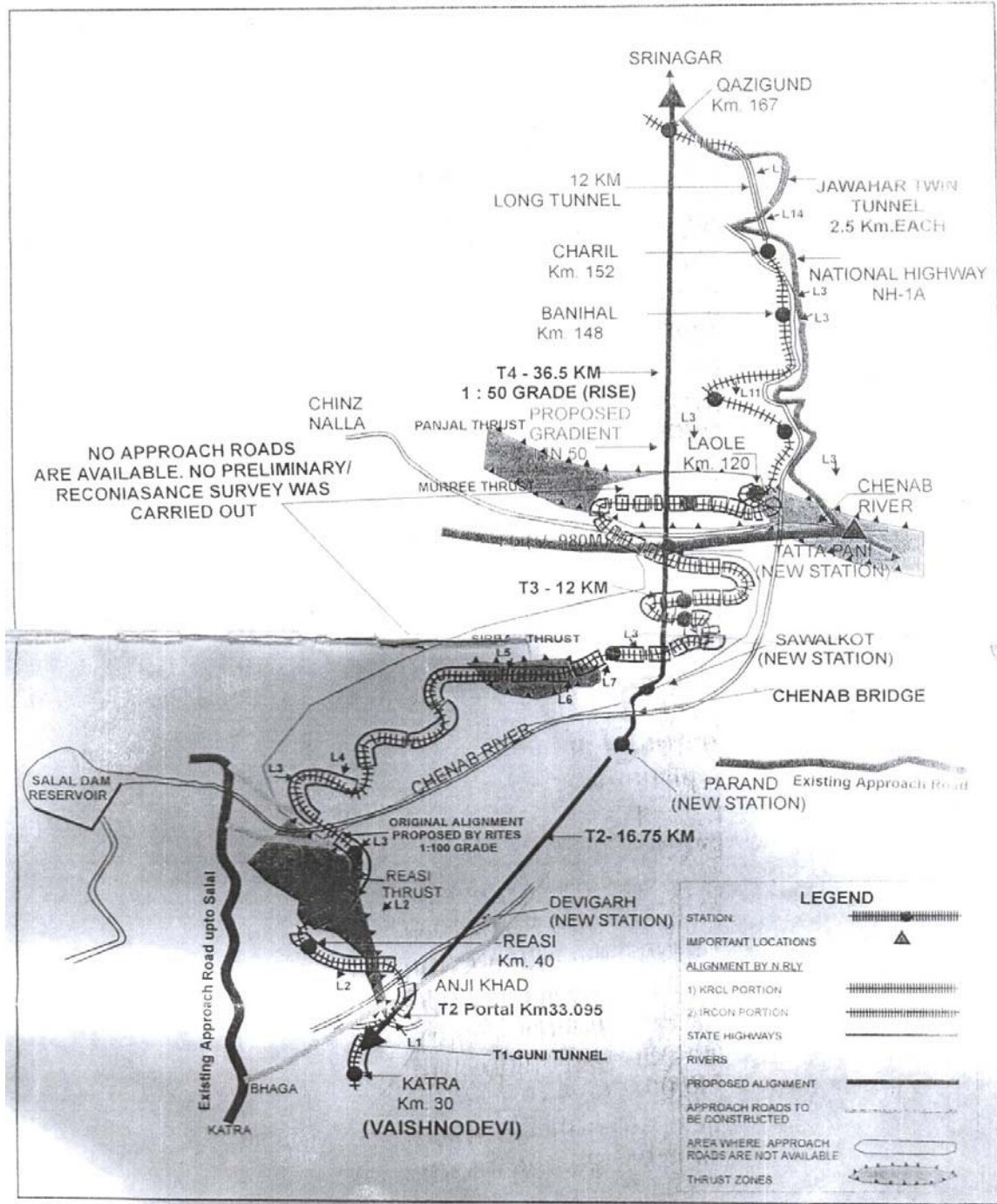
Comptroller and Auditor General of India

Dated:

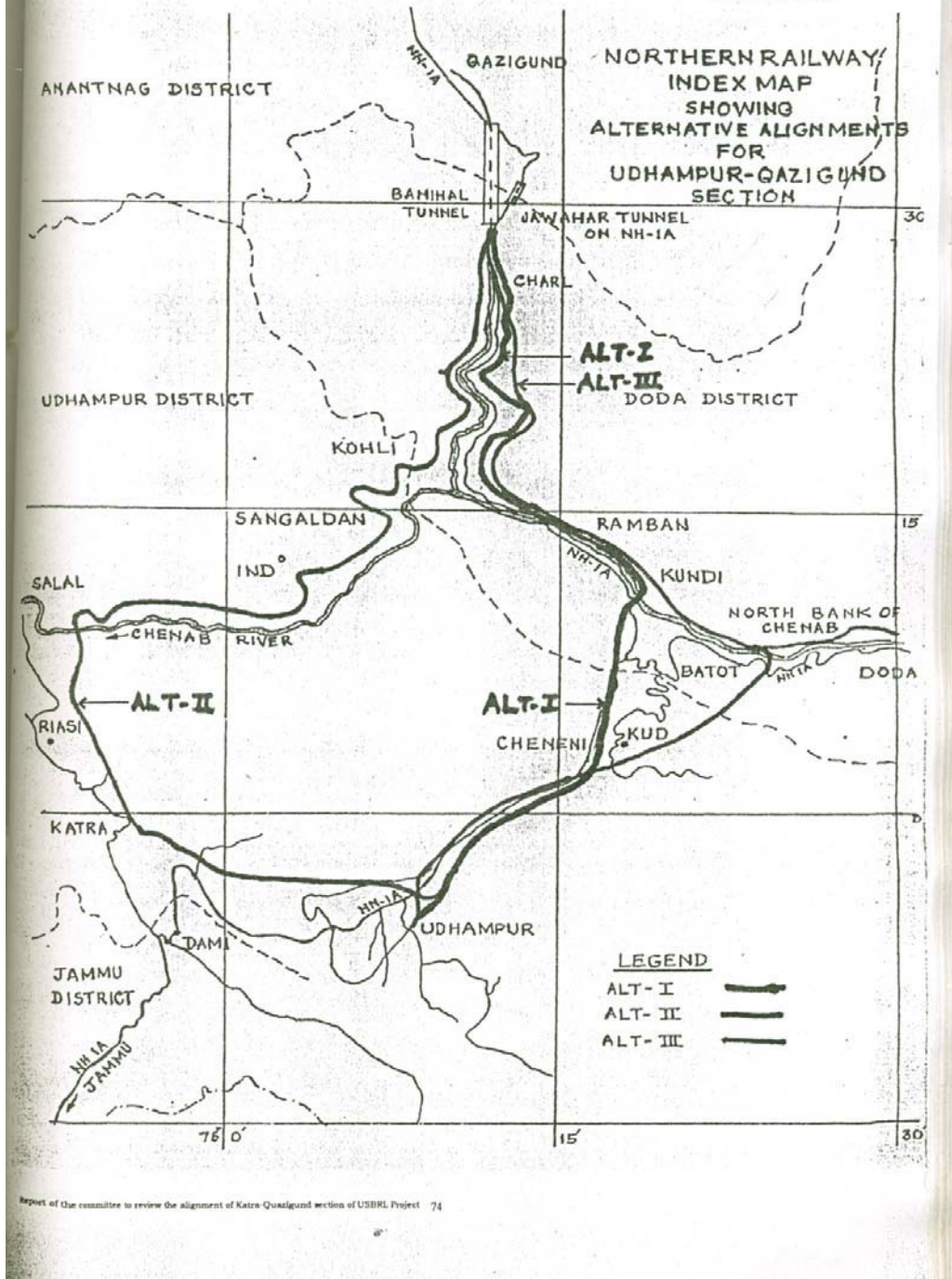
JAMMU-UDHAMPUR-SRINAGAR-BARAMULLA RAIL LINK



Geological sketch map of Kashmir Himalaya depicting various thrust between Katra and Qazigund and also indicating the alignment finalized by Northern Railway and alignment proposed by KRCL (taken from the report of KRCL)



