5. DISASTER MANAGEMENT EDUCATION

5.1. The Project

5.1.1. Outline of the Project

(1) Background of the Project

As long as JICA Study Team constructs the model school for disaster management as one of the pilot projects, it is considered that the school should function as a focal point of Disaster Management Education not only in AJK but also all over Pakistan. The construction of disaster management model school in Muzaffarabad, Sathi Bagh government girls high school project has some characteristics in terms of disaster management, the structure design is seismic resistant design and the school has playground for evacuation and water reservoir for emergency case. Hence it is very significant for the school to comprise soft component as well as physical function in terms of disaster preparedness. Conceiving this notion, the roles of model school are defined as written below:

1) The model school should act as the hub of the communities to support the affected people after disaster occurs, by offering place for evacuation and shelter, and
2) The school should contribute to the prevalence of Disaster Management Education, to disseminate its information and practice, which will be accessible to everyone. Students can be the main target to be transferred what they gain to their families and neighbors.

For fulfilling the former role, the model school is designed to have a large ground for the purpose of evacuation, big water tank and accommodations, for temporary shelter, which will be essential for community when disaster happens.

Aiming at having the latter role, JICA Study Team proposed the project for promotion of Disaster Management Education based on the model school. As mentioned above, Disaster Management Education was never taught in schools in Pakistan, thus teachers and students did not know how to protect them by themselves. Taking this lesson into consideration, the proposed project will cover the following activities:

- Development of student material on Disaster Management Education
- Development of teaching aids on Disaster Management Education
- Conducting teacher training on Disaster Management Education
- Organizing system in the school for Emergency
- Implementing the drills for evacuation involving community in the school area

These actions are absolutely vital for all the people live in near the school as well as teachers and students for the future and are expected to spread the idea to other areas in Pakistan.

Project implementation body will be Department of Education AJK for this proposed project and is scheduled to commence in August for 5 months.

(2) Objectives

To strengthen teachers' and students' abilities to manage natural disaster including earthquakes in Muzaffarabad City and to promote Disaster Management Education all over AJK through responsible agency, Department of Education, AJK.

(3) Project Components

Main Activities of the project will be the following;

1) To Develop material on Disaster Management Education for students
2) To Develop teaching materials on Disaster Management Education for teachers
3) To Implement teacher training on Disaster Management Education

(4) Steering Committee

Steering Committee has been established for the Project to authorize the developed textbooks and all of other issues to be required decision making. The members of the Steering Committee are listed below;

- Secretary Education, Education Secretariat AJK
- Additional Secretary Planning, P&D, AJK
- Director General, Directorate of Curriculum & Research Development (DCRD)
- Chief Education, P&D, AJK
- Director, Directorate of Education, Extension (DEE)
- District Education Officer (DEO), Secondary, Muzaffarabad
- Director, Geological Survey of Pakistan (GSP), Islamabad
- Deputy Director (Education/AJK), ERRA (Added as a member for the second Committee by ERRA's request)
- Provincial Planning Expert, SERRA (Added as a member for the second Committee by SERRA's request)
- Representatives from the JICA Study Team

(5) Work Schedule

Manning schedule, including work items and their durations are shown in the table below.

Table 5.1.1. Implementation Schedule

Manning Schedule	2006				
	8	9	10	11	12
Work Item and Duration					
【1】Examine the present situation	■				
【2】Hold Workshop	■				
【3】Formulate guideline for Disaster Management Education	■	■			
【4】Develop Draft Material for Student	■	■	■		
【5】Hold the Steering Committee			■		
【6】Develop Teaching Material			■	■	
【7】Submit Progress Report			■		
【8】Develop Teacher Training			■	■	
【9】Implement Training for Master Teachers				■	
【10】Revise Material for Student and Teaching Materal				■	
【11】Implement Teacher Training					■
【12】Evaluation					■
【13】Submit Final Report					■
Assignment of Experts					
Team leader/ Rehabilitation and Reconstruction Plan			■		
Disaster Management Education (Material Development)	■		■		
Disaster Management Education	■	■	■		
Education (Teacher Training)	■	■	■	■	■
Submission of Report			△ PR/R(3)		▲ F/R

Source:JICA Study Team

5.2. Implementation of the Project

JICA Study Team has commenced "The project for promotion of Disaster Management Education in Muzaffarabad City" in August 2006. The project was originally scheduled for 5 months; however, the duration has been extended for 1.5 months in response to request from the first Steering Committee, which held for the approval of textbooks on disaster management education on November 10, 2006 in Muzaffarabad, AJK. The following are the subjects discussed and agreed upon between the Pakistani and the JICA Study Team in the committee.

5.2.1. Draft Textbooks on Disaster Management Education

The additional secretary of education of AJK appreciated the work done by JICA Study Team. The idea of disaster management education by story telling is brilliant because children always take interest in listening stories. Moreover the textbooks are painted nicely and the contents of the textbook are also well elaborated. The committee said this is very

interesting way to teach the children about disaster management. They gave their feedback openly for further improvement in textbook.

The steering committee proposed to establish another committee for discussion of the contents of the textbook, which will be required time and coordination within the both department of education and the JICA Study Team. The Chairman in the steering committee nominated some experts from the directorate of curriculum and research development (DCRD) and directorate of education extension (DEE) from Pakistani side in order to revise and improve the draft textbooks according to the suggestions of steering committee.

The revision committee decided the work plan for improvement of draft textbook. Steering Committee will be held again after discussion and recommendation from the committee, and then the contents of the textbook will be approved by the steering committee.

5.2.2. Extension of the Project

Pakistani side understand the importance of the disaster management education, which has been progressed by the JICA Study Team for the earthquake-affected area. The textbook should cover not only earthquake and landslide but cover whole natural disasters and also there should be some detailed information about earthquake. The contents of the textbook should include basic mechanism of the natural disaster, survival techniques after the disaster and first aid. The textbook should be added explanation note for teachers and family of the textbook usage. And the flow of information should be revised. The committee also suggested that teacher guide should be developed before training so that they would use the guide in training of trainers as well.

It was high lighted by JICA study team that the recent project can not be completed because the text book on the subject is to be reviewed by the committee in next month. So it was felt appropriate to extend the implementation period of the existing project with in sanctioned/ approved funds till the completion of the school building. The text material developed for the training will only be used for the particular purpose. Further expansion of project /model will be considered after reviewing the achieved results of present project for disaster management.

The committee suggested that the textbooks should be utilized in the formal curriculum under the supervision of the Government. JICA Study Team responded that request from the Pakistani side is understandable for the JICA Study Team and convey the message to JICA Pakistan Office and JICA headquarter in Tokyo.

5.2.3. Actions have been taken

Taking these comments into account, JICA Study Team has taken the following actions.

- Revision Committee consists experts from Department of Education, AJK, Geological Survey of Pakistan (GSP) and JICA Study Team, was held for three days in Islamabad.
- The duration of the project has been extended until the middle of February.
- Development of Animated story is added for a new component of the project.

5.2.4. Revision Committee

According to the comments discussed in the first Steering Committee, revision committee was organized and held from 15th to 17th November. Decision made there are as follows;

- Two kinds of materials will be merged into one.
- Information about earthquake will be included.

  （Basic Mechanism, Survival technique, preparedness etc.）
- Scales of Earthquakes will be added. (Only for Upper Primary)
- Contents of other natural disasters will be included.

Although two kinds of materials were prepared for Disaster experienced and inexperienced students initially based on Japanese experience, the revision committee came to a decision to follow the comment, which is that the contents should include details of information about earthquakes and other natural disasters.

5.2.5. Main Contents of the textbook

Consequently, new materials comprise the following contents and the revision committee reached a consensus on them.

- Precious life
- Will to live
- Mutual help
- Mechanism of Earthquake
- Scales of Earthquakes (Only for Upper Primary) Types of landslides
- Signs of hazards (landslides)
- Other natural disasters Survival Techniques and PreparednessAccording to these amendments, texts and pictures were also reviewed drastically and it took more than one month to complete all the changes. Revised materials have been printed out and were prepared for their approval.

5.2.6. The Second Steering Committee

The second steering committee meeting was held jointly with the Department of Education Azad Jammu & Kashmir and JICA Study Team on 27th December 2006 in Muzaffarabad for the approval of textbooks on disaster management education. The Committee and JICA Study Team discussed the updated contents of the draft textbooks on disaster management education and further activities including training. The discussion of the meeting between JICA Study Team and the Steering Committee are described below.

5.2.7. Acceptance of the Draft Textbooks on Disaster Management Education

JICA Study Team explained that the textbooks were revised according to the comments raised in the last committee meeting and presented the updated draft textbooks to the participants of the meeting who heartily appreciated the efforts of JICA Study Team. And it was added that the revision committee, which was organized by the committee, helped a lot JICA Study Team to improve these booklets. The committee members expressed their gratitude for the updated material and formally approved the booklets.

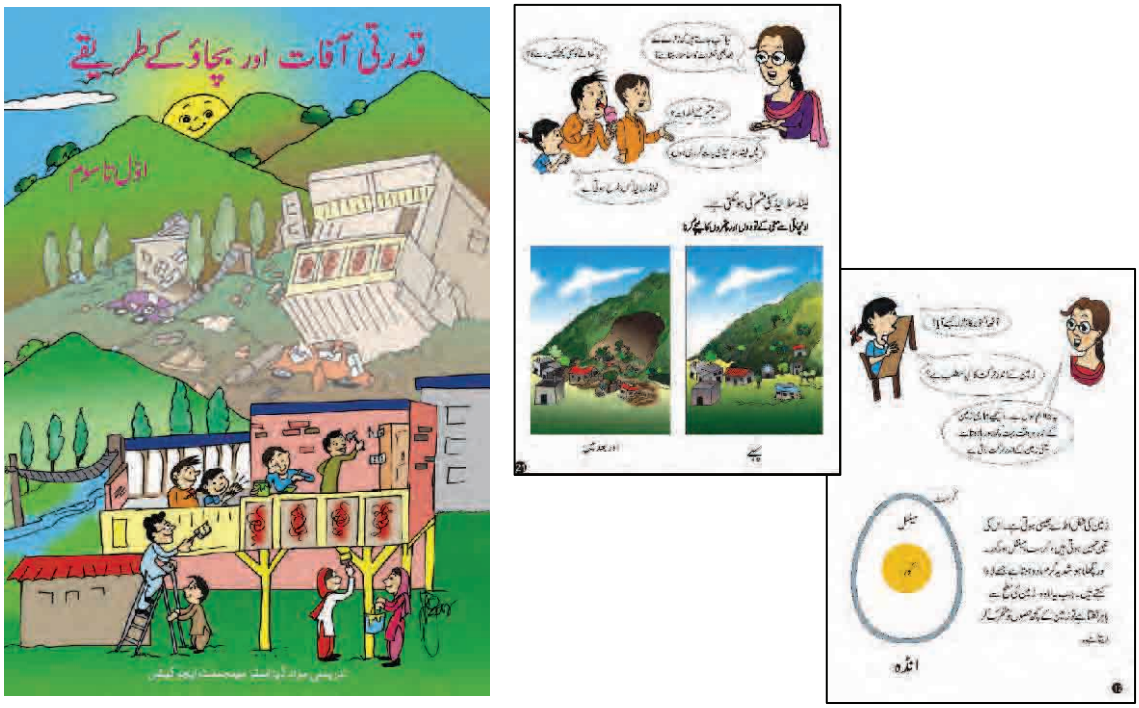


Photo: Draft Textbooks on Disaster Management Education

5.2.8. Development of Animated story on Survival Techniques

During the presentation, JICA Study Team explained that the team was developing an animated story on survival techniques, which would be used in the teacher training and in the

school for children. The committee deeply understood the effectiveness of such audio-visual teaching aids and encouraged JICA Study Team to precede the work.

5.2.9. Project of Disaster Management Education

While the committee members were discussing the importance of disaster management education on earthquakes, JICA Study Team pointed out the significance of education about other natural disasters as well, and stated that this kind of project should be implemented not only for Azad Jammu & Kashmir, but also for other areas of Pakistan, therefore the textbook should be in the hand of each and every Pakistani child as well. The committee member from Geology, Geological Survey of Pakistan praised the efforts of JICA Study Team and said that it is a unique project from which hundred of thousands of families and children would get benefit.

The committee put stress upon the importance to gain as much benefits as we can from the experience of JICA Study Team, because after the completion of this project, we are the main proponents who will be responsible to carry on this project, therefore we have to control the quality of the matter being imparted to the young minds and it is very important to hold conferences and seminars periodically in order to update our knowledge about the disaster management education.

5.2.10. Trainings on Disaster Management Education

After the approval of the materials in the steering committee, JICA Study Team organized two types of training on Disaster Management Education, one for Training of Trainers (so-called ToT) for five days from January 8th to 12th 2007 and another for Teacher's Training (so-called T.T.) for five days from January 22nd to 26th 2007. Teacher's Guide and Animated story are developed for the both training. Details of the trainings are discussed in this report later.

5.3. Analysis of Current Situation

5.3.1. Educational Sector in Muzaffarabad

(1) Legal Framework for Education and Schools

Islamic Republic of Pakistan is governed under the Islamic, democratic, federal Constitution of 1973. Under the Constitution of Pakistan, all aspects of school education except for the curriculum are the exclusive mandates for the provincial governments. The provinces and AJK are responsible for implementation of education at all levels within their area of jurisdiction.

(2) Educational Policy

Soon after the creation of Pakistan, the policy dialogue commenced with the 1947 National Education Conference, which emphasized the need for free, and compulsory primary education and for adult education to solve the problem of illiteracy over a period of 25 years by 1972. This was the first step towards defining education policies and goals in Pakistan. Since then there have been seven national education polices, nine Five Years Plans and several national-level schemes relating to education. The education policy in AJK educational sector is followed by the federal one. At present, it is under the National Education Policy 1998-2010.

(3) Institutional Arrangements

The project is being implemented in close cooperation with Directorate of Curriculum, Research and Development (DCRD) and Directorate of Education Extension (DEE) following the approval and notification from the Secretary Education of AJK. A Steering Committee was constituted as a higher decision making body to discuss and approve the textbooks developed by the JICA Study Team.

DCRD is in charge of development of textbooks for 1st to 8th grades. Currently there are two deputy directors in charge of administration and academic respectively; and six subject specialists for science, mathematic, English, Urdu, social study and Islamic study.

As mentioned earlier, the school and education system has to follow the Federal system. Therefore DCRD follows the curriculums, which are provided by the Curriculum Wing of the Ministry of Education of the Federal Government. For finalizing the curriculums, the Curriculum Wing sends the draft curriculums to AJK and each Province and asks comments. After considering the comments, the Curriculum Wing finalizes the curriculums and provides to AJK and each Province. Every five (5) to ten (10) years, the curriculums are revised.

The Curriculum Wing of the Ministry of Education of the Federal Government of Pakistan provides curriculums and draft textbooks; and DCRD develops and finalizes textbooks for AJK in consideration of the local situations in AJK. The textbooks developed by DCRD in AJK are required the approval from the National Review Committee (NRC) of the Ministry of Education in the Federal Government of Pakistan. Curriculums are, however, followed by the federal ones. The curriculum wing also provides draft scheme of study, which is a kind of timetable in schools.

Directorate of Education Extension (DEE) is responsible for teacher training, i.e., harnessing the skills of teachers who are responsible for imparting education to the students of primary and secondary grades. The main target of the teacher's training is for primary teachers. For

the teacher's training, DEE develops teacher's guides, as well. Besides teacher's training, DEE is in charge of the training for all staff of Education Department in AJK, e.g. management staff.

(4) Schooling System

The schooling system in AJK is not compulsory but voluntary education. The new laws, however, which will be enacted in a few months, stipulate primary education as compulsory.

Children enroll in the primary school from five (5) years old. Preparatory classes (*kachi*, or nursery) were formally incorporated into the school system in 1988. Some children enroll in preparatory classes. The grade system in education is organized into five levels as shown in the table below.

Table 5.3.1. Grade System

Level	Grade	Remarks
Primary	1- 5	
Middle	6-8	
High	9-10	
Intermediate	11-12	College/Higher Secondary
University	13-16	13 - 14 Grade (Graduation Level) 15 - 16 Grade (Master Level)

Source: Directorate of Public Instructions Elementary, "Pre & Post Earthquake Data, Educational Institutions (School and Colleges)" Azad Govt. of the State of Jammu & Kashmir, Muzaffarabad, 2006

In terms of managing bodies, there are two (2) types of schools. Public schools are run by the AJK government while private schools are run by private institute including NGOs and Civil Society Organizations (CSO).

Schooling fees are charged in the public schools in AJK though it is a small amount. Monthly fees are 1, 3, and 5 Rupees for primary (1-5), middle (6-8) and high (9-10), respectively.

While schooling fee for the private schools are high. Due to their high fees, these private schools cater only to the needs of the relatively affluent urban class, excluding a large section of the society comprising poor families.

Due to the cultural and religious reason, all government schools are single sex schools but some private schools are co-education schools.

(5) School

There are 6,014 educational institutions including schools and colleges in whole AJK. In Muzaffarabad district, there are 1,251 schools and 19 colleges. Among them, there are 50 schools and 5 colleges in Muzaffarabad city as shown in. the table below.

Table 5.3.2. Number of Educational Institutions (Schools and Colleges) in AJK

District	Male Institutions	Female Institutions	Total
Neelum	176	102	278
Muzaffarabad	722	548	1,270
Bagh	466	380	846
Poonch	388	459	847
Sudhnoti	248	238	486
Kotli	576	471	1,047
Mirpur	324	284	608
Bhimber	366	266	632
Total	3,266	2,748	6,014

Source: Directorate of Public Instructions Elementary, "Pre & Post Earthquake Data, Educational Institutions (School and Colleges)" Azad Govt. of the State of Jammu & Kashmir, Muzaffarabad,2006

AJK state is divided into eight (8) districts, among them four (4) districts for Neelum, Muzaffarabad, Bagh and Poonch suffered from the earthquake. Many educational institutions have been damaged or collapsed. Especially in Mazaffarabad district, 99.7% of the institutions have been damages and collapsed. A month after the earthquake, most of the schools have started again in buildings, tens, shelters and open spaces. Out of 1,269 schools in Muzaffarabad district, 899 and 360 schools are in tents and open spaces, respectively. These schools have to be reconstructed as soon as possible.

Because of the week structure of school buildings, there was a large scale of damage in schools as shown in the table below. A lot of students and teachers were died or injured by collapsed schools because the earthquake hits during the school time.

Table 5.3.3. Damaged Educational Institutions

District	Total No. of Institutions (Before Earthquake)	Damaged Institutions (Partly + Completely)	% (out of Total Damaged 2691)
Neelum	278	150	54.0%
Muzaffarabad	1270	1266	99.7%
Bagh	846	730	86.3%
Poonch	847	545	64.3%
Total	**3,241**	**2,691**	**83.1%**

Source: Directorate of Public Instructions Elementary, "Pre & Post Earthquake Data, Educational Institutions (School and Colleges)" Azad Govt. of the State of Jammu & Kashmir, Muzaffarabad, 2006.

While there are about 5,000 private schools in different forms in AJK. They have been increased suddenly in the last five (5) years. The private schools are stipulated to be registered by the government with some prerequisite qualifications, such as rooms, teachers, etc., and the registrations have to be renewed every year. There are, however, only about 200 schools are registered by the government.

