































SL	Parameters	Impact		Remarks
		Yes	No	
				the average labour requirement per day would be 3 unskilled and 16 skilled. The most of the unskilled and some of skilled manpower will be fulfilled from the local area. Hence labour camp will not be operated. Some of the outside labour will be reside within the work camp itself.
3.5	• Stockpiling of materials	√		The construction material will be stored at the convenient locations for the construction activities.
3.6	• Operation of construction equipment and transport	√		No heavy construction equipments are needed. Only small dewatering pumps, mixers, vibrators, etc will be used, which do not contribute major air pollution. Tractors and trucks would be used for material transportation.
3.7	• Occupational health and safety	√		Occupational health and safety of the workers will be dealt with.
3.8	Temporary Closure of Irrigation System	√		Construction activities are likely to disturb the supply of irrigation water. Effect will be minimized by scheduling activities in consultation with WUA.
<b>4</b>	<b>Environmental Problems Resulting from Project Operations</b>			
4.1	Effect on downstream water use		√	The proposed intervention will not be abstracting more water than existing quantity. Hence effects on downstream users have not been foreseen.
4.2	Adverse soil modifications		√	The proposed subproject is the rehabilitation of the existing irrigation system, adverse soil modification will not occur due to the proposed subproject implementation.
4.3	Changes in groundwater hydrology	√		The Subproject will improve the irrigation system which will likely recharge the groundwater tables within the command area.
4.4	Mosquito Breeding	√		Water ponding within the command area may lead to increases in incidence of waterborne diseases and mosquito breeding
4.5	Hazards associated with the use of toxic chemicals	√		Use of pesticides for the pest control could be hazardous to the people and live stock
4.6	Hazards associated with the use of mineral fertilizer	√		Increased use of fertilizers likely due to improved irrigation system, These may find its ways to ground water and surface water which could hazardous
<b>5</b>	<b>Realization of Enhancement Potentials</b>			
5.1	Employment to the local people	√		Construction activities will require construction labors. Local people will get opportunity in employment. In addition farmers have to share the construction cost which will be mostly usually in terms of labor force.
5.2	Community water supply in command area	√		The command area has existing water supply scheme (tap water). However canal water used for domestic purpose, and the purpose of washing and cleaning.
5.3	Aquaculture in command area		√	Farmers are not practicing aquaculture within the command area. It is unlikely that this will be changed during Subproject implementation.

SL	Parameters	Impact		Remarks
		Yes	No	
5.4	Livelihood programs for landless households	√		Construction activities will require both skill and unskilled laborers. The Subproject will also provide livelihood trainings to enhance economic conditions of landless households.
5.5	Feasibility of cooperatives	√		The Project will implement institutional development activities to strengthen capacity of water users associations which could function as a cooperative to support the farmers.

36. In many environmental assessments there are certain effects that, although they will occur during either the construction or operation stage, should be considered as impacts primarily of the location or design of the project, as they would not occur if an alternative location or design was chosen. The two activities in which the Subproject interacts physically with the environment are during construction and operation, so these are the two activities which most significant environmental impacts can occur. The Subproject will not cause any significant adverse environmental impacts because: (i) most of the individual elements of the Subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other excavation; and (iii) mitigation measures are devised for any negative environmental impacts.

37. These potential environmental impacts may be direct or indirect, and reversible or irreversible. The magnitude of the impacts may be high, medium or low and such impacts may be of site-specific, local, regional or of national nature. Furthermore, some impacts may be short-term, particularly related with the upgrading stage, medium-term and long-term duration.



## V. POTENTIAL ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

### Environmental Problems due to Subproject Location

38. **Encroachment due to Settlement:** The sub project is in the close proximity of Lalitpur Sub Municipality. The subproject is in the process of semi urbanization. Following encroachment were noticed during the walk through survey:

- The main canal passes through the boundary of some of the private property with houses. The surface drain of these properties is discharged into the canal. These drained water may be polluted and may not be suitable for the irrigation which could be harmful for the crops.
- *The connection of the surface drains from the private property should be stopped and prohibited. Hence any form of wastes water outlet should not be connected or discharged to the canal. WUA should be mobilized to enforce this unauthorized connection of the surface drain.*
- The main canal after chainage 2.4 km, it passes through settlement area where the canal water has been used for the domestic purpose such as washing clothes and cleaning utensils. The washing is carried out by the side of the canal. The wastes water containing soap, detergent and refused material discharged into the canal itself. Soap and detergent contaminated water is harmful for the crops.
- *Since the people have been using canal water for the domestic purpose, complete prohibition of these activities may not be acceptable to the people. The uses of canal water for the purpose of domestic use are not an issue. But wastes water from these activities should not be discharged back into the canal. Their outlet should be kept away from the canal. People lack basic requirements of health, hygiene and sanitation concepts. Hence awareness on health, hygiene and sanitation will be required to the people. Since the users are mostly women, the awareness program shall focus on women. An amount of Rs 25,000.00 has been allocated under environmental cost for the awareness campaign.*
- *As far as possible it is recommended not to use the canal water for the domestic purpose if not the washing area shall be identified and properly built with the drainage and outlet. Since there are a number of users, the construction of the washing area should be the responsibility of the users. The project will carry out the awareness program on health and hygiene. The WUA will have to enforce this rule in the community.*
- The branch canal runs along with the road to some distance. The solid wastes are dumped in the canal and the canal is found clogged. The farmers have to clear all the debris in the canal before putting the canal in operation.
- *The canal along the road side shall be covered. The cost of the covered canal is the part of civil works.*
- The branch canal runs through the settlement area under covers and reappears at the end of the settlement for irrigating part of the command area. The condition of under

cover section is unknown. It is believed that households connected their drainage in the canal.

- *The quality of water due to inlet of drains is not fully suitable for irrigation. However, WUA has assured that they will educate and mobilize concerned residents not to discharge effluents directly into the canal system. Hence, it has been expected that water quality will be improved during implementation period.*

### **Environmental Problem Related to Project Design**

39. **Suitability of Natural water for irrigation:** The source water is being used for irrigation for several years and there is no pollution source upstream. But there is possibility of water getting contaminated between the intake and command area as the canal passes through the settlement area. This has been discussed in earlier section

40. **Use of Chemicals in Agriculture and Horticulture:** The project area is located very close to the Lagankhel, where fertilizers and pesticides are easily available. The farmers are currently using fertilizers and may increase their use. Excess use of chemical fertilizers in the field may percolate into groundwater or run down into surface water along with the runoff. But the excess use of chemicals would be very rare practice as the farmers are aware about consumers' preference for low chemical products. Considering rareness of application, this impact has been considered of low magnitude, local extent and long-term duration.

41. *The agricultural development plan has recommended the optimum dose of required chemical fertilizers for each of the proposed crops. The WUA needs to incorporate agricultural chemical regulation in their plan.*

42. **Selection of Pesticides:** Majority of farmers of the subproject area are aware of the toxicity of the pesticides. Only few farmers are using pesticides. As reported, they have not undertaken any kind of integrated pest management (IPM) training. Farmers are interested on IPM rather than use of pesticides. With this background, it could be assumed that impact associated with the pesticides will be low magnitude, local in extent and long term in duration.

43. *Include IPM training under agriculture development program. The cost of this training will be covered from ADP.*

44. **Canal Management:** The operation and maintenance of the system will be the responsibility of the farmers themselves. The canal management should not have any problems as they have been practicing such works for many years by recruiting Dhalpa (labour). Hence, this impact has been classified as low magnitude, local extent and long-term duration.

45. *However the management will be worked out by the coordination committee of the system. The coordination committee will develop management plan on rotational basis.*

46. **Passageway:** There are some passageways in the existing canals which is not adequate for movement of the people. Hence, 6 additional foot bridges, 1 Village Road Bridge

(VRB) and 2 Hume Pipe VRBs have been proposed on request of farmers. This is a positive impact of high magnitude, local in extent and long term duration.

### **Environmental Problems Related to Construction Stage:**

47. The Subproject will use labour-based, environment-friendly, and participatory approach, the important features of which are:

- Use of local people as labour, hand tools and small equipment, rather than heavy machinery for construction.
- Balancing cut and fill and reuse of excavated materials as construction materials, and thus not generating excess spoils as far as possible.
- Use of bio-engineering techniques: integrated use of vegetation, simple civil engineering structures, and proper water management systems for slope protection.

48. Significant adverse negative environmental impacts are not expected during the construction stage mainly because: (i) rehabilitation works can be constructed without causing major disruption to irrigation users; (ii) most earthwork will be done by WUA working on short lengths at a time so most impacts will be localized and short in duration; and (iii) the overall construction program will be relatively short for a project of this nature, and is expected to be completed in 21 months.