Annexure-2.1

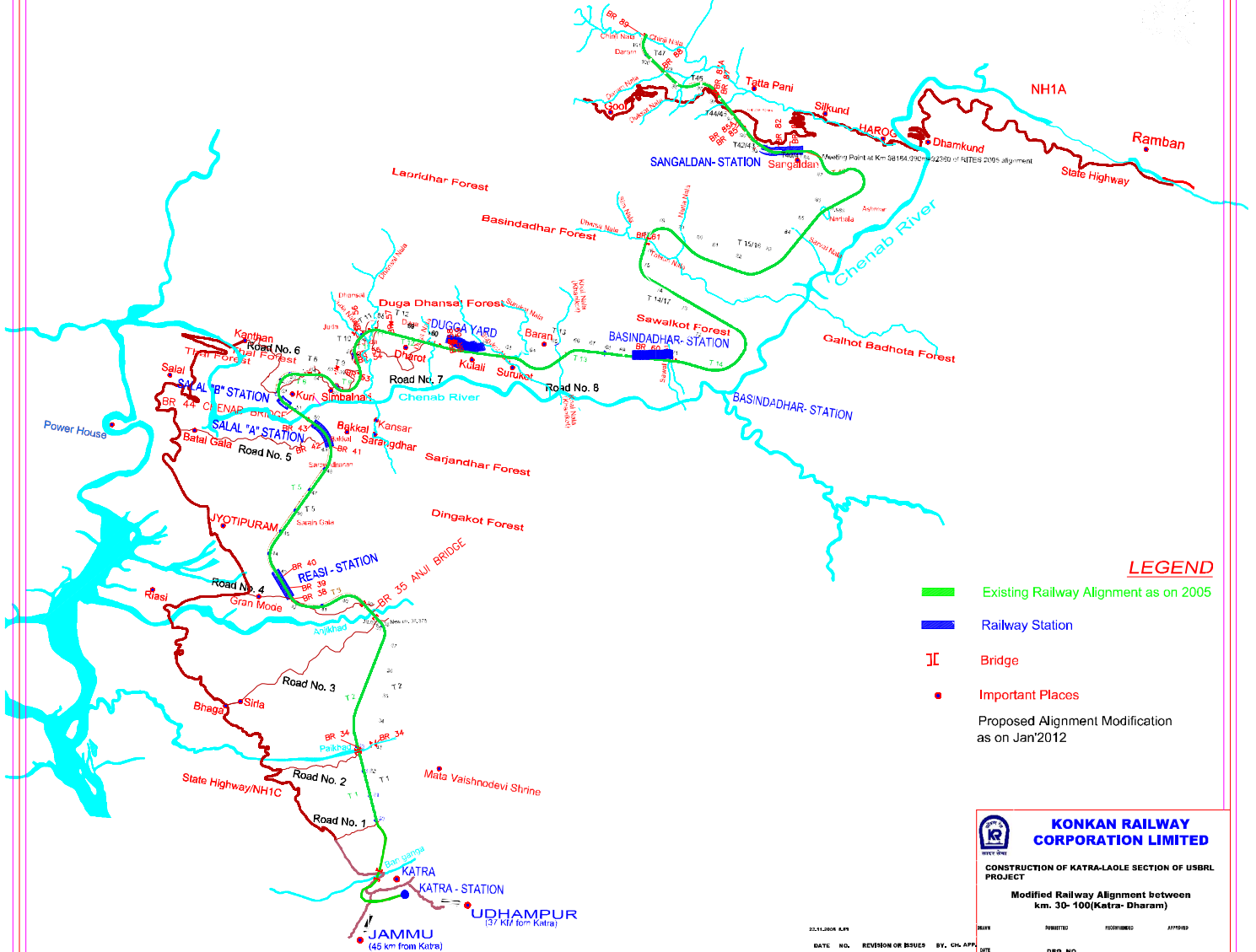




भारतीय रेल



KONKAN RAILWAY CORPORATION LTD. KATRA - DHARAM SECTION OF UDHAMPUR - SRINAGAR - BARAMULLA RAIL LINK PROJECT



LEGEND

- Existing Railway Alignment as on 2005
- Railway Station
- Bridge
- Important Places
- Proposed Alignment Modification as on Jan'2012

KONKAN RAILWAY CORPORATION LIMITED

CONSTRUCTION OF KATRA-LAOLE SECTION OF USBRL PROJECT

Modified Railway Alignment between km. 30-100(Katra- Dharam)

DATE	NO.	REVISION OR ISSUES	BY	CHK. APPR.	DATE	NO.	REVISION OR ISSUES	BY	CHK. APPR.
22.11.2008	001								

JK/KR/CLD/P/DR/001001
REV. NO. 00
DATE

Annexure -I

The due processes of consideration expected on investment decision of a new line and commencement of work and incurrence of expenditure there on are:

(Authority: Engineering Code and Financial Code of Indian Railways)

The project should be developed through the following process:

- i) Preliminary investigation to determine how the line will fit with the general scheme of future Railway development.
- ii) Frame the objective of the Project
- iii) determine various option to meet the demand
- iv) Investigation of some selective alternatives through Reconnaissance survey and Traffic survey
- v) preparation of feasibility report indicating the technical and operational and economic feasibility of these alternatives
- vi) Evaluation of alternatives involving technical and operational feasibility. economic analysis, social profitability and financial appraisal
- vii) While doing so the parameters such as ruling gradient and degree of curvature should be decided taking into account the topography of the area, level of traffic, the speed envisaged, the mode of traction and above all the initial cost of construction and unit cost of service with different alternatives
- viii) Social benefits should be quantified with reasonable degree of accuracy. Assumption and reasons underlying any judgment about non quantifiable benefit should be clearly spelt out.
- ix) selection of scheme based on such an appraisal
- x) further detailed examination of selected alignment by conducting a preliminary survey upon which an abstract estimate is prepared in order to enable the authority competent to give administrative approval to the expenditure after forming a reasonably accurate idea of the probable expenditure and to gauge adequately the financial prospects of the proposal
- xi) Approval of Abstract Estimate by Competent Authority which is an Administrative sanction for investment on the project(can commence preliminary works like land acquisition and procurement of stores)
- xii) Final location Survey to secure the information necessary for the preparation of the detailed plan on which technical sanction of the project is given. Project Estimate/Detailed estimate should be prepared after a careful examination of the various details of construction so as to reduce to a minimum, the probability of omission of any item of expense which

is capable of being foreseen. The authority according technical sanction should satisfy itself that (i) the details of the scheme as worked out are satisfactory, (ii) the methods proposed for the execution of the work are adequate and (iii) the cost has been estimated from reliable data and is likely to be reasonably accurate.

- xiii) Approval of project estimate by competent authority
- xiv) Budget allotment for the work
- xv) Commencement of work

The overriding principle of due consideration in respect of investment decision on a new line stipulated in Railway Engineering Code and Railway Financial Code are:

- i) Alignment selection.

Gathering of maximum information that is relevant to achieve the objective set. Consideration of various alternatives and every related aspects with an open and transparent manner and find out the best in terms of economy, unit cost of service, technical and operational feasibility.

- ii) Commencement of work.

The commencement of work of a new line should be sanctioned by a competent authority only after satisfying that (i) the details of the scheme as worked out are satisfactory, (ii) the methods proposed for the execution of the work are adequate and (iii) the cost has been estimated from reliable data and is likely to be reasonably accurate. In short he should have an assurance on the constructability, stability, maintainability of the structures to be made on the elected alignment and cost of construction.

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Annexure II

Statement showing various alignment options proposed through Eastern Corridor and Western Corridor

S.No.	Details	Alignment recommended by RITES 1 to 50 (C) Eastern Corridor (RITES -1986)	Alternative I 1 in 40(C) Eastern Corridor considered as per DPR	Alternative II 1 to 100 (C) Eastern Corridor considered as per DPR	Selected alignment through Western Corridor. (NRly)	Another Possible alternative available in Western Corridor 1 to 50(C) (Later suggested by KRCL)
1	Total length	150.75 Km	122.59 Km	198.10 Km	167.60 Km	71.5 Km*
2	No. of curves	118	108	174	84	
3	Length of curves	51.909 km	44.06	60.238 km	44.87KM	N.A.
4	Sharpest degree of curvature	6	6	6	2.75	2
5	No of 6 degree curves	61	N.A.	46	N.A.	N.A.
6	No. of tunnels	103	96	112	81	4
7	Total length of tunnels	84.15 km	87.04	100.75 km	87.2Km	68Km
8	Major tunnels I) Chineni II) Banihal	14.08 km 9.95 km	14.08 Km	15.62 km 10.25 km	10.03	36.50 KM (Tattapani-Qazigund)
9	No. of major bridges	45	39	67	69	3
10	No. of ROB/RUB	5		12		
11	Cost **	Rs. 778.94 crore		Rs. 1117.32 crore.	Rs.2415.14crore	Rs. 6153.00 crore
12	No of Station	14	10	16	14	7

* *Katra –Qazigund (excluding 30 Km from Udampur-Katra)*

** *The estimates pertain to different time period.*