A new law regarding examinations will be established in a few months. According to the new law, the Elementary Board will be in charge of examination for both grade 5th and 8th. After the enactment, these non-registered private schools will suffer from the examinations.

(6) Teacher

Teachers are classified into four (4) types in terms of qualifications as shown in the table below.

Table 5.3.4 Qualification of Teachers

Types of Teachers	Qualifications	
	Educational Background	Professional Certification
Primary Teacher (1-5 Grade)	Matric (10 grade)	PTC[1] (Primary Teaching Certificate)
Junior Teacher (6-8 Grade)	FA (12 grade)	CT (Certification of Teaching)
Senior Teacher (9-10 Grade)	BA (14 grade)	B Ed (Bachelor of Education)
Subject Specialist (11-12 Grade)	MA (16 grade)	M Ed (Master of Education)

Source: Directorate of Education – Muzaffarabad

There are 25,872 teachers in total in AJK as shown in the table below. Almost half of the teachers are primary teachers. According to the interviews for DEE staff who are in charge of teacher's training, the level of the teachers is not enough, especially for primary teachers.

Table 5.3.5 Number of Teachers in AJK

District	Primary		Junior		Senior		Subject		Others		Total		Grand Total
	M	F	M	F	M	F	M	F	M	F	M	F	
Neelum	352	178	185	66	106	30	0	0	19	7	662	281	943
Muzaffarabad	1,625	1,132	977	530	546	293	30	37	83	47	3,261	2,039	5,300
Bagh	1,092	911	702	480	383	277	29	21	61	44	2,267	1,733	4,000
Poonch	942	1,032	658	543	378	291	36	32	60	51	2,074	1,949	4,023
Sudhnoti	562	517	328	202	166	110	0	5	23	16	1,079	850	1,929
Kotli	1,351	952	773	464	419	251	21	19	65	45	2,629	1,731	4,360
Mirpur	717	614	463	393	272	235	6	23	43	45	1,501	1,310	2,811
Bhimber	744	573	411	316	208	175	5	15	30	29	1,398	1,108	2,506
Total	7,385	5,909	4,496	2,994	2,478	1,662	127	152	385	284	14,871	11,001	25,872

Source: Directorate of Public Instructions Elementary, "Pre & Post Earthquake Data, Educational Institutions (School and Colleges)" Azad Govt. of the State of Jammu & Kashmir, Muzaffarabad, 2006

[1] PTC: Elementary Collage (2 years) with Certification

The teacher student ratio by level is 1:36, 1:15 and 1:10 at primary, middle and high schools, respectively as shown in the table below. These figures, however, show the average in whole AJK. According to the interviews for Education Department in AJK, the ratio at primary school is about 100- 300 in rural area. In rural areas, teachers are not enough.

Table 5.3.6 Teacher Student Ratio by level

	Primary	Middle	High
Male	1 : 37	1 : 14	1 : 10
Female	1 : 34	1 : 17	1 : 11
Total	1 : 36	1 : 15	1 : 10

Source: Azad Kashmir at a Glance, Planning and Development Department Muzaffarabad, Azad Government of the State of Jammu and Kashmir

(7) Student

There are 525,242 students in primary, middle and high schools in AJK while total population for these age groups is 1,017,000 as shown in the table below. The enrollment ratio is 52% in total. The literacy rate in AJK is well above 60% which is significantly higher than the national average of Pakistan.

Table 5.3.7 Number of Students and Enrollment Ratio, 2005

Level	Sex & Age Group	Population	No. of Students	Enrollment Ratio (%)
Primary	Male: 05 - 09 Years	285,000	186,791	66
	Female:05 - 09 Years	274,000	181,001	66
	Total	559,000	367,792	66
Middle	Male: 10 - 12 Years	145,000	62,750	43
	Female:10 - 12 Years	131,000	50,219	38
	Total	276,000	112,969	41
High	Male: 13 - 14 Years	95,000	26,138	28
	Female: 13 - 14 Years	87,000	18,343	21
	Total	182,000	44,481	24
Grand Total		1,017,000	525,242	52

Source: Azad Kashmir at a Glance, Planning and Development Department Muzaffarabad, Azad Government of the State of Jammu and Kashmir

(8) Teaching Method

Teaching methodology in primary schools is very primitive. The learning emphasis is mostly on memorizing (learning by rote) the textbook contents rather focusing on comprehension and understanding of the contents. The use of audio-visual and teaching aids is highly needed but hardly used.

(9) Textbook

Textbooks are developed by DCRD with considering the situation in AJK. They are printed after the approval from NRC in the Federal Ministry of Education. Teacher's Foundation is in charge of printing for textbooks. Teacher's Foundation orders printing to printing company in Lahore after they receive script and illustrations from DCRD. There is no printing company, which can deal with color printing in AJK. Teacher's Foundation is in charge of textbook printing; however, their works are actually an order. Basically the printing company compiles and prints. The textbook is on sale in the bookstore. The price of the textbook is around 15 Rs. Textbooks are revised every five (5) to ten (10) years followed by the revised curriculum.

In Urdu and English textbooks, local heroes, poems and tales in AJK are used. For social studies, the textbook is prepared district-wise based on the names of places, rivers, and so on in respective district. While for social studies above 6^{th} grade, the same textbooks as federal one are used in AJK.

5.3.2. Issues on Disaster Management Education

The interview survey for teachers and students has been conducted by the JICA Study Team to ask the knowledge about disasters and the actual actions and behaviors just after the earthquake. The followings are issues in terms of the disaster management education clarified through the above analysis and the interview survey.

(1) Students

An interviewee of a student at 10^{th} grade knows the word of "earthquake," however he didn't know how it was before the earthquake. When the earthquake happened, he supposed it was "the judgment day." Some students did not know even the word of earthquake.

Students are not taught disasters in schools. Most of the students don't know disasters, their mechanism and how to be prepared. As a result, a lot of students were died or injured in the schools; and some students ran away from the schools without any instructions from the teachers just after shaking of the earthquake.

Under this circumstance, firstly students should learn what disasters are, how to be prepared, how to manage and behave when it happens so that they can secure their lives by proper preparedness and actions.

(2) Teachers

As well as teachers do not know disasters well. Off course, the most of teachers had not experienced the earthquake before October 8, 2005 even if they know the earthquake. There is not a guideline and a manual for disasters in schools.

Just after the earthquake, some teachers instructed the students and call over the name of students using attendance note to confirm their safety. Some teachers, who are mostly male, participated in rescue activities not only in the school but also the neighboring community. Even in the better case, the thing, which teachers could do for the students, were to instruct them to go home.

While some teachers have been injured by collapsed school buildings; they could not do anything for students. From the interview survey, some teachers, who were safe, could not do anything for students because they were scared and could not know what and how to do. Only the thing that could do was just sitting and crying.

Therefore teachers are required not only to learn disasters but also to learn what and how to do in such occasion, such as how to evacuate, secure the safety of students, first aid and so on.

(3) Teaching System

Due to the insufficient capacity of teachers and low quality textbook, the teaching system is not effective. Quality teaching requires teachers to have depth knowledge as a background of matters to teach. For example, if teachers teach the earthquake to students, they have to know not only the mechanism of the earthquake but also the science of the earth, natural science and how to manage disasters. For this purpose, teacher's training program together with teacher's guide has to be considered.

Textbooks have to be considered as well so that students can learn joyfully, be interested in the subjects and not only memorize but also think themselves. Some effective method and program should be considered such as field work, quiz and game. In terms of disaster management, there is no material on disaster management.

(4) School

In Japan, school is as headquarter for disaster management to help not only students but also neighboring communities. However it seems to be difficult for schools in AJK to be the

headquarters because school buildings are structurally weak; and there are not enough play grounds in some schools.

First of all, it is recommended that the school buildings are to be physically prevented against disasters. The systems for disasters should be established such as correspondence procedure, contact list, structure in emergency, stocks of water, food, medical supplies, etc.

5.4. Basic Concepts of Disaster Management Education

The disaster management education should be conducted based on the following key concepts.

- The disaster education in the earlier stage is effective.
- Each student should have one book to be imparted the information
- Student education should also include sensitization of parents in terms of multiplied effect.
- The contents of the education should be based on the relevant grades.
- It is important not only to have knowledge by lecture but also to understand practically through work-study program.
- For upper primary students, to study by self-thinking nourishes judicial and practical capacities.
- It is crucial for teachers to understand the importance and necessity of the disaster management education.

5.4.1. Development of Textbook for student

In this pilot project, textbook were developed targeting grades from one (1) to five (5) in the primary schools. The target students are divided into lower (grade 1-3) and upper (grade 4-5) primary. The two types of textbooks were developed in the project.

1) Lower Primary Student: Grade 1-3
2) Upper Primary Student: Grade 4-5

(1) Objective

The objective is to develop easily understandable textbook in accordance with the appropriate grades of the students.

(2) Aims

The followings are the aims for both lower and upper primary students.

Lower Primary Student (Grade 1-3)

- Students should follow the instructions of teachers and parents.
- Students are interested in disasters.

Upper Primary Student (Grade 4-5)

- Students can not only follow the instructions of teachers and parents but also rely on their own judgment and management.
- Students gain knowledge of disasters.
- Students can help with parents and friends.

(3) Principles

The textbooks have been developed based on the following principles.

- Using illustrations to make visually understandable.
- Being a total story to learn with fun.
- Using many questions for not memorizing but understanding by thinking.
- Using dialogue style for script
- Making students behave based on self judgment thorough understanding
- Making students think with looking at illustrations so as to judge depending on the circumstances.
- Considering contents which are showed by illustrations, scripts and supplemented by teachers (teacher's guide) corresponding with the grades.

5.4.2. Direction for Curriculum

Holding a class on disaster management education in schools, it is essential to consider about the curriculum. The curriculum in AJK follows the federal one. For the purpose to formalize the disaster management education, it is necessary to be incorporated in the federal curriculum. For the meanwhile, the disaster management education should be promoted as a pilot project under the current curriculum; then the curriculum should be considered with the feedback for the lessons learnt from the result of the pilot project.

The disaster management education should be executed as a permanent and standard curriculum instead of a temporary event. Even the next earthquake will happen after 100 or

1,000 years, the education should be continued and developed to be a culture of disaster management education through the generations.

Currently not only students but also teachers are lacking knowledge, experiences, and capacities for disaster management. In terms of sustainability, it is recommended to start the disaster management education from the reasonable level; and it should be improved and developed though the continuation.

In line with the current curriculum, it is recommended that the general subject including mathematics and social studies, which is called integrated subject for lower primary and the science or social studies for upper primary should be used for the disaster management education. In addition, it is recommended that the date of October 8 should be designated as the day of disaster management, and the lesson for the disaster management education should be conducted on that day. In total two (2) or three (3) lessons a year are proposed for the disaster management education. Especially, the month of May is appropriate time because it starts monsoon, when it becomes more hazardous for landslide so that awareness would be raised.

Utilizing Urdu class for the disaster management education is more effective by using stories of disasters. The following ideas should be considered to be included in the curriculum for the disaster management education in the future.

- Disaster management drill
- Poster contest
- Composition contest

5.5. Teacher's Guide

5.5.1. Objectives of Teacher's Guide

JICA Study Team has developed the textbooks, "Natural Disaster and Survival Techniques", specially prepared for Primary Students in the Earthquake affected areas. In terms of their developing stages, textbooks comprise two types, one targeting Class from 1 to 3; another is for Class 4 and 5. Along with the textbooks, students should be taught the topics on Disaster Management Education in the effective manner with the help of teacher's guidance. Therefore it is highly recommended for teachers to attend the proper training before imparting the important information to their students.

Teacher's guide was designed for every teacher who would like to hold a well-organized class on Disaster Management Education by using the textbook. It helps even those who

have not taken a proper training, to understand how to utilize the textbook effectively in their classes.

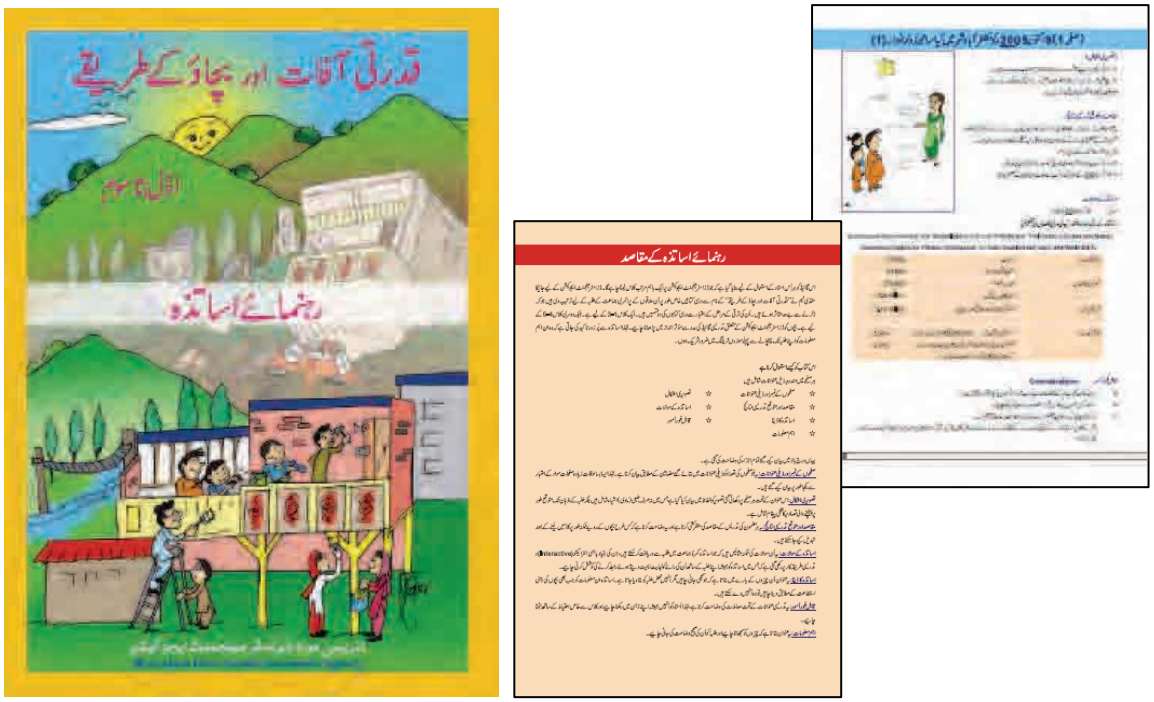


Photo: Teacher's Guidebook on Disaster Management Education

5.5.2. Key Concept for Development of Teacher's Guidebook

Teacher's Guidebook is developed based on Japanese experience, taking into account the following key concepts;

1. Consideration for the children who are traumatized is described. .
2. Objectives and Expected Learning Outcomes for each topic are clearly specified.
3. Detailed information on natural disaster including of earthquake is provided.
4. To hold an interactive class, explanation of the illustrations and teacher's questions are mentioned.

5.5.3. How to use Teacher's Guidebook

In the guide, each page consists of the following items below;

- **Page Number and Subtitle**
- **Illustration**
- **Objectives and Expected Learning Outcomes**
- **Teacher's Questions**

- **Important Information**
- **Teacher's Data**
- **Considerations**

The followings are explanations of each indicated item;

- **Page Number and Subtitle**

This shows numbers of the page according to the topics indicated in the subtitles. So some pages are jointly explained in terms of contents.

- **Illustration**

This explains the picture of each page verbally including of not only the physical objects but also the hidden message of the pictures expected to be imparted to the students.

- **Objectives and Expected Learning Outcomes**

This demonstrates the aims of teaching each topic and explains how children's behaviors would be possibly changed after having the class.

- **Teacher's Questions**

These are the examples of the possible questions which teacher can ask from the students in class, based on the concept of interactive teaching methods, in which teachers should always try to communicate with their students in the greatest respect for their opinions.

- **Important Information**

This show the things should be understood and clearly explained to the students.

- **Teacher's Data**

This show the things should be understood but unnecessary explained to the students. Teachers can always impart this information whenever they feel that it is effective to explain according to mentality of the children.

- **Considerations**

Theses explain the issues surrounding the teaching topic; therefore teacher should always keep them in mind and should manage the class with special care.

In order to have an effective class, teacher should be expected to read the above items carefully and prepare themselves before the class.

5.6. Training on Disaster Management Education

5.6.1. Strategy for the trainings

JICA Study Team conducted two types of training, one for Training of Trainers (so-called ToT) and another for Teacher's Training (so-called T.T.) in January in collaboration with Department of Education AJK in Muzaffarabad. Training of Trainers was designed based on strategy for the trainings of "The project for promotion of Disaster Management Education in Muzaffarabad City", one of urgent rehabilitation projects of "The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City in the Islamic Republic of Pakistan". The aim of the training was basically to prepare master trainers in order to fulfill our objectives, which are to strengthen teachers' and students' abilities to manage natural disaster including earthquakes in Muzaffarabad City and to promote Disaster Management Education through responsible agency, Department of Education, AJK. Hence, it was deliberately considered that involvement of governmental agency would play a vital role for making a ripple effect on promotion of Disaster Management Education in AJK as well as in the city.

The aims of Teacher's Training are already mentioned in this report before. Since JICA Study Team constructs the model school for disaster management as one of the pilot projects, it is very significant for the school to comprise soft component as well as physical function in terms of disaster preparedness. The school can contribute to the prevalence of Disaster Management Education, to disseminate its information and practice, which will be accessible to everyone. These ideas are implicated with our basic concept, which is that students are the main targets for this whole project, expecting to be transferred what they gain to their families and neighbors.

5.6.2. Training of Trainers (ToT)

It was five days training from January 8th to 12th 2007 conducted by JICA Study Team in collaboration with Department of Education AJK. The participants were mainly selected from the department of curriculum and research development (DCRD) and department of education extension (DEE), taking account of gender balance. And 10 school headmasters/mistresses were allowed to participate in the training in the response to the department's request. As a result, there were 24 participants excluding of resource persons from DCRD and DEE, Geological Survey of Pakistan (GSP), Pakistani Red Crescent Society and JICA Study Team in the training.

(1) Components for ToT

The training covered a range of areas including:

- Overview of natural disasters and some other disasters in Pakistan and Azad Jammu and Kashmir (Drought, Flood etc.)
- Mechanism of earthquake
- Survival Techniques and (Evacuation Drills)
- Japanese Experience on Disaster Management Education
- Sharing of materials developed by JICA Study Team
- Methodology of teaching the material
- Effectiveness for usage of teaching aids (Animated story etc.)
- Holding model class in a school
- First Aid (Theory and Practical)
- Psychosocial Interventions (Introduction of the Story book "Hippo's feelings")
- Japanese Art "Origami"
- Risk of Epidemics in Disaster Areas
- Sanitation and Hygiene
- Child Rights

Photo: Lecture on Fist Aid was conducted by Pakistani Red Crescent Society

Photo: Japanese teaching aid was introduced to understand the mechanism of earthquake

(2) Outcomes of ToT

Through the training, some positive outcomes were observed from the participant's feedbacks One of the most encouraging points was that the materials developed by Study Team have proved their attractiveness and effectiveness for learning about disaster management education through model class in an actual school in Muzaffarabad. Students pick up the things very quickly with a help of the pictures in the materials. Comments about the training are also encouraging, here some of feedbacks received from the participants.

"The workshop was very interesting. All the participants of the workshop showed great interest in the sessions."