49. During the construction phase most of the potential negative environmental impacts are associated with the activities of the construction contractor(s). By including environmental management clauses in the individual contract documents, the potential for adverse impacts can be significantly reduced.

50. **Excavations.** Excavation will be at the structures locations. But as the structures are small, quantity of excavation would not cause adverse effects that cause increase in silt run-off, induced erosion, loss of potential cropland, loss of vegetation.

51. Mitigation measures include: (i) confine excavation operations to the dry season; (ii) use of silt traps; and (iii) spoils shall be disposed of in locations that will not promote instability and result in destruction of property, vegetation, irrigation and drinking water supply. Disposal near wetlands, protected areas, and other areas that will inconvenience or deprive local residents of their livelihood shall not be allowed. Acidic and saline spoils shall not be spread into agricultural land.

52. **Work Camp Location and Operation.** Potential environmental impacts include (i) temporary air and noise pollution from machine operation; (ii) water pollution from storage and use of fuel, oils, solvents, and lubricants; (iii) unhygienic conditions from laborers.

53. *Mitigation measures include: (i) The Contractor shall consult with WUA and or VDC before locating project offices, sheds, and construction plants; (ii) camps shall not be located*

*near settlements or near drinking water supply intakes; (iii) no trees shall be cut and removal of vegetation shall be minimized; (iv) water and pit latrines facilities shall be provided for laborers; (v) used oil and lubricants shall be recovered and reused or removed from site by the Contractor; (vi) at conclusion of the Subproject, all wreckage, rubbish, or temporary works that are no longer required shall be removed or given to local residents; (vii) all temporary structures, including office buildings, shelters, and latrines shall be removed; (viii) sites shall be restored to near natural or stable conditions; (ix) exposed areas shall be planted with suitable vegetation; and (x) the Subproject proponent shall report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of the works.*

**54. Stockpiling of Materials (Storage of topsoil, fill material, gravel, aggregates, and other construction materials).** Potential environmental impacts include (i) siltation and pollution of surface water resulting from uncontrolled runoff from storage piles; and (ii) disturbance to private property.

*55. Mitigation measures include: (i) stockpiling shall not be permitted during the rainy season unless covered by a suitable material; (ii) stripped material shall not be stored where natural drainage will be disrupted; (iii) protection of materials from erosion prior to rainy season; and (iv) storage on private property will be allowed only if written permission is obtained from the owner or authorized lessee.*

**56. Operation of construction equipment and transport:** As no heavy construction equipments are needed, the subproject activities will not contribute major air pollution and excessive noise. However airborne dust particles due to construction materials during transportation and use may result in deposition and possible damage to vegetation, crops, and water resources.

57. Mitigation measures include: (i) stockpiled sand and soil shall be slightly wetted before loading particularly in windy conditions; (ii) vehicles transporting sand and soil shall be covered with a tarpaulin; and (iii) limit and control working practices through contract provisions such as: (a) avoid noise-generating activities at night; (b) consult with local community to inform them of the nature, duration, and likely effects of the construction work; (c) schedule work during dry season

**58. Occupational health and safety:** In the construction sites, there will be movement of local peoples. Despite precautions, possibility of accidents could not be ruled out completely as many types of equipment will be under operation. Hence, construction activities may pose safety concern to local peoples as well as workers. Although the health and safety will be major concern during the construction stage, magnitude of the impacts has been evaluated as low since provision of health and safety measures are mandatory in any of the construction contracts and due to small scale of construction. The extent will be site specific and duration will be of short term.

*Accidental insurance will be covered for all construction workers and staff. An amount of Rs. 19,000.00 has been allocated for the buying the accident insurance policy of the workers. This cost shall be covered from the environmental management cost. In order to minimize the unwanted accidents and possible effects of dust and gaseous emission to construction workers,*

*the project will ensure adequate safety measures such as provision of helmets, masks, ear plugs, road signs, warning signals etc.*

59. **Temporary closure of irrigation system.** The construction activity in the canal system is likely to disturb the supply of the irrigation water. Hence the provision of temporary closure of irrigation system will have to be made with due consultation with WUA.