"As a whole the participants of the workshop took part with great interest. The experts expressed their point of views in a very befitting manner."

"Workshop is going on very well and the objectives are been fulfilled. The preparation of the books for the children is a better effort."

"Workshop is the most suitable source of information. These kinds of workshops should always be organized so that more information and knowledge would be gained."

"The workshops of this kind are sources of Awareness and they would become useful information not only for us but for other people specially children."

Photo: Students were actively learning about disaster management education through conducted model class

(3) Development of Teaching Aids

JICA Study Team has introduced some teaching aids for conducting more effective class on disaster management education. One of them is an Animated story on Survival Techniques, audio-visual teaching aids, produced by Study Team in collaboration with a local animation studio. In terms of the animation, positive feedbacks were received from the participants.

Regarding psychological intervention, Study Team has prepared a picture-story show, so-called "*KAMISHIBAI*" in Japanese. According to the expertise, the victims of the Great Hanshin-Awaji Earthquake exhibited some symptoms such as regression, physiological response and emotional-behavioral response. Hence healing the mental scars was a prioritized issue especially in schools after the quake. Based on Japanese experience, the story, "Hippo's feelings" by Dr. Yoshiki TOMINAGA, Japanese professor of Hyogo University of Teacher Education on psychological trauma, was translated to both English

and Urdu, which is Pakistani official languages, and introduced to the participants as “Hippo ka ehesasaat”

Photo: Picture-story show, “Hippo’s feelings” by Dr. Yoshiki TOMINAGA

Photo: Trainees and students showed their interests, watching on animated story on Survival Techniques

5.6.3. Teacher's Training (T.T.)

Consequently, in collaboration with Department of Education AJK, Teacher's Training (T.T.) was conducted for five days from January 22nd to 26th 2007. Most of the participants were teachers from Sathi Bagh government girls high school and some members from Pakistani Red Crescent Society were allowed to join in the training. As a result, there were 27 participants excluding of resource persons from DCRD and DEE, Local NGO, "Sahil", Pakistani Red Crescent Society and JICA Study Team in the training.

The training covered a range of areas including:

- Overview of natural disasters and some other disasters in Pakistan and Azad Jammu and Kashmir (Drought, Flood etc.)
- Mechanism of earthquake
- Survival Techniques and (Evacuation Drills)
- Japanese Experience on Disaster Management Education
- Sharing of materials developed by JICA Study Team
- Methodology of teaching the material
- Effectiveness for usage of teaching aids (Animated story etc.)
- Holding model class in a school
- First Aid (Theory and Practical)
- Psychosocial Interventions (Introduction of the Story book "Hippo's feelings")
- Japanese Art "Origami"
- Risk of Epidemics in Disaster Areas
- Sanitation and Hygiene
- Child Rights

Photo: Trainees were sharing what they learnt from the training with the others

5.7. Recommendations

In principle, the continuation of the disaster management education is highly essential. Through the continuation, it is required to revise the textbooks and the teacher's guide following the teacher's training based on the feedbacks and lessons learnt. Furthermore, it is desirable to expand the disaster management education not only in Muzaffarabad but also the whole AJK and even for the whole Pakistan. In order to achieve this future vision, it is necessary that the disaster management education should be incorporated in the Federal curriculum.

The level of education should be upgraded from imparting simple to complex concepts in a stepwise manner because currently the knowledge and awareness level is very low not only for students but also for teachers and parents. In the future, first aid and evacuation drill should be included in the disaster management education.

For the time being, mental care is important for the earthquake-experienced students. For this purpose, it is desirable to look to the experts for mental care.

Apart from the disaster management education, for the reconstruction of school buildings, disaster management measures should be applied. Disaster management model school of Sathi Bagh government girl's high school is expected to lead by example for the other school buildings. The disaster management school should be equipped with stocks in emergency,

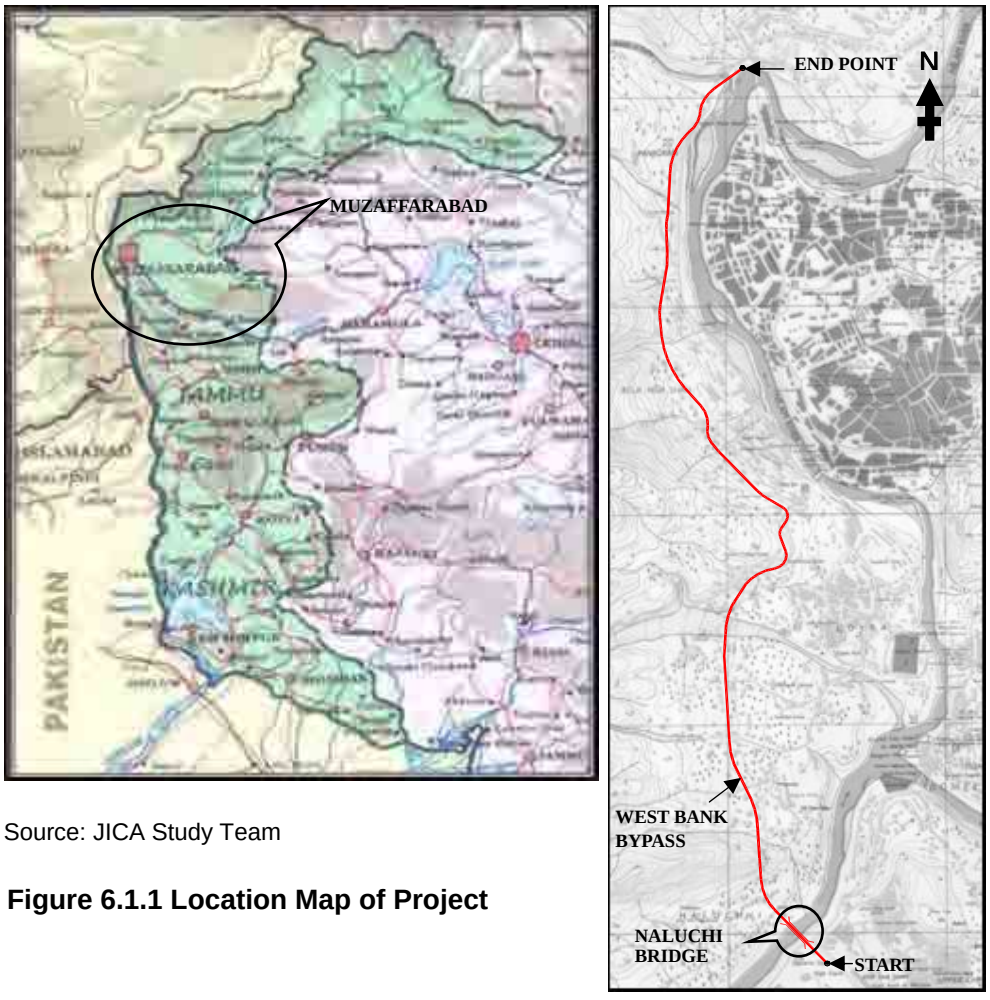
such as water, food, and medical supplies. The system for emergency should be established; and the manual for teachers should be prepared based on the systems.

6. WEST BANK-BYPASS PROJECT

6.1 General

The project intends to decrease traffic congestion in Muzaffarabad city and to enhance rehabilitation activity. Moreover, the villages located in the northern part of the city will enhance rehabilitation and development. The project will be a symbol for rehabilitation of the Muzaffarabad city. For these reasons, in the rehabilitation and reconstruction master plan, the high priority was given to the west bank-bypass project that aimed to reinforce the new trunk route in the west of the Neelum river. The study team carried out the preliminary design for the new bypass road that will consist of a 5.7 km long road including a new bridge. The preliminary design study of West Bank-bypass Project is comprised the following scope of works;

1) Topographic & Geotechnical Survey
2) Traffic Survey and Demand Forecast
3) Road Alignment Study
4) Natural Disaster Hazard Study
5) Alternative Study of Naluchi Bridge
6) Preliminary Environmental Study
7) Procurement Condition Study
8) Implementation Plan



Source: JICA Study Team

Figure 6.1.1 Location Map of Project

6.2 Topographic & Geotechnical Survey

6.2.1 Topographic Survey

The major scope of works of topographic survey to conduct is compromised as follows;

- Primary Control Point Survey
- Traverse Survey
- Topographic Mapping Survey
- Road Centerline Survey and Profile Survey
- Road Cross Section Survey

The survey quantities to be conducted are shown in Table 6.2.1.

Table 6.2.1 Topographic Survey Quantities

Work Item	Work Quantities
Primary Control Point	2 locations
Travers Survey	9,600 m
Topographic Mapping Survey	55 ha
Centerline and Profile Survey	5,600 m
Cross Section Survey	250 sections

Source: JICA Study Team

6.2.2 Geotechnical Investigation

The content of survey are divided into the following three works;

- Survey for Road and Bridges Section
- Survey Landslide Section
- Survey for Existing pile of Naluchi Bridge

The geotechnical investigation items and quantities of surveys are shown in Table 6.2.2.

Table 6.2.2 Geotechnical Investigation Items and Quantities

Work Item	Work Quantities
Boring Investigation	
1) for Abutment and Pier of Naluchi Bridge	5 locations (total 71 m)
2) for Small Size Bridge	3 locations (total 39 m)
3) for Landslide Section	1 location (50 m)
Existing Pavement Condition Survey by Test Pit	5 locations
Laboratory Test for Gravel and Rock Samples	As required

Source: JICA Study Team

(1) Naluchi Bridge

Based on above drilling data and field geological survey, geological profile of the Nalichi Bridge was prepared.

The basement rock on the Naluchi Bridge is composed slate of Muzaffarabad Formation of Precambrian era. The said rocks are very hard, however, having high schistcity with open cracks. This formation strikes N 10°W and dips 80°W to the Jhelum River on the left bank. The Slope of cliff on left bank shows more than 45°and several rock falls are found here and there. On the other hand, the same formation on the right bank shows a plunging structure with gentle slope and it seems stable. RQD (Rock Quality Designation) value of the said rock is resulted at approximately 0 % due to exfoliation of the rock.

(2) Small Bridge

There are four permanent rivers on the proposed route alignment, and among them, three small size bridges are proposed. Boring works were carried out for there bridges. Soil profile Result of boring is shown in Figure 6.2.3.

(3) Landslide Section

Landslide NL64 is the biggest landslide. And its direction of sliding is crossing the proposed route.

Boring survey is carried out for NL64 landslide as a main target. The geological profile of landslide is shown in Figure 6.2.4.

Result of field geological survey is as follows.

This landslide is classified as ridge type.

There are 4 flat surfaces on the slope.

Almost trees on the slope are standing up right.

There is no spring water on the foot of slope.

There are no new open cracks around upper scarp.

On the upper slope, hard sandstone is found. The strike and dip of formation shows N40E, 30SE. This forms dip slope.

On the foot of slope, soft red shale is found. The strike and dip of formation shows N40 E, 60SE.

It is difficult to find slipping surface in the talus deposits. Ground water table could not be found. From the geological and geomorphologic points of view, this landslide is stable at present. It seems that this landslide will be stable unless big cutting work is not carried out on the foot of slope.

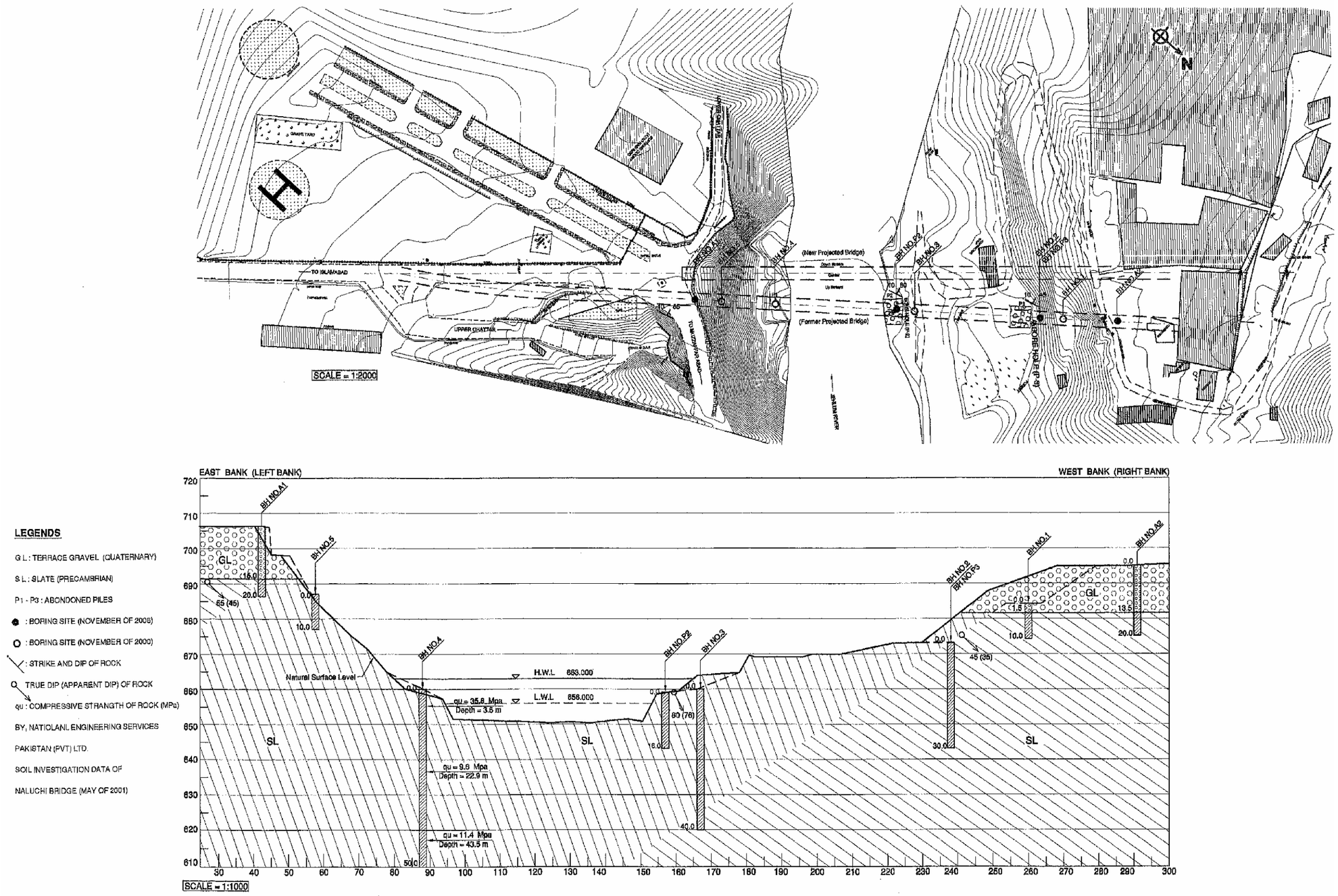


Figure 6.2.1 Geological Profile of Naluchi Bridge at Over River Section

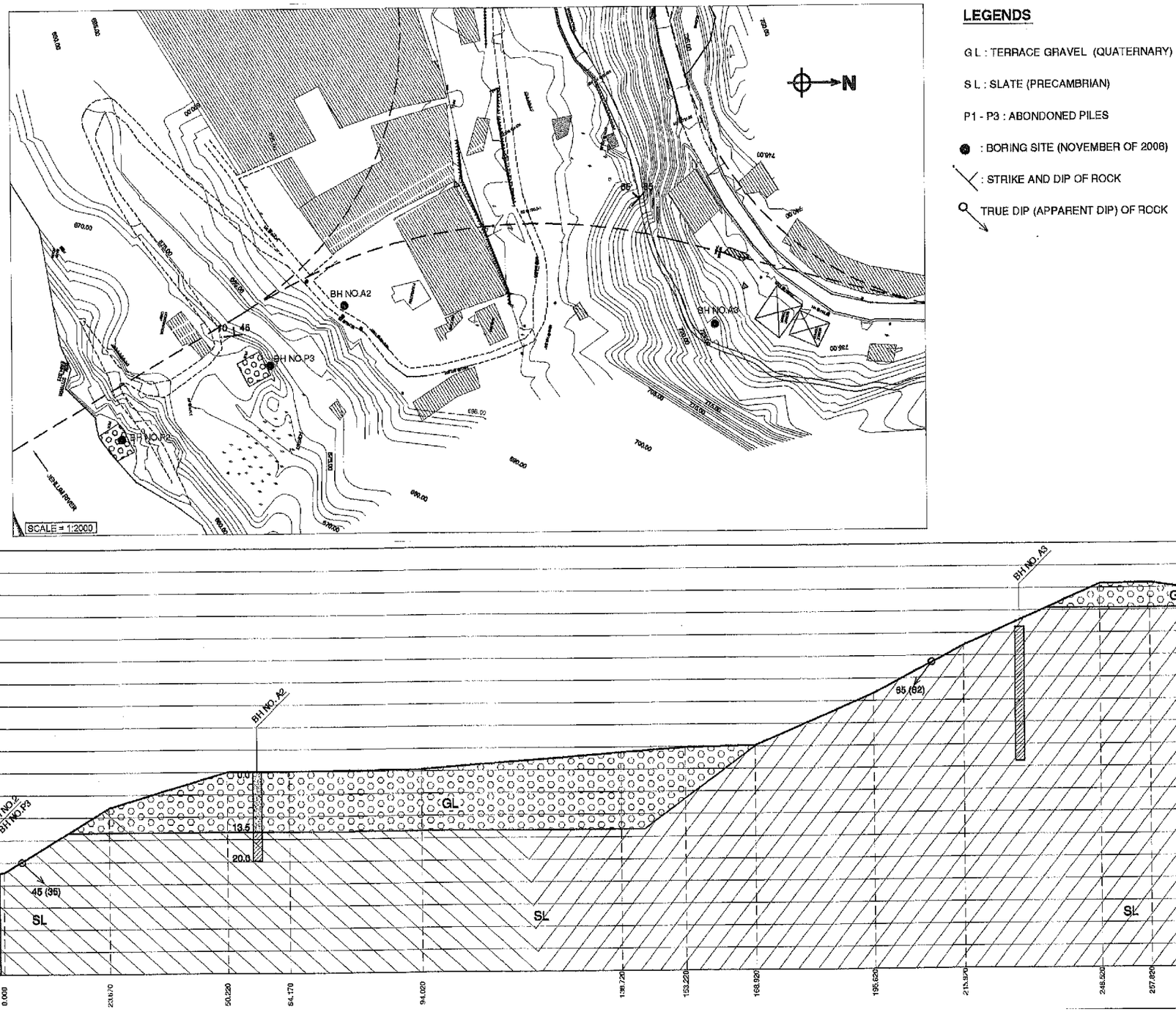


Figure 6.2.2 Geological Profile of Viaduct Section after Naluchi Bridge

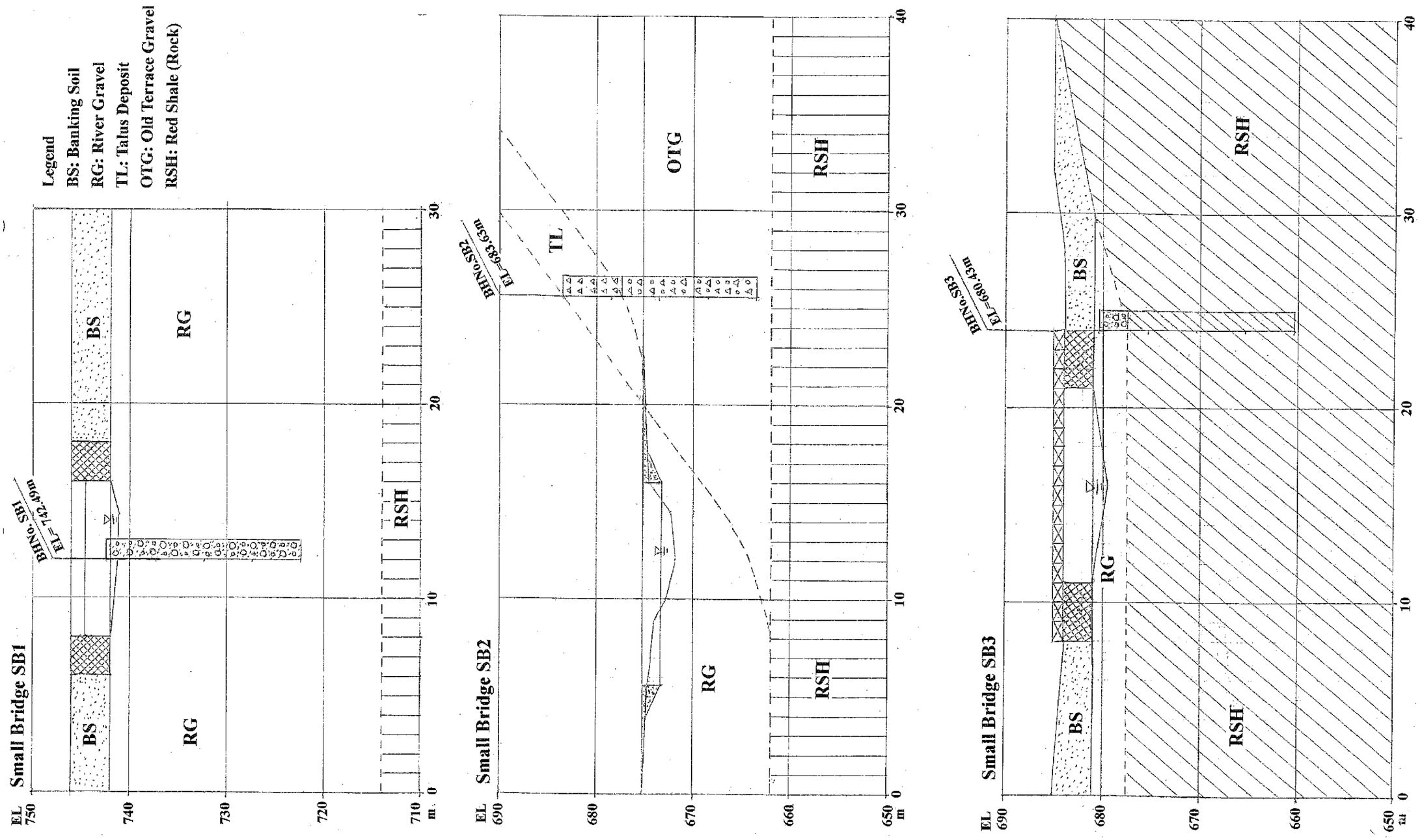


Figure 6.2.3 Geological Profile of Small Size bridges

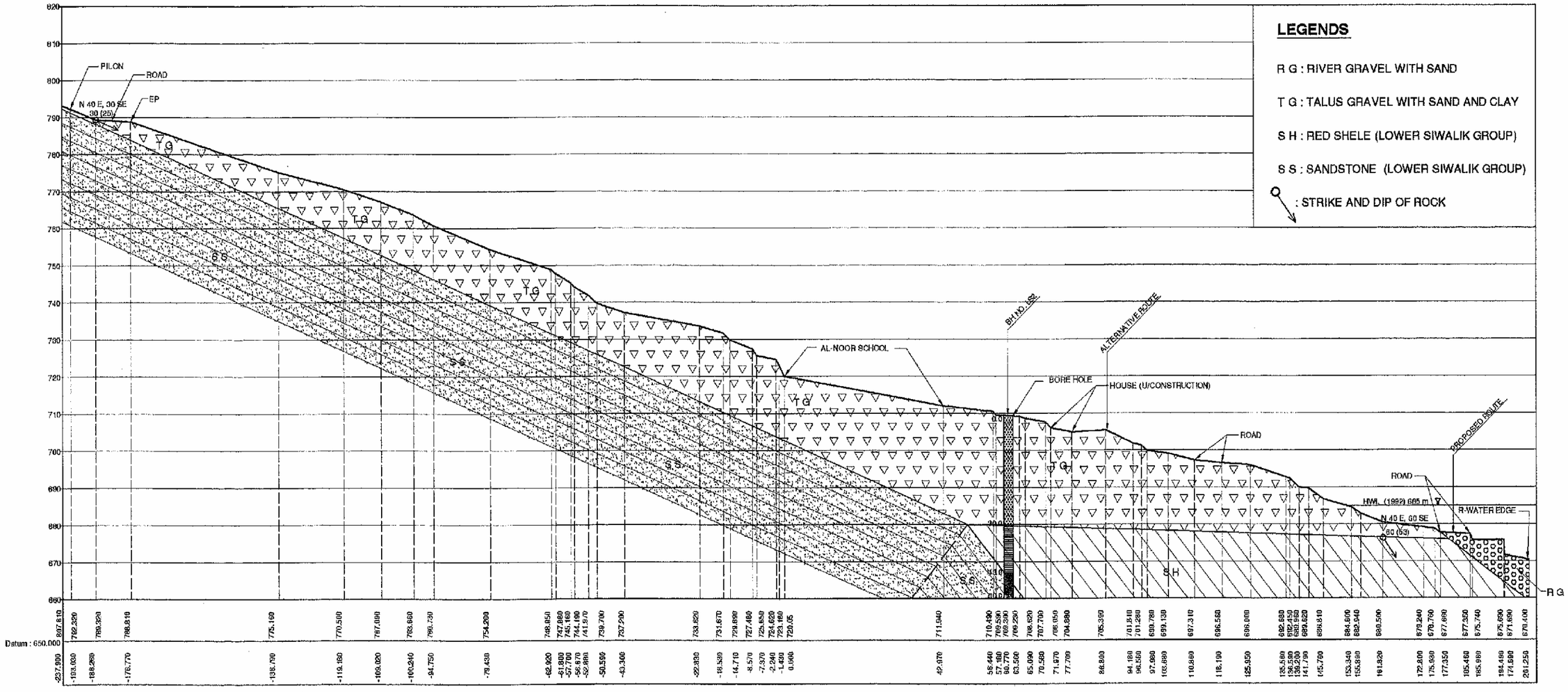


Figure 6.2.4 Geological Profile of Landslide Section

(4) Laboratory Test

A series of laboratory tests for soil, rock and concrete sample were carried out. The results of laboratory test for the Naluchi Bridge and small bridge is shown in Table 6.2.5. Result of laboratory test for landslide is shown in Table 6.2.6.

The design parameters of soil may be established form results of direct shear test as the below table;

Table 6.2.3 Design Parameter of Gravely Soil (Average)

Soil Type	Angle of Internal Friction(°)	Cohesion (KPa)	Bulk Density (gf/cm^3)
Gravely Soil	35	0.2	2.03

Note: USCS = Unified Soil Classification System

Source: JICA Study Team

The rock tests are carried out for slate of Muzaffarabad Formation, red shale and hard sand stone of Siwalik Group Test and results are as below table;

Table 6.2.4 Design Parameter of Rock (Average)

Rock	Compressive Strength (MPa)	Bulk Density (gf/cm^3)
Slate	15.8	2.804
Sandstone	36.6	—
Red shale	0.4	2.320
Sandstone	3.3	2.320

Source: JICA Study Team

Table 6.2.5 (1) Summary of Laboratory Test for Road and Bridge

Sample No.	Depth	Grain Size Analysis by ASTM (% Passing)													Atterberg Limits			Direct Shear Test		Soil Classification	Bulk Density	Natural Moisture content	Unconfined compression strength	Specific Gravity
		3"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200	0.005(mm)	LL	PL	PI	Angle of Internal Friction(degree)	Cohesion(kps)	USCS	gf/cm3	%	Mpa	
Naluchi Bridge Central Pier (BH-P2)																								
P2-1	11-12m																				2.771		4.06	2.41
P2-2	14-15m																				3.033		18.13	2.41
Naluchi Bridge Right Abutment (BH-P3)																								
P3-1	6m	100	77.59	49.43	35.83	31.15	26.55	17.90	13.91	9.31	8.16	6.44	4.14		NP		NP			CL-ML	2.55	7.09		2.69
P3-2	12m	100	100.00	84.83	73.06	71.47	69.02	67.80	57.45	36.13	25.41	13.49	1.57		NP		NP			CL	2.68	6.15		2.68
P3-3	14m	100	50.94	30.19	22.64	20.75	19.81	17.92	15.09	10.38	7.55	4.72	1.89		NP		NP			GW	2.69	3.20		2.66
Naluchi Bridge Right Abutment (BH-A3)																								
A3-1	1m	100					28.0	22.5		18.0			9.4	5.0	NP		NP	37	0.4	GW	2.04			2.41
A3-2	3m	85					0.9	0.7		0.6			0.4	0.3	NP		NP	37	0.4	GW	2.04			2.41
A3-3	6m	100					20.0	17.5		13.0			10.0	5.0	NP		NP			CL-ML	2.03			
A3-4	8m	97					57.0	52.0		37.5			28.0	18.0	27	20	7			CL				2.70
A3-5	12m	100					29.0	16.0		11.0			6.8	4.0	NP		NP			GW	2.01			2.69
A3-6	16m	100					59.0	39.0		26.0			14.0	10.0	NP		NP			GW				
A3-7	20m	100					53.5	40.0		27.5			15.0	11.0	24	20	4			CL	2.00			2.70
Bridge No.-1 at RD 2+000(BH-SB1)																								
SB1-1	4m	100	100	100	94.55	90.47	75.92	43.20	28.60	17.74	14.11	10.47	6.83		NP		NP			GW		9.62		2.64
SB1-2	6m	100	100	100	100	100	89.68	58.73	41.54	27.79	20.91	14.03	7.15		NP		NP			GW		11.93		2.69
SB1-3	12m	100	100	100	100	100	100.00	85.71	64.29	33.33	21.43	9.52	2.38		NP		NP			GW		20.11		2.66
SB1-4	16m	100	100	100	100	100	87.50	62.50	37.50	22.50	15.00	10.00	5.00		NP		NP			CL-ML		27.05		2.70
SB1-5	18m	100	100	100	100	100	47.17	37.74	24.53	16.98	13.21	9.43	3.77		NP		NP			CL		16.60		2.69
Bridge No.-2 at RD 3+700(BH-SB2)																								
SB2-1	1m	100					26.00	17.00		11.50			6.90	0.70	NP		NP	32	0.1	GW	2.02			2.750
SB2-2	3m	100					85.00	83.00		81.50			79.00	16.00	27	20	7	-	-	CL-ML	-	7.00		
SB2-3	5m	100					84.00	64.00		55.00			50.00	18.00	33	22	11	-	-	CL	1.98	6.80		2.685
SB2-4	7m	100					60.00	57.50		55.00			50.00	26.50	35	25	10	-	-	CL	-	5.90		
SB2-5	9m	100					25.00	24.00		20.00			16.00	0.40	NP		NP	35	0.1	GW	2.01			2.745
SB2-6	12m	100					18.00	16.00		1.20			0.50	0.35	NP		NP	-	-	GW	-			
SB2-7	13m	100					50.00	36.50		20.00			11.00	0.55	NP		NP	36	0.2	GW	2.03			2.725
SB2-8	16m	100					80.00	65.00		56.00			44.00	22.00	27	20	7	-	-	CL	-	6.50		2.722
SB2-9	19m	100					49.00	42.50		37.00			32.00	17.00	32	24	8	-	-	GC	-	5.90		
SB2-10	20m	100					8.00	6.00		5.00			4.00	0.55	NP		NP	-	-	GC-GM	-			

Table 6.2.5 (2) Summary of Laboratory Test for Road and Bridge

Sample No.	Depth	Grain Size Analysis by ASTM (% Passing)													Atterberg Limits			Direct Shear Test		Soil Classification	Bulk Density	Natural Moisture content	Unconfined compression strength	Specific Gravity
Bridge No.-3 at RD 4+800(BH-SB3)																								
SB3-1	4m		100	93.21	86.91	78.66	67.32	49.79	37.42	25.05	20.93	16.80	8.55		NP		NP			CL	2.677			2.68
	7m																						36.60	
SB3-2	11m		100	100	41.84	32.64	32.35	31.47	23.42	16.52	12.31	8.92	0.28		NP		NP			GW	2.530			2.81
SB3-3	16m		100	76.62	71.36	68.01	49.00	43.02	29.43	14.17	11.32	6.65	4.58		NP		NP			GW	2.590			2.78
SB3-4	20m		73.93	66.58	53.92	52.54	49.50	38.01	31.27	23.76	19.85	14.50	5.67		NP		NP			GW	2.630			2.71

Table 6.2.6 Summary of Laboratory Test for Landslide

Sample No.	Depth	Grain Size Analysis by ASTM (% Passing)													Atterberg Limits			Direct Shear Test		Soil Classification	Bulk Density	Natural Moisture content	Unconfined compression strength	Specific Gravity
		3"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200	0.005(mm)	LL	PL	PI	Angle of Internal Friction(degree)	Cohesion(kps)	USCS	gf/cm3	%	Mpa	
LS2-1	1m	100	100	100	100	100	75.00	52.78	44.44	36.11	30.56	19.44	48.33		NP		NP					21.41		2.69
LS2-2	9m	100	100	100	100	100	77.50	50.00	35.50	25.50	15.50	8.00	3.00		NP		NP					11.09		2.68
LS2-3	12m																				2.60	7.09	22.20	
LS2-4	14m	100	100	100	100	100	45.95	28.38	18.92	13.51	8.11	4.05	1.35		NP		NP					3.59		2.66
LS2-5	18m	100	100	100	100	100	75.00	50.00	32.69	21.15	11.54	5.77	1.92		NP		NP					2.67		2.70
LS2-6	22m	100	100	100	100	100	43.84	27.40	20.55	13.70	10.96	6.85	2.74		NP		NP					8.42		2.68
LS2-7	27m	100	100	100	100	100	75.00	55.56	41.57	30.56	22.22	13.89	2.78		NP		NP					6.24		2.75
LS2-8	31m																				2.32		0.4	
LS2-9	33m	100	100	100	100	100	86.11	44.44	25.00	16.67	13.89	8.33	5.56		NP		NP					9.18		2.69
LS2-10	38m	100	100	100	100	100	66.67	36.11	22.22	13.89	11.11	8.33	5.56		NP		NP					5.09		2.71
LS2-11	44m	100	100	100	100	100	57.41	27.78	20.37	14.81	12.96	9.26	3.70		NP		NP					6.85		2.72
LS2-12	46m																				2.32		3.28	
LS2-13	47m	100	100	100	100	100	20.00	13.33	10.00	8.33	6.67	5.00	3.33		NP		NP					4.11		2.71

(5) Existing Road Pavement Survey

The existing pavement thickness to be measured and soil parameter of sub grade portion is shown in Table 6.2.8. Items of existing road pavement survey are as follows.

- Existing Pavement - Carriage way Width
- Formation Width - Height of Embankment
- Crust Thickness - In- Situ Density
- Field Moisture Content - Test Pitting
- Laboratory Test for CBR

All sub-grade soil samples were tested for Design CBR under soaked condition for 96 hours. The CBR moulds were prepared at three levels of compaction in accordance with AASHTO T193. The range of CBR values to be obtained at 0.2 inch penetration is as follows.

90 % of Compaction : CBR = 8.5 % ~ 16.3 %
95 % of Compaction : CBR = 18.9 % ~ 34.4 %
100 % of Compaction : CBR = 27.5%-50.4%

Table 6.2.7 Pavement Thickness and Soil Property of Subgrade

Location	Mettled Width in meter	Formation Width in meter	Height of Embankment meter	Existing Crust Thickness Sheet in " cm "				Field Dry Density g/cc	Field M.C %	Max Dry Density g/cc	OPT M.C %	Compaction %
				Surfacing	Base	Sub-Base	Total Thickness					
Tp1/ km-0+500 L/S	_	_	_	TST washed	13.0	22.0	35.0	2.118	6.8	2.131	6.8	98.6
Tp2/ km-0+900 L/S	7.90	9.10	R/S 3.60 L/S 1.0Down	3.00	15.0	20.0	38.0	2.000	8.0	2.167	6.5	93.8
Tp3/ km-1+400 L/S	7.00	10.00	R/S 0.50 L/S NSL	2.50	26.0	22.0	50.0	1.947	8.6	2.120	7.1	91.8
Tp4/ km-4+800 L/S	7.00	9.50	Built up area	3.50	16.50	30.0	50.0	2.100	6.5	2.145	6.9	97.9
Tp5/ km-5+500 Main Abotabad Road	6.10	10.00	Hilly Area	10.00	25.0	65.0	65.0	_	_	22.000	6.0	_

Source: JICA Study Team

Table 6.2.8 Summary of CBR Test

Location	Passing %age Through Sieve Size											Atterberg Limits			AASHTO Soil Classification	Laboratory Compaction		CBR Value 0.2"		
	2½"	2"	1½"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#200	LL	PL	PI		Max Dry Density g/cc	OPT M.C%	90%	95%	100%
Tp1/ km-0+500	_	100	95	86	79	74	72	67	50	20	14	Non-Plastic			A-1-a	2.131	6.8	8.5	19.8	30.7
Tp2/ km-0+900	_	_	100	95	89	80	76	65	48	28	23	24	20	4	A-1-a	2.167	6.5	9.8	19.8	31.9
Tp3/ km-1+400	_	_	100	99	94	88	82	73	47	30	25	25	20	5	A-1-a	2.120	7.1	10.2	18.9	27.5
Tp4/ km-4+800	_	100	94	92	89	83	79	69	55	33	25	25	20	5	A-1-b	2.145	6.9	12.3	22.5	35.8
Tp5/ km-5+500	100	78	70	66	63	61	60	58	49	26	19	24	20	4	A-1-a	2.200	6.0	16.3	34.4	50.4

Source: JICA Study Team

6.3 Traffic Survey and Demand Forecast

6.3.1 Traffic Survey

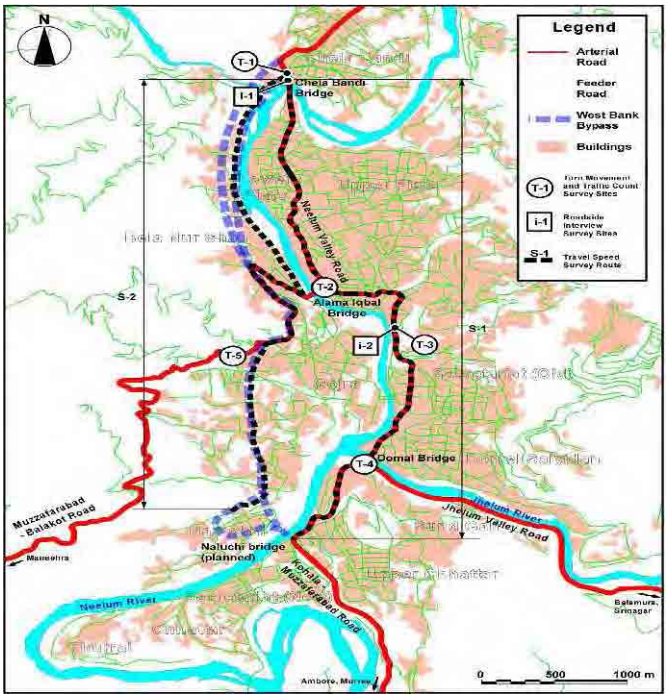
The following traffic surveys were executed from 27th – 30th November 2006, in order to quantify current traffic volume and conditions as a basic information for the demand forecast for West Bank Bypass Road;

Traffic count survey	:	5 locations (6:00am – 24:00pn, 18 hours)
Road side interview survey: (O-D survey)		2 locations (6:00am – 24:00pn, 18 hours)
Travel speed survey	:	2 routes

Concerning to the traffic demand forecast, the following reports are considered into the demand analysis;

Future ordinary traffic : "The Pakistan Transport Study in the Islamic Republic of Pakistan (PTPS), March 2006, JICA"

Earthquake-related traffic and city inner traffic : "The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City in the Islamic Republic of Pakistan", , January 2007, JICA" Finalr report I -Volume 2 Sector Report.



Source: JICA Study Team

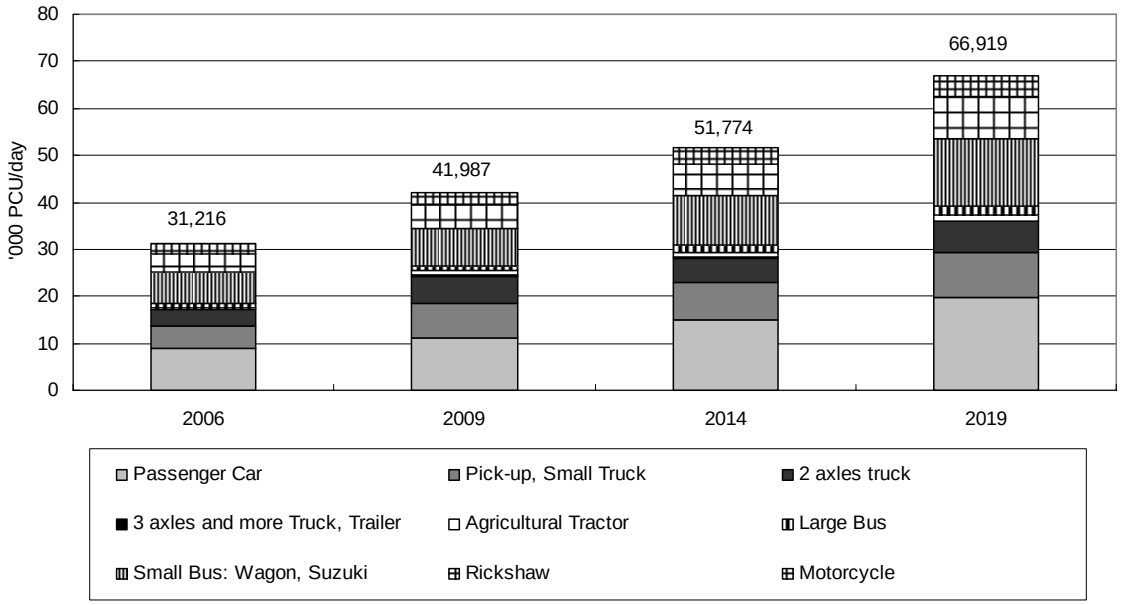
Figure 6.3.1 Location of Traffic Survey Sites and Route

6.3.2 Traffic Demand Forecast

(1) Future Traffic Demand in Muzaffarabad

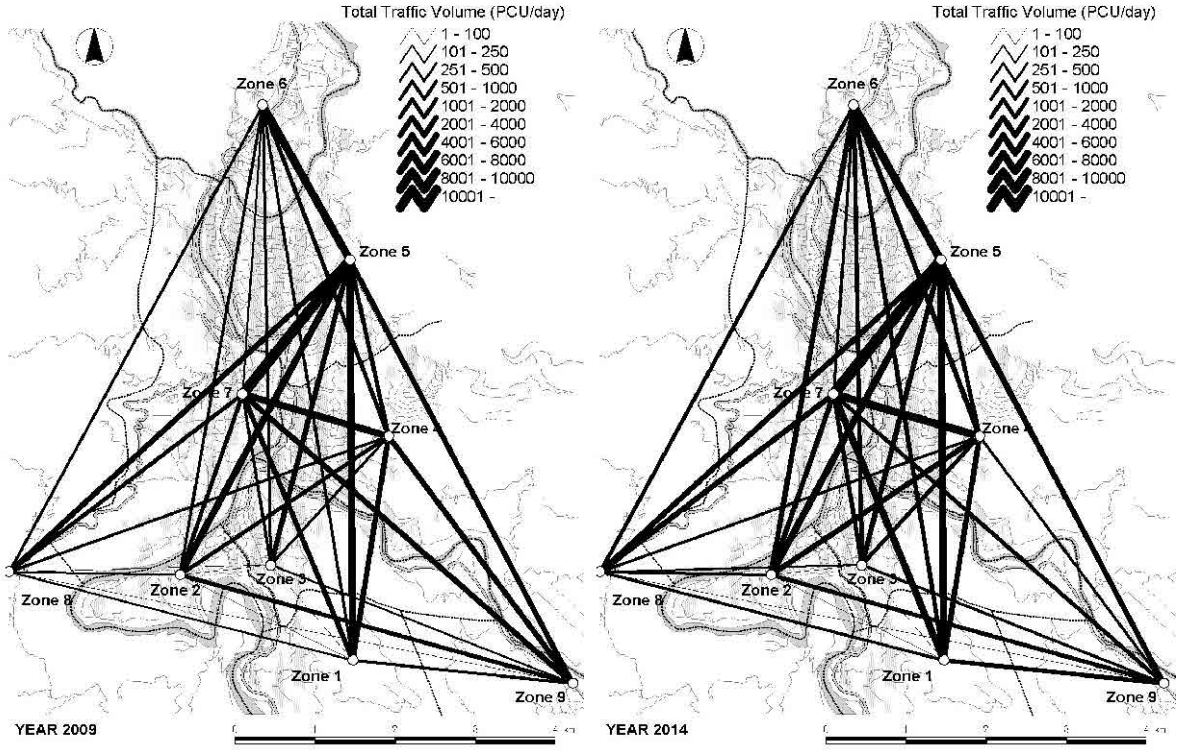
The ordinary traffic and earthquake-related traffic is a future traffic demand in Muzaffarabad and surrounding areas. The total number of daily vehicle trip is estimated 41,987 PCU in 2009, 51,774 PCU in 2014, and 66,919 PCU in 2019 as shown in Figure 6.3.2.

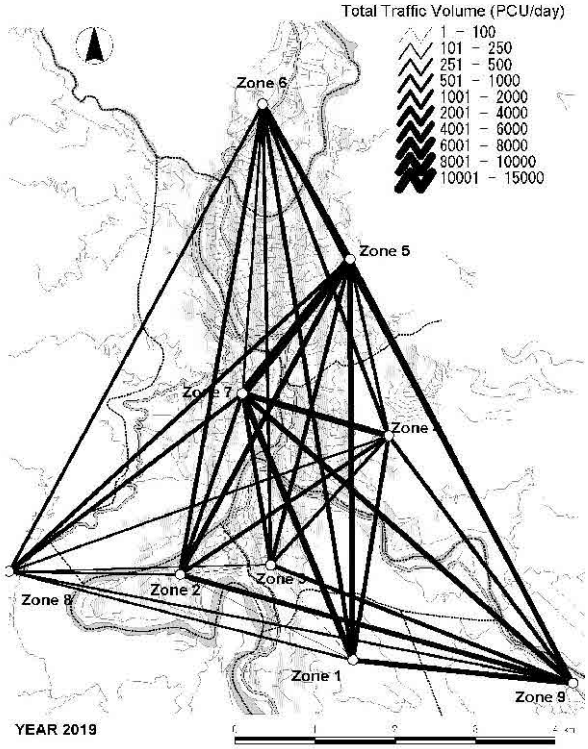
Forecasted future vehicle trip distribution is shown in Figure 6.3.3. It is expected that Muzaffarabad city centre (zone 5) continues to be the centre of daily activities of this area in future, however, the weight of Muzaffarabad city centre (zone 5) will decrease because this zone is already almost saturated and increasing population will be accepted in other area such as Chela Bandi (zone 6) and Gojra (zone 7).



Source: JICA Study Team

Figure 6.3.2 Future Vehicular Trip Volume





Source: JICA Study Team

Figure 6.3.3 Future Vehicular Trip Distribution

(2) Future Traffic Demand on West Bank Bypass

West Bank Bypass route has two alternative sections. For considering future traffic demand on West Bank Bypass, following four (4) road network were prepared.

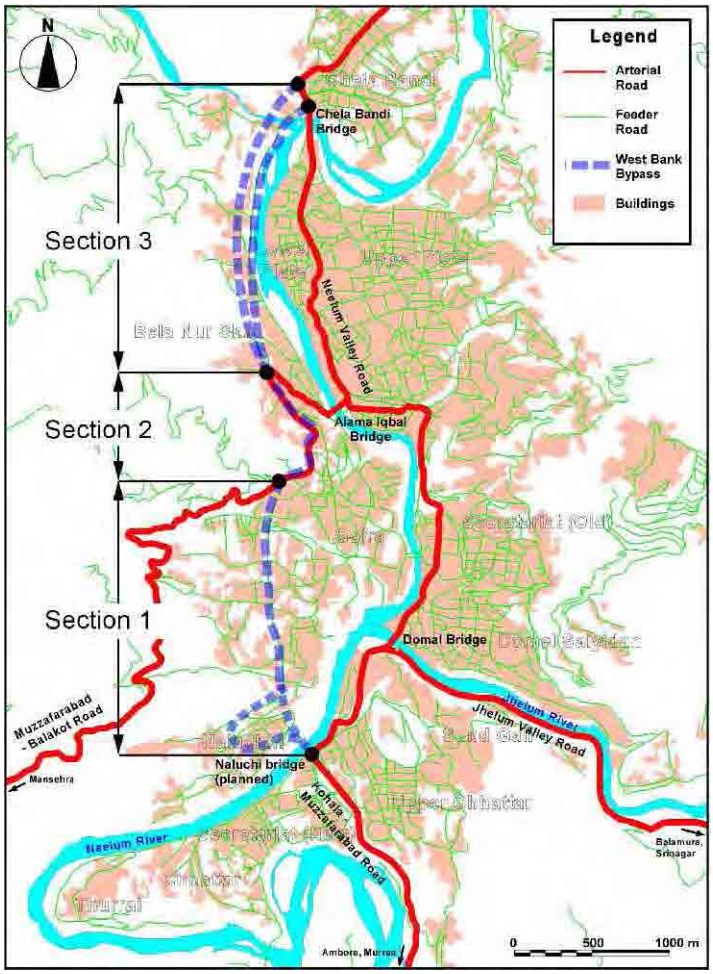
- Case 1: short cut route in west side of Naluchi bridge and existing road access to Neelum Valley Road,
- Case 2: short cut route in west side of Naluchi bridge and new road access to Neelum Valley Road,
- Case 3: detour route in west side of Naluchi bridge and existing road access to Neelum Valley Road, and
- Case 4: detour route in west side of Naluchi bridge and new road access to Neelum Valley Road.

Forecasted future vehicular OD matrices were assigned on the each road networks by user equilibrium assignment method, and link parameters are defined as follows;

- Maximum speed of existing road are 40km/h and capacity is 20,000 PCU/day in total of both directions, and
- Maximum speed of West Bank Bypass is 50km/h and capacity is 20,000 PCU/day in total of both directions.

Table 6.3.1 shows summary of the results of traffic assessment by major sections of West Bank Bypass Road as shown in Figure 6.3.4. The Naluchi Bridge – Balakot road intersection (Section 1) is the most congested section, and Balakot road intersection – Neelum Valley road intersection (Section 3) is the lowest traffic volume section.

Comparing amongst section cases, a difference of alternatives at section 3 is slightly, and traffic demand of Case 1 and Case 2 routes are larger than detour route. The most congested section of West Bank Bypass is section 1 where it is expected about 18,200 PCU traffic volumes per day in 2019 of Case 1 and 2. The results of traffic assessment of Case 1 are shown in Figure 6.3.5, and forecasted turn movement traffic volume at the major intersection of West Bank Bypass is shown in Figure 6.3.6.



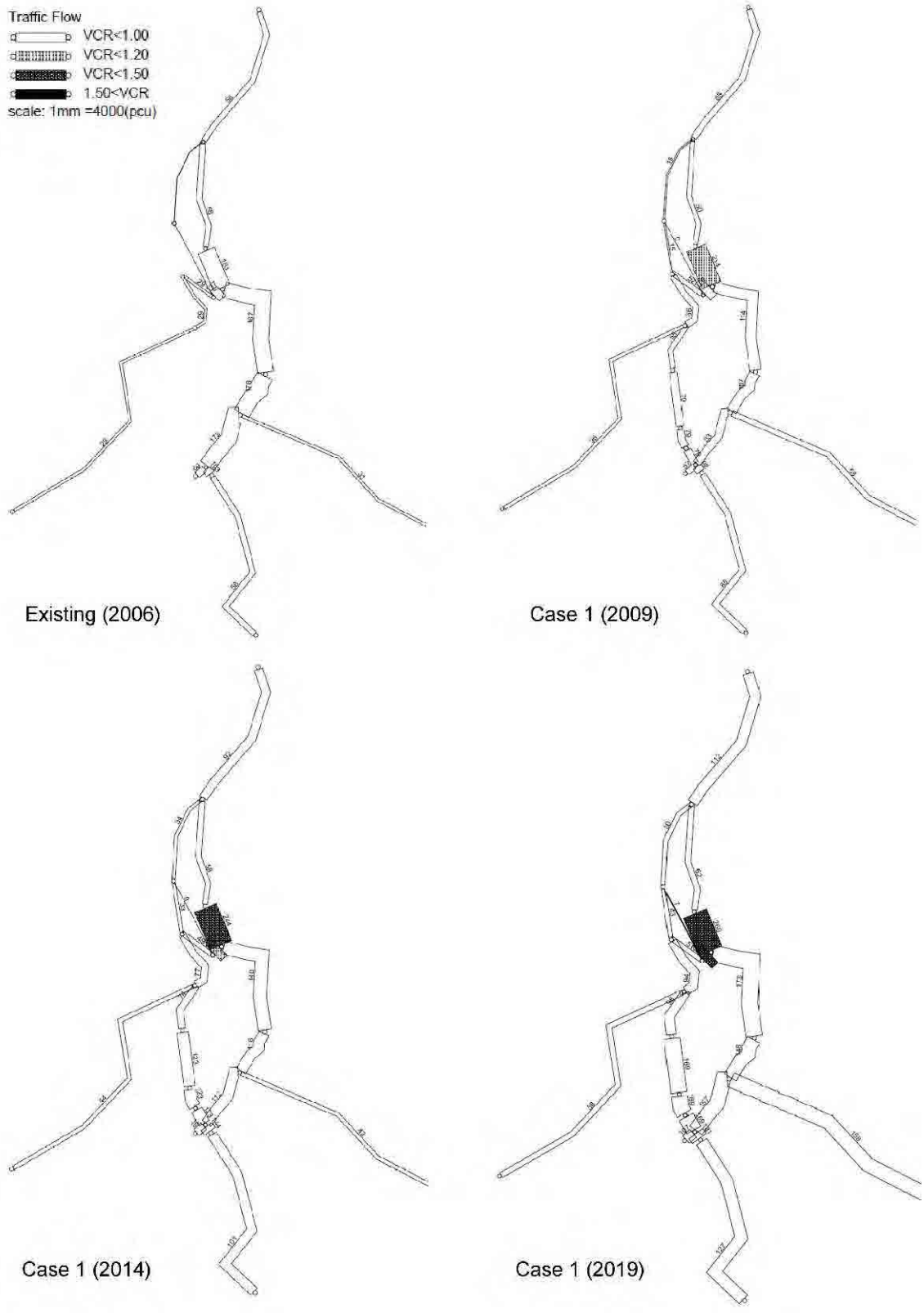
Source: JICA Study Team

Figure 6.3.4 Section of West Bank Bypass

Table 6.3.1 Future Traffic Volume of West Bank Bypass by Section (100 PCU / day in total of both directions)

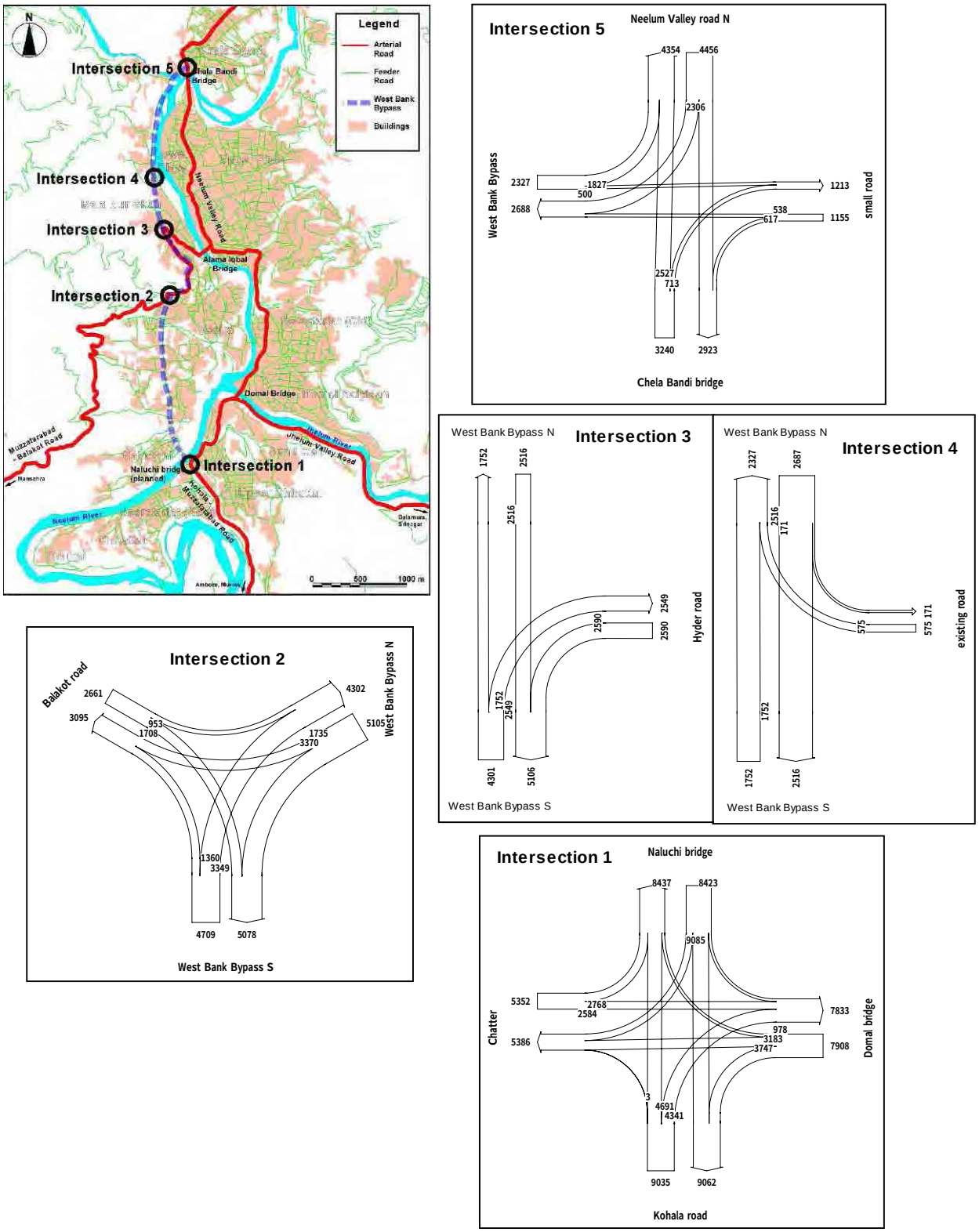
Case	Year	Section 1	Section 2	Section 3
		Naluchi Bridge - Balakot Road	Balakot Road - Hyder Road	Hyder Road - Neelum Valley Road
1	2009	55 - 79	66	15
	2014	74 - 123	77	33 - 34
	2019	98 - 169	94	43 - 50
2	2009	55 - 79	66	15
	2014	73 - 123	77	34
	2019	98 - 168	94	49
3	2009	41 - 60	53	15
	2014	64 - 112	68	32 - 33
	2019	93 - 164	91	40 - 50
4	2009	41 - 60	53	15
	2014	64 - 112	68	33
	2019	93 - 164	91	47

Source: JICA Study team



Source: JICA Study Team

Figure 6.3.5 Assigned Traffic Volume of Case 1 ('000 PCU/day)



Source: JICA Study Team

Figure 6.3.6 Forecasted Turn Movement Volume in 2019 (Case 1)

6.4 Road Alignment Study

6.4.1 Formulation of Design Criteria

The road alignment study of West Bank Bypass was conducted with pre-dominant identification features 1) to connect the intersection in front of Supreme Court in Kohala Muzaffarabad Road defined as the beginning point and the intersection at one side of Chela Bandi Bridge along Neelum Valley Road as the end point, and 2) to utilize the exiting roads as much extent as possible.

Taking into account alignments of the existing roads, topographic condition in the Project site, future traffic volume of less than 20,000 AADT, it is defined that proposed road is categorized under the road classification system as a primary road in provincial roads with the design speed adopted with 50 km /h in accordance with NHA and AASHTO standards related to the Project, and followings are major geometric design criteria applicable in the Project.

Table 6.4.1 Applicable Geometric Design Criteria

Classification	Applied Criteria or Value
Road Classification	Primary in provincial roads
Design Speed	50 km/h
No's of lane	2
• Lane width	3.65 m
• Shoulder width	1.00 m (Min.)
Horizontal Alignment	
• Min. Radius	75 m
• Max. Super elevation	10 %
Vertical Alignment	
• Max. Grade /1	14 %
• Crest Curve	
Stopping Sight Distance	65 m
Passing Sight Distance	345 m
• Sag Curve	
Stopping Sight Distance	65 m

Notes: /1 means 8 % applied as per site conditions.

Applicable typical cross section is shown in Figure 6.4.1.

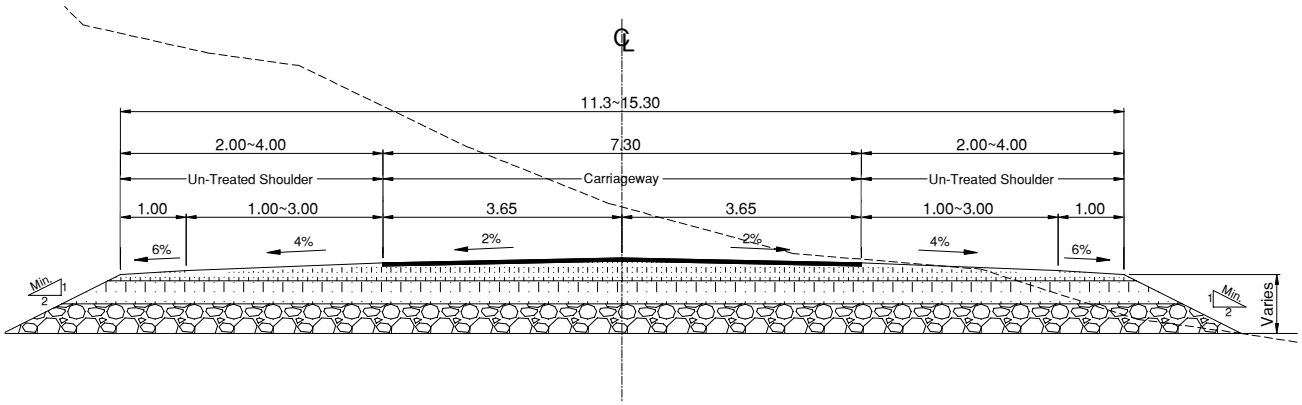


Figure 6.4.1 Typical Cross Section

6.4.2 Route Alignment Study

Considering possible alternative routes, the project road is broadly subdivided into three sections.

Section 1: Section 1 is defined as a section from Naluchi Bridge to junction of the project road and Naluchi road.

Section 2: Section 2 is defined as a section from junction of the project road and Naluchi road, to junction of Naluchi road and Chela Bandi Bridge-Alama Iqbal Bridge road.

Section 3: Section 3 is defined as a section from junction of Naluchi road and Chela Bandi Bridge-Alama Iqbal Bridge road to junction at west bank side of Chele Bandi Bridge along Neelum Valley Road.

Alternative routes of each section are located considering various control points such as pylons, schools, hospitals, graveyards and permanent buildings, and followings are comparison of the alternatives in each section.

The alternative routes are depicted in Figure 6.4.2.

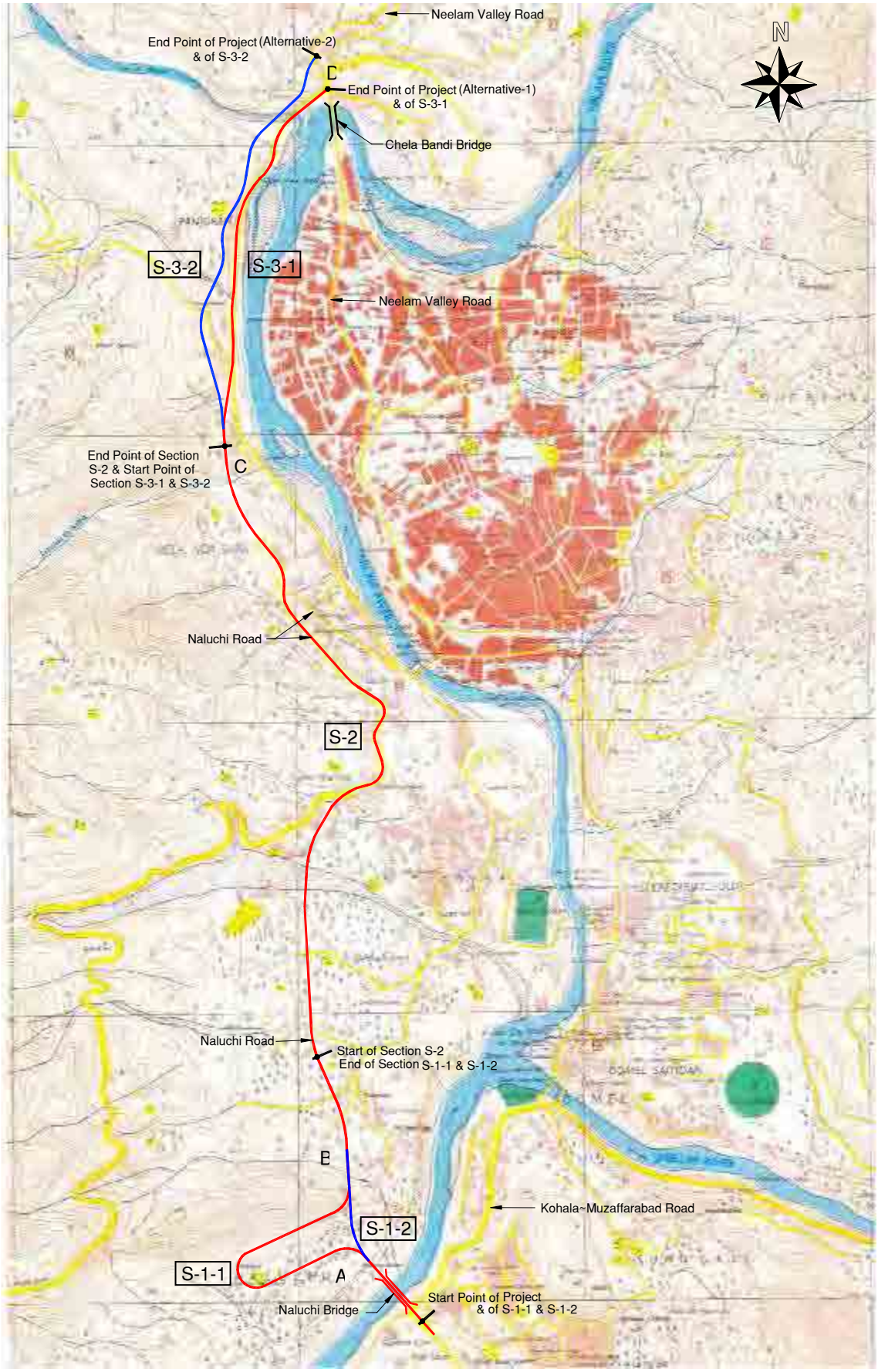


Figure 6.4.2 Route Alternative

Each alternative mentioned above is evaluated from viewpoints of cost, technical aspect and environmental aspect as shown in Table 6.4.2.

In view of economical construction cost and less adverse socio-economic environmental aspect, Alternative S-1-1 in Section -1 and Alternative S-3-1 in Section -3 are selected as an optimum alternative. Hence, combination with alternative S-1-1 in Section -1, Section -2 and Alternative S-3-1 in Section -3 is consequently selected as an optimum route for West Bank Bypass.

Table 6.4.2 Evaluation of Alternative Routes

Section		Section -1		Section -2	Section -3	
Alternative		S-1-1	S-1-2	No Alternative	S-3-1	S-3-2
Technical Data	Characteristic	U-Turn Route	Direct Connection	Improvement of Existing	River side	Mountain side
	Section Length (m)	1,820	1,125	2,510	1,290	1,480
	Availability of Existing Road	No	No	Yes	Yes	No
	Road Structure	Earth Work	Bridge	Earth Work	Earth Work	Earth Work
	Traffic Volume (cpu/day)	19,500	19,500	19,500~12,000	12,000	12,000
	Nos of lane	2	2	2	2	2
	Road Width	10~14 m	12.5 m	10~14 m	10~14 m	10~14 m
	Min. Radius	R=75	R=250	R=75	R=100	R=150
	Max. Grade	I=3.75	I=8	I=7	I=3.1	i=6.7
	Major Intersection	4 legs at grade	4 legs at grade	3 legs at grade	5 legs at grade	3 legs at grade
Evaluation	Cost	Cheep	Expensive	-	Cheep	Expensive
	Technical Aspect	Longer travel distance	Steep grade	-	Adverse affect to at grade intersection and risk of flood	Local community development
	Socio Economic Environment	Large area of land acquisition required	Minor adverse effects	-	Less influence	Large area of land acquisition required
	Natural Environment	Spreading of noise	Minor adverse effects	-	Risk of flooded road	Possibility of Land slides

6.5 Natural Disaster Hazard Study

6.5.1 Hazard Assessment along Road Alignment

The JICA Study Team conducted the hazard assessment survey concerning to natural disaster along the proposed road alignment. As a result of the site survey, the following natural disaster hazards are assumed at locations as presented in Figure 6.5.1;

1) Rock fall / collapse 2) Slope failure 3) Landslide
4) Debris flow 5) River flood

[Rock Fall / Collapse]

The basement rock on the Naluchi Bridge is composed slate of Muzaffarabad Formation and the said rocks are very hard, however, having high schistcity with open cracks. The current slope, where is on the left side bank cliff of the Jhelum River at Nalichi bridge, is maintaining stable condition. However, in the case such as excavation works for the bridge pier construction, the said section has high risk to occur rock mass fall or slope collapse, and it is should be required to be reinforced the said slope such as rock bolt method in order to avoid such incident.(No.1 in Figure 6.5.1)

[Slope Failure]

The following sections should be noted for to be taken into consideration for the road design against slope failure disaster;

- Km 0 + 600(No.2 in Figure 6.5.1) : at connection point with existing road after viaduct section
- Km 2 + 200(No.6 in Figure 6.5.1) : at intersection with Muzaffarabad - Balakot Road
- Km 3 + 300(No.8 in Figure 6.5.1) : at cutting hill portion on new road alignment section

Among the above sections, the existing slopes of Km 2 + 200 and Km 3 + 300 to be expanded are composed wit terrace deposits and/or highly weathered and fragile rock. Therefore, the slope protection measure may be required to reduce rock fall risk.

[Landslide]

A relatively large landslide scars at section between Km 3+700(No.9 in Figure 6.5.1) and a small scale of landslide scars at Km 4+500(No.11 in Figure 6.5.1) may be observed s observed. However, it is concluded that the said landslide section will be maintaining stable condition without cutting of slope for road widening.

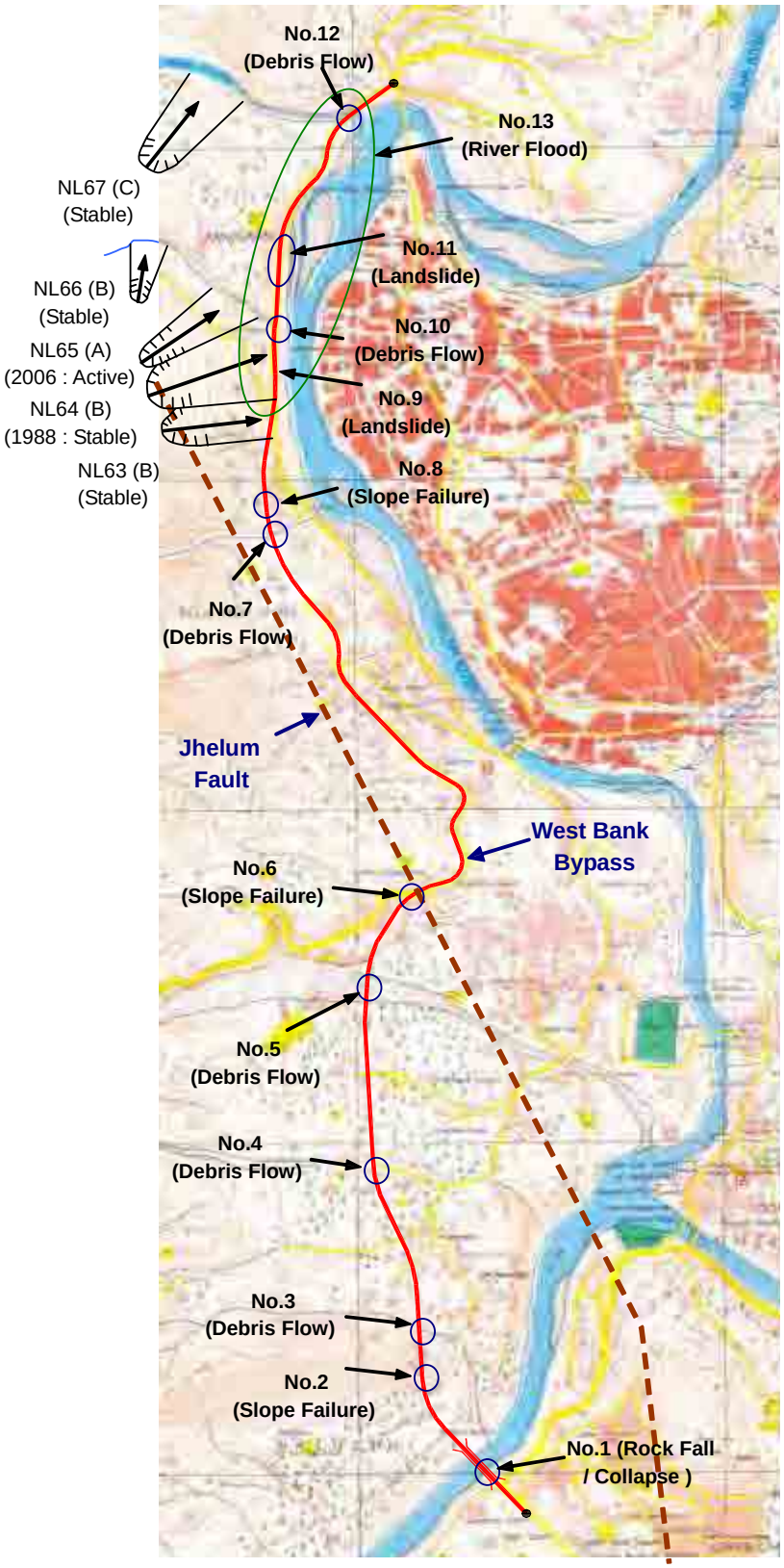
[Debris Flow]

Debris flow survey was conducted at 12 locations where are small rivers is crossing the proposed route, and 6 sections(No.3,4,5,7,10,12 in Figure 6.5.1) among the survey sections may be judged to have risk for debris flow occurrence. Among the risk sections of debris flow, it was judged that risks at Km 4+100 and at Km 4+700 are higher. The following recommendations are made for the countermeasure against debris flow risk at the both sections;

- Km 4+100(No.10 in Figure 6.5.1): Installation of check dam by gabion mat and provision of groundsel and retaining wall by gabion mat at the landslide section of upstream side.
- Km 4+700(No.12 in Figure 6.5.1): Realigning the new road alignment to down stream side in order to reduce impact by debris flow.

[River Flood]

The section between Km 3+700(No.9 in Figure 6.5.1) and Km 4+600(No.13 in Figure 6.5.1), where exiting road runs along the Neelum River, was soaked caused by the 1992 Flood up to +685 m. The risk of flood on the said section should be taken into consideration for the road design, and it should be required that the appropriate design water level will be established to conduct the probability analysis by collecting past water level records of the Neelum River.



Source: JICA Study Team

Figure 6.5.1 Location Map of Disaster Hazard along Road Alignment

6.5.2 Road Slope Failure Mitigation Study

Earthquake and rainfall frequently cause collapses in cut slopes. Many cut slopes are stable during normal conditions but become unstable during or after heavy rainfall or earthquake. To prevent slope collapses, either the sliding force must be decreased or sufficient resistance to overcome the sliding force must be added by structures.

Slope protection works for cut slopes:	Grouted riprap
	Shotcrete
	Rock net
	Steel pipe pile
	Concrete crib with rock bolt
Slope protection works for fill slopes:	Grouted riprap
	Rock fill
	Stone masonry retaining walls
	Reinforcement embankment
Drainage structures:	Horizontal drainage
	Vertical drainage
	Drainage on berm
	Drainage for the foot of slope

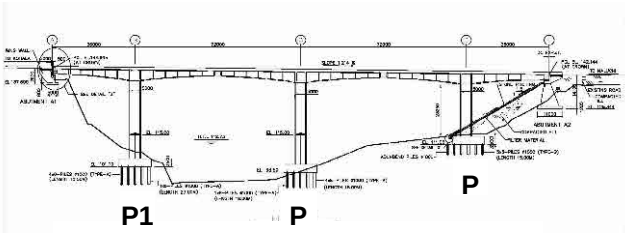
6.6 Alternative Study of Naluchi Bridge

Alternative study of Naluchi bridge consists of alternative route study of river crossing site for Naluchi Bridge, assessment of the existing foundations partially constructed by a local contractor before 2005 Earthquake, proposed bridge design criteria, alternative bridge study of Naluchi Bridge and study results on the other structures along proposed West Bank Bypass.

6.6.1 Assessment of Existing Foundation

The Government of AJK has planned since 1972 to implement the West Bank Bypass Project. In the Project the Naluchi Bridge crossing the Jhelum River was planned by AJK Government and the bridge was designed by a local consultant, NESPAK. The original design was PC-Box girder with 216 m bridge length rested on RC wall type piers with in-situ RC piles. The general view of Naluchi Bridge in the original design is shown in Figure 6.6.1. The Naluchi Bridge Construction Project was awarded by the PWD (Highways) AJK to a local contractor in the middle of 2005 and the contractor commenced to construct in-situ piles at P2 and P3 piers. Up on the completion of 36 piles in P2 & P3, the project was however suspended due to 2005 October 8th Earthquake.

Under such situation the Government of Pakistan decided to review the original design and requested JICA to carry out the Preliminary Study of West Bank Project including Naluchi Bridge in the Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City. Accordingly it is planned in the study to assess soundness of the piles constructed in above project whether the such piles are safe or not and possibility of utilizing those in the further bridge construction.



Original Design

Source: JICA Study Team

Figure 6.6.1 Existing Pile Foundations of Naluchi Bridge

(1) Field Investigation and Results

The total number of 36 in-situ RC piles consisting of 11 piles against 30 piles at P2 and 25 piles against 25 piles at P3 pier was constructed by the local contractor and later on the work was suspended due to the Earthquake.

The investigation items and quantities for sanity check of existing concrete piles at Naluchi Bridge are shown in Table 6.6.1.

Table 6.6.1 Investigation Items and Quantities for Sanity Check

Work Item	Work Quantities
Concrete Coring	3 piles (total 56 m)
Compressive Strength Test	30 samples
Sonic Integrity Test	36 piles (all of existing piles)
Static Axial Compressive Load Test	1 pile

The summary of the tests in order to assess soundness of the piles are shown in the following table:

Table 6.6.2 Summary of sanity assessment results

Name of Test	Purpose of Test	Number of Samples	Results	Judgment
Concrete Strength Test	Measurement of Placed Concrete Strength	3 Piles	Concrete strength of 3 Piles are under the requirement	**Fail**
Sonic Integrity testing	Measurement of Pile length	36 Piles	12 Piles are below the requirement	**Fail**
Static Load Test	Measurement of Allowable Bearing Capacity	1 Piles	Measured Bearing capacity is less than the requirement	**Fail**

It is concluded that quality of the piles constructed under the previous project are under the requirements and no longer re-usable in the further bridge construction. Furthermore, It is noted that construction of P1 at the river water left edge as per the original design is in high risk of construction failure due to steep slope and fragile geology in the left side bank.

Under such, continuation of the bridge construction as per the original design is no longer recommendable, and it is rather prudent to proceed new bridge planning and design in stead of that.

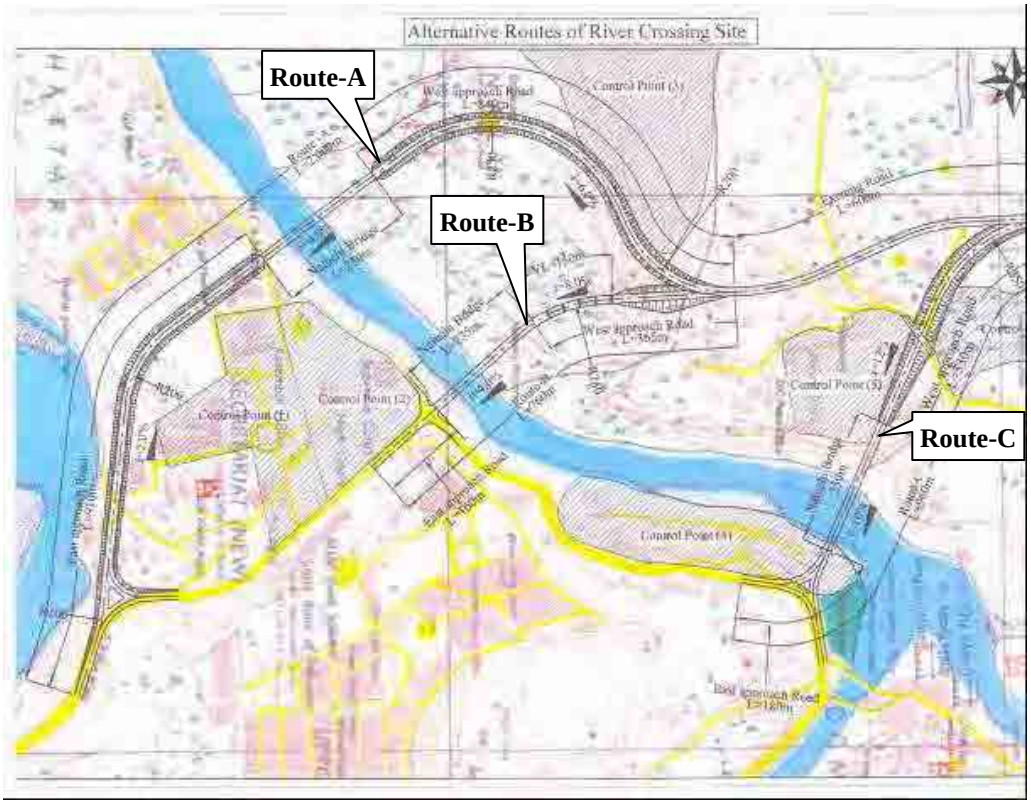
6.6.2 Alterative Study of River Crossing Sites

The alternative routes of Jhelum river crossing site of West Bank Bypass are formulated considering control points such as governmental buildings, residential area, critical hazardous area and followings are key features of each alternative.

Table 6.6.3 Conceivable Alternative of River Crossing Sites

Alternative	Route Length	Align-ment	Approx. Bridge Length	Outline of Route
A	L=2,000 m	R=200 m I=6.0 %	L=250 m	At 2nd curve of Kohala-Muzaffarabad road beside AGK Secretariat compound, proposed route turns to right and passes through backyard of the Government Compound and Supreme court. And after the route crosses Jhelum River and passes through residential area and connects with the existing road in the west bank.
B	L=760 m	R=150 m I=8.0 %	L=235 m	Proposed route starts from intersection at the end of Kohala road in front of gate of Supreme court and crosses Jhelum River. After crossing Jhelum River the route connectes with the existing road in the shortest route by viaduct.
C	L=960 m	R=150 m I=12 %	L=250 m	Proposed route starts from intersection between Kohala-Muzaffarabad and Neelum Valley Road, and crosses Jhelum River, and after connects with the existing road in west bank. Because of considerable difference of the elevations between east side and west side, this route has steep grade of about 12 %.

The control points and route alternatives are shown in Figure 6.6.2.



Source: Study Team

Figure 6.6.2 Alternative Routes of River Crossing Site

The each alternative is evaluated from view points of geometric aspect, construction cost, socio-economic environment, Naluchi Bridge construction and serviceability, and followings are results of the evaluation.

Table 6.6.4 Evaluation of Route Alternatives

Alternative	Evaluation Item					Overall Rating
	Geometric	Construction Cost	Socio-economic environment	Naluchi Bridge construction	Serviceability	
A	S shape horizontal alignment is disadvantageous	Longest route (L=1,750 m)	Large area required of land acquisition and many houses affected	Longest bridge length and no construction yard available	Longest trip distance	Most disadvantageous
Rating	Fair	Poor	Poor	Poor	Poor	
B	No defective alignment	Shortest Route (L=525 m)	Minimal adverse effect	Shortest bridge length and enough construction yard at west bank side	Moderate trip distance	Most advantageous
Rating	Good	Good	Good	Good	Fair	
C	Steep gradient with long length is disadvantageous.	Moderate route length (L=710m)	Passing through army camp at east side and dividing villages by route at west side is disadvantageous.	Difficulty of construction because of steep grade and not enough construction yard	Shortest trip distance	No realistic plan because of passing army camp
Rating	Poor	Fair	Poor	Fair	Good	

Source: JICA Study Team

As indicated in Table 6.6.4, alternative B is selected as an optimum route because of the shortest route among the others, most economical alternative, relatively smooth alignment, less adverse effect of socio-economic environment and relatively short trip distance. Furthermore, accessibility of alternative B to connect with the existing roads is the most advantageous.

6.6.3 Formulation of Design Criteria

Applicable design standards and codes in new bridge design on the West Bank Bypass Road are as follows:

SFRP	Standards for Roads in Pakistan	【NHA－1992】
DBNH	Designing of Bridges on National Highways	【NHA-July/2006】
SBS	Standardization of Bridge Superstructures	【NHA-March/2005】
PCPHB	Pakistan Code of Practice for Highway Bridges	【PAKISTAN－1967】
AASHTO	Standard Specifications for Highway Bridges	【USA－2004】
UBC	Uniform Building Code	【USA－1996】

The geometric criteria of the bridge design are tabulated in Table 6.6.5 and proposed cross section of Naluchi bridge is designed as shown in Figure 6.6.3 in accordance with NHA Designing of Bridges on National Highways, July 2006.

Table 6.6.5 Bridge Design Criteria

Items	Design Value	Remarks
Classification	Primary	
Design speed	50km/h	
Lane width	3.65m* 2 =7.30m	2 lane
Shoulder width(Left)	1.20m	
Shoulder width(Right)	1.20m	
Walkway(Both sides)	1.50m	
Live Load	Class A Loading	As per WPCHB
Peak Ground Acceleration	0.35	

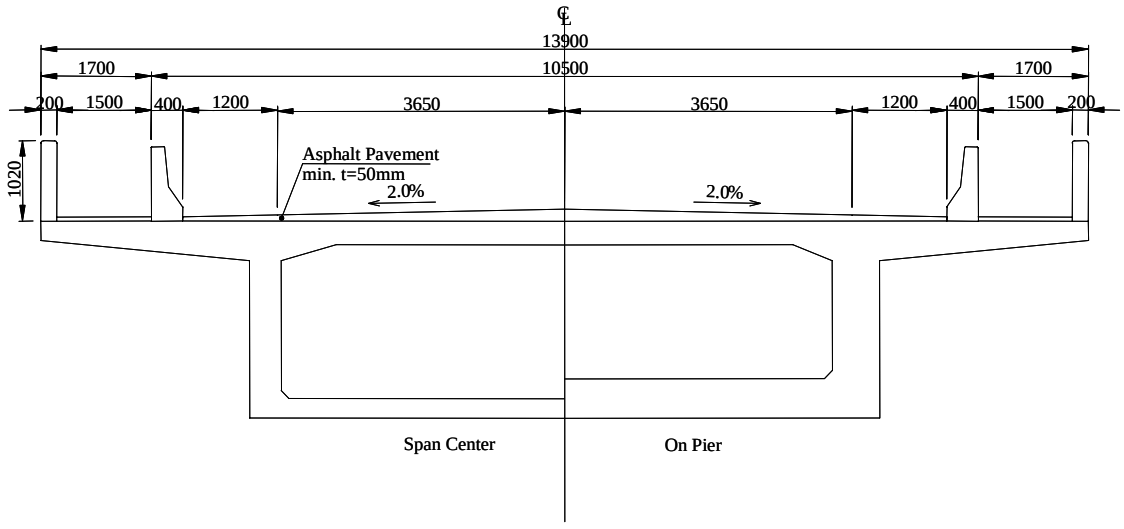


Figure 6.6.3 Typical Cross Section

6.6.4 Alternative Bridge Type Study

Prior to bridge type selection study, a total bridge length and locating piers and abutment on alternative route B, selected for Jhelum river crossing site, was studied considering profile of the existing ground line, proposed height of a new Naluchi bridge with 706.5m, high water flood level of 663.0m and geological conditions revealed by mechanical boring results. As a result of the study, a total bridge length is estimated at about 240 m to 250 m, and within the length one abutment (A1) and one pier (P1) are located at top of the left side river bank and beside river water edge line in left side bank respectively, while one pier (P2) is also located beside the right side water edge line and several piers and abutment also follow in right side river terrace. As a summary of the study, maximum span length, if P1 and P2 are provided, is about 80 to 90 m or more than about 125 m, provided only A1 and P2 without P1.

Regarding to construction of P1, since the river bank at left side has very steep slope and insufficient flat area at water edge line, it is difficult to access pier construction site, and cut slop due to construction of footing will be affected to stability of steep cliff. Furthermore it is also difficult to dewater foundation site if seepage encountered. Hence installation of pier at this site is a very high risk of construction failure.

Considering possible maximum span length between 80m and 125 m, and the bridge engineering practice at recent era, steel truss, steel arch, PC box girder and PC extra dosed type as main bridge are selected as a conceivable bridge type. And those alternatives are broadly divided into two categories, one is with P1 (a Pier at left side bank or east side bank) and other is without P1.

In case of without P1, maximum span length is estimated at 120-125 m from abutment at the edge of the left side cliff to the river pier at the right side water edge line. Considering this span length required, followings are conceivable alternatives.

In case of with P1, maximum span length is estimated at about 85 m between piers. Hence followings are conceivable alternatives.

Table 6.6.6 Bridge Type and Span Arrangement

Alternative	Bridge Type	Span Arrangement
Alt-1	Steel Arch + 3 span plate girder bridge	136 m + 3 @ 38m= 250 m
Alt-2	Two span continuous PC Box Girder	2 @ 125 = 250 m
Alt-3	Two Span Continuous PC Extra Dosed Bridge	2 @ 125 = 250 m
Alt-4	Three span continuous steel truss + two span plate girder bridge	50 + 85+ 50 +2 @ 32.5 = 250 m
Alt-5	Three span continuous PC box Girder + two span PC I girder bridge	50 + 85+ 50 +2 @ 32.5 = 250 m

Each alternative is evaluated from five evaluation items consisting of construction cost, construction aspect, structural aspect, construction period, maintenance aspect and technology transfer aspect, and the evaluation result is simply rated with five ranks from excellent, good, fair, poor to bad. In order to evaluate the alternatives as quantitative as possible, the rating result from poor to excellent is scored from 1 to 5 points respectively Furthermore, each evaluation item is weighted with multiple factor considering impotency of the item. In this study, following multiple factors are applied.

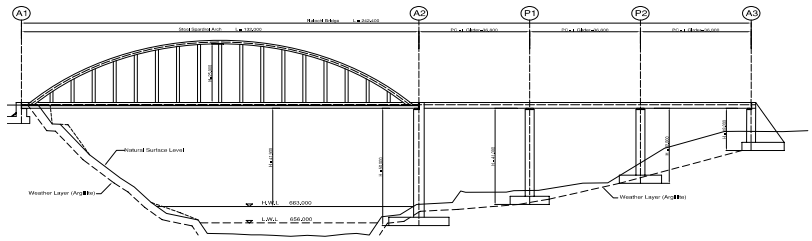
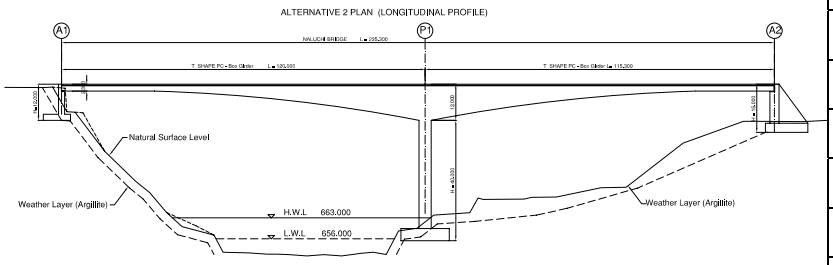
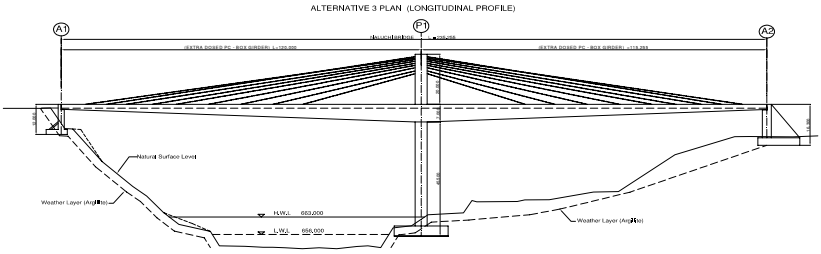
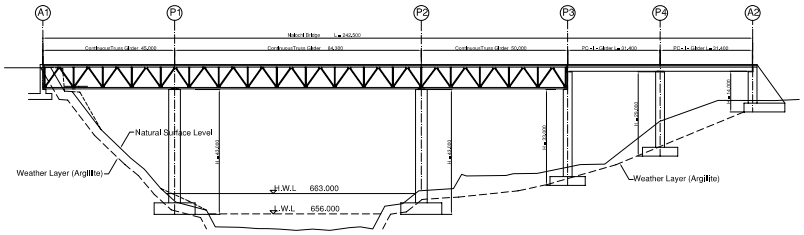
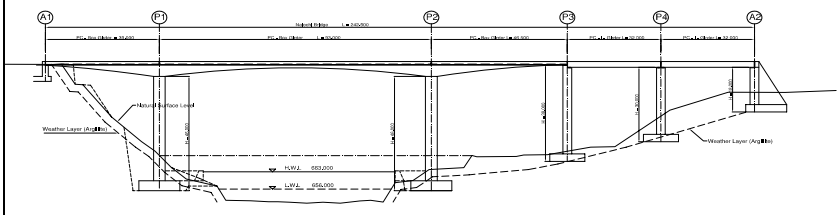
Table 6.6.7 Multiple Factors

Evaluation Items	Multiple Factor	Reason
• Construction Cost	5	Most importance element in development of infrastructures.
• Construction Aspect	2	Risks/Easiness of construction is important considering severe site condition.
• Structural Aspect	1	Especially for earthquake proof
• Construction Period	3	Because of project background, that is restoration of earthquake damage, early completion is requisite.
• Maintenance Aspect	2	Impotency of life cycle cost
• Technology transfer Aspect	1	Enhancement of local contractors' technical capability.

Considering above criteria, individual score point of each alternative and total points using multiple factors are estimated and the results are shown in Table 6.6.8.

As indicated above, Alternative 3 has the maximum points with 48, furthermore Alternative 3 has no negative rating items with possible creation of Muzaffarabad landmark or earthquake restoration symbol. Hence, Alternative 3 Two Span Continuous PC Extra Dosed Bridge is selected as an optimum bridge type. The Extra Dosed bridge similar with Alternative 3 is shown below:

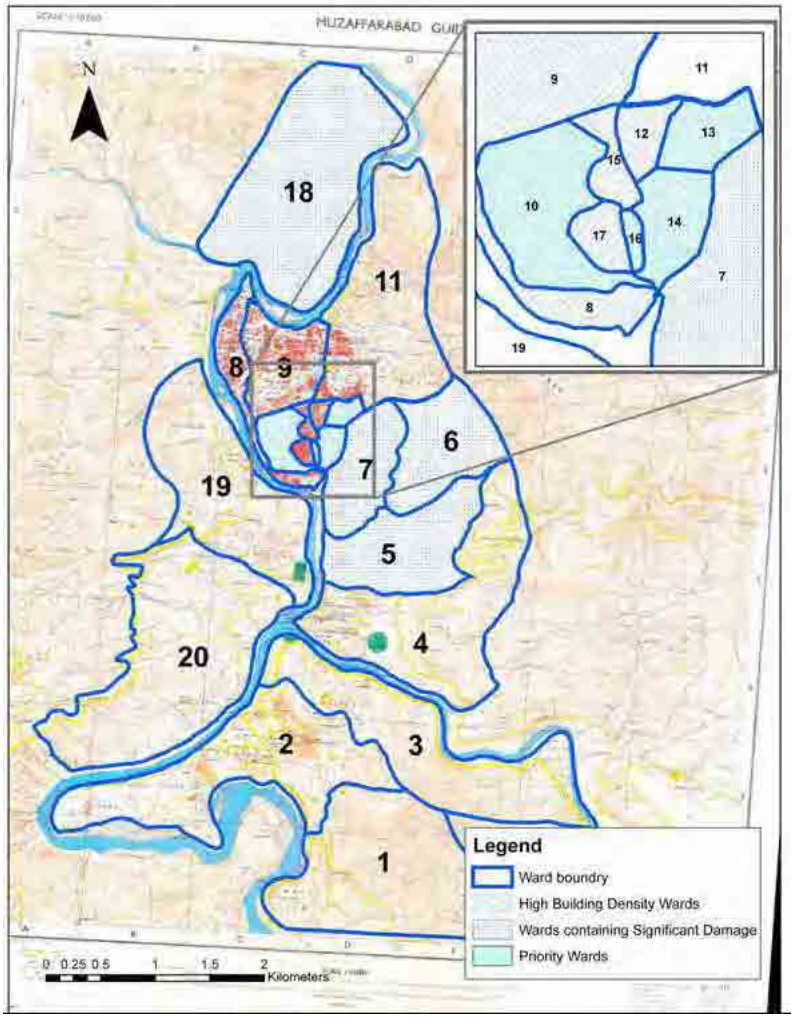
Table 6.6.8 Multiple Factors

	General View	Evaluation Results	
Alt-1		Cost（x5）	Bad(5)
		Construction (x2)	Bad(2)
		Structural（x1）	Bad(1)
		Period（x5）	Fair(9)
		Maint.（x2）	Bad(2)
		Tech.（x1）	Poor(2)
		Total Point	21
Alt-2		Cost（x5）	Poor(10)
		Construction (x2)	Poor(4)
		Structural（x1）	Bad(1)
		Period（x5）	Fair(9)
		Maint.（x2）	Excellent(10)
		Tech.（x1）	Poor(2)
		Total Point	36
Alt-3		Cost（x5）	Fair(15)
		Construction (x2)	Good(8)
		Structural（x1）	Fair(3)
		Period（x5）	Fair(9)
		Maint.（x2）	Good(8)
		Tech.（x1）	Excellent(5)
		Total Point	48
Alt-4		Cost（x5）	Good(20)
		Construction (x2)	Bad(2)
		Structural（x1）	Fair(3)
		Period（x5）	Excellent(15)
		Maint.（x2）	Poor(4)
		Tech.（x1）	Bad(1)
		Total Point	45
Alt-5		Cost（x5）	Excellent(25)
		Construction (x2)	Bad(2)
		Structural（x1）	Fair(3)
		Period（x5）	Bad(3)
		Maint.（x2）	Good(8)
		Tech.（x1）	Bad(1)
		Total Point	42

6.7 Preliminary Environmental Study

In order to further the formulation of resettlement action plan and Environmental Impact Assessment (EIA) for coming next detailed design stage, the following preliminary environmental survey and study were conducted in this study;

- To conduct Initial Environmental Examination (IEE) to lead to coming EIA,
- To conduct Social Baseline Condition Survey in the project area {Ward 18, 19 and 20} of Muzaffarabad City, aiming to promote coming resettlement action plan formulation.
- To organize the focus group discussion along the proposed route with the local residents aiming to, inform them about the up coming project, as well as for resettlement action plan formulation.



Source: MCM and JICA Study Team

Figure 6.7.1 Wards in Municipal Area

From the preliminary environmental study, the following conclusion and recommendation are made:

The initial examination of potential impacts of the proposed improvement of the West Bank Bypass Road Construction results that this project will generate no significant natural environment impacts.

However, the project is likely to cause significant involuntary resettlement and the cost of the proposed project is more than Rs. 50 millions, the final conclusion is that EIA for the Western By pass Road Construction will be required. Equally, there is a need for detailed environmental management and monitoring plan (EMMP) including for mitigation measures to be implemented for all project stages.

Form the forces group discussion to be organized at 25 times in the Study, it was found that vast majorities of the people were not aware about the upcoming West Bank Bypass Project and still they were not informed by any department. Therefore, further public consultation will be required.

6.8 Procurement Condition Study

The construction cost survey for West bank Bay-pass project has been carried out in Dec.2006 Secondary data was collected about the availability of construction material in Muzaffarabad and surrounding cities.

1) Construction Cost Survey for Materials and surrounding cities
2) Construction Cost Survey for Machinery and surrounding cities
3) Construction Cost Survey for Labour
4) Major Transportation Systems to the Construction Site
5) Transportation Cost of Major Equipment and Materials
6) Price Hike in Material, Equipment and Labor in Pakistan

Table 6.8.1 Construction Cost Survey for Materials, Nov 2006

Construction Material	Unit	Price (Rs.)	Remarks
Cement Type-I (OPC)	TON	5,150.0	Price at site
Aggregate	Cft	36.5	Price at site
Sand	Cft	29.0	Price at site
Admixture	kg	150.8	Price at site
Asphalt Grade 60/70 & 80/100	TON	27,100.0	Price at site
Asphalt M.C. 70	TON	36,500.0	Price at site
Asphalt R.C. 250	TON	36,500.0	Price at site
Steel Expansion Joint	kg	58.0	Price at site
Pre-Stressing Strand, 3/8", 1/2"	TON	65,000.0	Price at site
Blasting Material	kg	35.0	Price at site
Channel 100x50 mm , 200x75 mm	TON	40,500.0	Price at site
Steel Plates 6 mm , 10 mm, 12mm, 18 mm	TON	42,500.0	Price at site
Steel Guard rail (galvanized)	kg	113.0	Price at site
Reignforcement Bar			
Deformed Bar	TON	43,000.0	Price at site
Round Bar	TON	42,000.0	Price at site
Oil and Lubricant			
Diesel Oil	Litre	38.8	Price at site
Gasoline	Litre	57.0	Price at site
Greese	kg	120.0	Price at site
Lubricant	Litre	140.0	Price at site
Structure Steel			
H-Beam (300x300mm)	TON	48,000.0	Price at site
H-Beam (400x400mm)	TON	48,000.0	Price at site
Channel	TON	40,500.0	Price at site
PC Wire and Cable	TON	68,000.0	Price at site
Timber	Cft	510.0	Price at site
Wooden Plate	Cft	600.0	Price at site

Source: Statistical Bulletin of Pakistan

Table 6.8.2 Construction Cost Survey for Machinery, Nov 2006

Construction Equipment	Unit	Price (Rs.)	Remarks
Machinary			
Bull-Dozer . 200 H.P	month	275,000	For 8-hours daily working
Bull-Dozer . 90 H.P	month	225,000	For 8-hours daily working
Loader (tyre)	month	175,000	For 8-hours daily working
Crane (30 Ton)	month	180,000	For 8-hours daily working
Crane (50 Ton)	month	320,000	For 8-hours daily working
Crane (100 Ton)	month	400,000	For 8-hours daily working
Truck (Flat bed, 5-8 ton)	month	100,000	For 8-hours daily working
Power Shovel(0.4-0.6m^3)	month	150,000	For 8-hours daily working
Compactor	month	40,000	For 8-hours daily working
Roller (Tyred)	month	180,000	For 8-hours daily working
Roller (Tandem)	month	145,000	For 8-hours daily working
Roller (Vibratory)	month	150,000	For 8-hours daily working
Asphalt Paver	month	250,000	For 8-hours daily working
Asphalt Plant	hour	10,500	
Concrete Plant	hour	3,000	
Vibrator (for Concrete works)	hour	300	
Concrete Pump with Truck	hour	1,800	
Concrete Mixer (0.5m^3)	hour	430	
Concrete Mixer (0.3m^3)	hour	350	
Static Tandem Roller12 T	month	70,000	For 8-hours daily working
Water Tank Bowser Type 12000 Ltr	month	22,000	For 8-hours daily working
Bitumen Sprayer (Manual) 250 Ltr	month	8,000	For 8-hours daily working
Compressor. 300 CFM	month	70,000	For 8-hours daily working
Concrete Static Mixer 1/4Cu.Y	month	35,000	For 8-hours daily working
Asphalt Cutter	month	40,000	For 8-hours daily working
Diesel Tanker	month	120,000	For 8-hours daily working

Source: Statistical Bulletin of Pakistan

Table 6.8.3 Construction Cost Survey for Labour, Nov 2006

Classificationof Construction Labour	Unit	Price (Rs.)	Remarks
Labour			
Foreman Earthwork	month	25,000	For 8-hours daily working
Foreman Concrete	month	25,000	For 8-hours daily working
General Foreman	month	25,000	For 8-hours daily working
Painter	month	10,400	For 8-hours daily working
Steel Binder/Cutter	month	10,400	For 8-hours daily working
Highly Skilled Labour	month	7,800	For 8-hours daily working
Helper	month	6,760	For 8-hours daily working
Foremen	month	35,000	
Skilled Labour	month	6,500	For 8-hours daily working
Unskilled Labour (Common Labour)	month	4,500	For 8-hours daily working
Carpenter	month	11,700	For 8-hours daily working
Welder	month	7,800	For 8-hours daily working
Mason	month	11,700	For 8-hours daily working
Driver for Truck/Dump Truck	month	7,000	For 8-hours daily working
Operator for Concrete Plant / Asphalt plant	month	15,000	For 8-hours daily working
Operator for Paving machine	month	15,000	For 8-hours daily working

Source: Statistical Bulletin of Pakistan and Quaternary Survey by JICA Study Team

Table 6.8.4 Estimated Prices of 2007. Sep Include Escalation – Materials

Description	Unit	Origin	Basic Price (Rs)	Quantity Discount	Handling Cost at Origin (Rs.)	Freight Cost (Rs.)	Handling Cost at Destination (Rs.)	Other Costs (R.s)	Price at Destination (Rs.)	Earth Quack Effect	Overall Construction Activity effect	Expected Escalation	Price in September 2007 (Rs.)
Accelerator admixture	kg	Rawalpindi	180	Nil	0.04	0.67	0.04	Nil	180.75	Demand increased	labor and material availability decreased/ basic cost and freight	15%	207.9
Retarder admixture	kg	Rawalpindi	150	Nil	0.04	0.67	0.04	Nil	150.75	Demand increased	labor and material availability decreased/ basic cost and freight increased	15%	173.4
Steel Grade. 40	TON	Rawalpindi	41,000	Nil	50	865	85	Nil	42,000	Demand increased	labor and material availability decreased/ basic cost and freight increased	5%	44,100
Steel Grade. 40	TON	Karachi	43,000	Nil	60	2,355	85	Nil	45,500	Demand increased	labor and material availability decreased/ basic cost and freight	15%	52,325
Steel Grade. 60	TON	Rawalpindi	42,000	Nil	50	865	85	Nil	43,000	Demand increased	labor and material availability decreased/ basic cost and freight	5%	45,150
Steel Grade. 60	TON	Karachi	44,000	Nil	60	2,355	85	Nil	46,500	Demand increased	labor and material availability decreased/ basic cost and freight increased	15%	53,475
Pre-Stressing Strand, 3/8", 1/	TON	Lahore	65,000	Nil				Nil	65,000	Demand increased	labor and material availability decreased/ basic cost and freight increased		65,000
Steel Expansion Joint	Kg	Rawalpindi	57	Nil	0.08	0.82	0.10	Nil	58	Demand increased	labor and material availability decreased/ basic cost and freight	5%	60.9
Blasting Material	Kg	Rawalpindi	25	Nil	0.05	9.89	0.06	Nil	35	Demand increased	labor and material availability decreased/ basic cost and freight increased	5%	36.8
Steel Profiles	TON	Lahore	39,000	Nil	60	1,355	85	Nil	40,500	Demand increased	labor and material availability decreased/ basic cost and freight increased	10%	44,550
Channel 100x50 mm , 200x75	TON	Lahore	39,000	Nil	60	1,355	85	Nil	40,500	Demand increased	labor and material availability decreased/ basic cost and freight increased	10%	44,550
Steel Plates 6 mm , 10 mm, 12mm, 18 mm	TON	Lahore	41,000	Nil	60	1,355	85	Nil	42,500	Demand increased	labor and material availability decreased/ basic cost and freight increased	10%	46,750
H-Beam , 5"x3" , 6"x4" , 7"x4" , 8"x4"	TON	Lahore	43,000	Nil	60	1,355	85	Nil	44,500	Demand increased	labor and material availability decreased/ basic cost and freight increased	10%	48,950
Sheaths	Lm	Lahore	40	Nil	1.00	17.60	1.40	Nil	60	Demand increased	labor and material availability decreased/ basic cost and freight increased	10%	66.0
wooden planks	Cft	Abbotabad	500	Nil	0.80	8.35	0.85	Nil	510	Demand increased	labor and material availability decreased/ basic cost and freight increased	17%	596.7

Source: JICA Study Team

Table 6.8.5 Estimated Prices of 2007. Sep Include Escalation – Equipment

Description	Monthly Charge (Rs.)	weekly charge (Rs.)	Daily Charge (Rs.)	Hourly Charge (Rs.)	Mob/Demob Charges (Rs.)	Other Charges	Earth Quack Effect	Overall Construction Activity effect	Expected Escalation	Price in September 2007 (rs.)
Bull-Dozer . 200 H.P	275,000	68,750	10,577	1,322	60,000		Demand increased	No Major Effect	10%	302,500
Bull-Dozer . 90 H.P	225,000	56,250	8,654	1,082	60,000		Demand increased	No Major Effect	10%	247,500
Front End Loader . 2.50 Cu.M	175,000	43,750	6,731	841	50,000		Demand increased	No Major Effect	10%	192,500
Tandem Vibratory Roller . 10-12 Ton	145,000	36,250	5,577	697	48,000		Demand increased	No Major Effect	10%	159,500
Tandem Vibratory Roller . 8 Ton	120,000	30,000	4,615	577	48,000		Demand increased	No Major Effect	10%	132,000
Combination Roller 10 - 12 T	150,000	37,500	5,769	721	48,000		Demand increased	No Major Effect	10%	165,000
P.T.R (9 - Wheeler)18 T	180,000	45,000	6,923	865	48,000		Demand increased	No Major Effect	10%	198,000
Static Tandem Roller12 T	70,000	17,500	2,692	337	48,000		Demand increased	No Major Effect	10%	77,000
Excavator, (Track Type) 100 H. P	150,000	37,500	5,769	721	48,000		Demand increased	No Major Effect	10%	165,000
Power Broom	25,000	6,250	962	120	12,000		Demand increased	No Major Effect	10%	27,500
Paver 4 M Wide	250,000	62,500	9,615	1,202	50,000		Demand increased	No Major Effect	10%	275,000
Compressor. 300 CFM	70,000	17,500	2,692	337	12,000		Demand increased	No Major Effect	10%	77,000
Concrete Static Mixer 1/4Cu.Y	35,000	8,750	1,346	168	10,000		Demand increased	No Major Effect	10%	38,500
Concrete Transit Mixer 6CuM.	275,000	68,750	10,577	1,322	12,000		Demand increased	No Major Effect	10%	302,500
Crane. 45 T.	300,000	75,000	11,538	1,442	20,000		Demand increased	No Major Effect	10%	330,000
Crane. 20 T.	150,000	37,500	5,769	721	20,000		Demand increased	No Major Effect	10%	165,000
Concrete Pump	175,000	43,750	6,731	841	12,000		Demand increased	No Major Effect	10%	192,500

Note:
1: expected escxalation is assumed keeping in view the demand and supply trend.
2: concluded price in sep 2007 do not include the mobilization and demobilization charges.

Source: JICA Study Team

Table 6.8.6 Estimated Prices of 2007. Sep Include Escalation – Labour

Description	skill level	Monthly Consolidated salary Rs.)	Day charge (Rs.)	Hourly charge (Rs.)	Medical & Social	Others	Earth Quack Effect	Overall Construction Activity effect	Expected Escalation	Price in September 2007 (Rs.)
Foremen										
Foreman Asphalt	High	35,000	1,346	168	15%	20%	Demand increased	Availability decreased	25%	43,750
Foreman Earthwork	High	25,000	962	120	15%	20%	Demand increased	Availability decreased	25%	31,250
Foreman Concrete	High	25,000	962	120	15%	20%	Demand increased	Availability decreased	25%	31,250
General Foreman	High	25,000	962	120	15%	20%	Demand increased	Availability decreased	25%	31,250
Mason	Average	11,700	450	39	15%	15%	Demand increased	Availability decreased	30%	15,210
Carpenter	Average	11,700	450	39	15%	15%	Demand increased	Availability decreased	30%	15,210
Painter	Average	10,400	400	39	15%	15%	Demand increased	Availability decreased	30%	13,520
Steel Binder/Cutter	Average	10,400	400	39	15%	15%	Demand increased	Availability decreased	30%	13,520
Highly Skilled Labour	Average	7,800	300	31	15%	15%	Demand increased	Availability decreased	30%	10,140
Operators concrete aspahlt										
Helper	Normal	6,760	260	24	15%	15%	Demand increased	Availability decreased	40%	9,464
Welder	Average	7,800	300	24	15%	15%	Demand increased	Availability decreased	30%	10,140
unskilled labour										
Labour	Normal	6,500	250	22	15%	15%	Demand increased	Availability decreased	40%	9,100

Note:
Highh : 10 to 15 years Experience in relevant field
Average 03 to 05 years Experience in relevant field

Source: JICA Study Team

6.9 Implementation Plan

The proposed implementation schedule is presented in the Table 6.9.1. Basic design concepts of road alignment and new Naluchi Bridge are determined in this preliminary design study, therefore, the said design concepts should be developed at the next detail design stage.

- Coming detailed design stage may be divided into i) Basic Design Stage and ii) Detail Design Stage.
- Two months time duration is reserved between the both design stages, in order to consider the approval of PC-1 and public dissemination of EIA report.
- In order to promote the land acquisition and resettlement process, the resettlement action plan shall be formulated, because the said process may deemed to be critical in the implementation of the project.
- The pre-qualification process of hiring contractor could be commenced after the approval of PC-1.
- Procurement of consultant is required for tendering assistance and supervision of construction work. This procurement may also be commenced after the approval of PC-1.

Table 6.9.1 Proposed Implementation Schedule