60. **Mitigation Measures:** *The construction activities will be planned in consultation with the WUA members. The intake construction will be carried out during the dry season and the alternative measures will be made to keep the canal in running conditions if the construction activities will be carried out during the canal operation time. Flexible hosing and/or diversion canals will be used to supply water to affected users. Cost of alternative arrangement for supplying the water will be part of the civil construction cost.*

### **Environmental Problems Resulting from Subproject Operations**

61. **Changes in Groundwater Hydrology.** The application of the irrigation water in the field is likely to recharge the groundwater of the subproject area vicinity and the groundwater table will rise in general. But any substantial change in groundwater hydrology is unlikely due to the proposed project because the subproject area is already receiving the irrigation water. The proposed subproject is rehabilitation only. Hence the impact is considered of low magnitude, local in extent and long term in duration.

62. **Mosquito Breeding.** In an irrigation project, the water is flooded in the field especially during the monsoon season, which could be the breeding ground for the mosquito, a carrier of diseases. But the proposed subproject is the rehabilitation of the existing irrigation system, which is already in operation. The proposed subproject is not going to have any additional effect on the environment. Hence the impact is considered of low magnitude, local in extent and long term in duration.

63. **Hazards associated with the Use of Toxic Chemicals.** Pesticides are the toxic chemicals that would be used in the agricultural crops whenever crops are infested by the insects. From the focused group discussion with the farmers, they seemed to be aware of the toxicity of the pesticides. Use of pesticides in the subproject area is minimum. Farmers need some IPM (integrated pest management) training so as to train the farmers in pest management without the use of pesticides. With this background, it could be assumed that impact associated with the pesticides (toxic chemicals) will be of low magnitude, local in extent and long term in duration.

64. **Hazards associated with the Use of Mineral Fertilizer.** The farmers have been using chemical fertilizers in the crops. But the quantity of usage is less than the recommended dose for the crops. The project intends to carry out training in the crops cultivation to increase the crops yield. Hence the use of chemical fertilizers is going to be increased with the project implementation. But given the proper training programs, the application dose will be optimum for the crops and it would not create any hazard as such. Hence the impact is considered of low magnitude, local in extent and long term in duration.

## Realization of Enhancement Potentials

65. **Employment Opportunity to the Local People.** The construction of the subproject would require both skilled and unskilled labour. Semi skilled and unskilled labours are available in the subproject area as well as its vicinity. The subproject would provide employment opportunity to the local people. In addition, the farmers will have to make their contribution, which could be in kind and cash. The farmers preferred to make contribution by providing labour.

66. **Community Water Supply in Command Area.** The subproject has access to the water supply through other springs originating from upper part of the hill. Canal water has been used for any domestic purpose, and for the purpose of washing and cleaning. This has been addressed above.

67. **Livelihood Programs for Landless Households.** There are ultra poor/landless households in the subproject area who work as tenants for other households who own the land. The proposed subproject intends to enhance the economic condition of these households by implementing different livelihood programs.

68. **Feasibility of Cooperatives.** The existing irrigation system is being operated and maintained by the water users association. They have defined rules and regulations, which are followed by all the members. The rules and regulations are socially binding. The proposed CMIASP intends to implement a number of institutional development activities in strengthening capacities of the WUAs in agricultural production, and poverty alleviation of the project area. The WUA will have the key role to play in these activities. For the project implementation, a coordination committee is planned to be formed. The WUA could also function as the cooperatives to support the farmers in terms of making timely availability of agricultural inputs, marketing of the agricultural production, facilitating the micro credits.

## VI. ANALYSIS OF ALTERNATIVES

69. Since the proposed subproject is an existing FMIS, there is no other option for the alternative location for intake location and canal alignment. There were options of the type of intake and lining of the canal. Depending on the topographic condition of the intake site a single orifice intake has been proposed. There was number of options for the canal lining namely: soil cement lining, plastic sheet lining, geotextile lining and cement concrete lining. The farmers preferred to have cement concrete lining with reinforcement of chicken wire mesh.

## VII. INSTITUTIONAL ARRANGEMENTS

70. **Institutional requirements.** Nepal has an established legal and policy framework for environmental safeguarding in relation to projects. Environmental protection is overseen by the Ministry of Environment, Science and Technology (MoEST). It holds overall responsibility for environmental policy. The principal legislation for environmental safeguarding is the 1997 Environmental Protection Act (EPA) and its rules 1997, amended in 1999 and amendment in 2008. Implementation of the EPA is the responsibility of the MoEST and the sectoral ministries. For those projects having insignificant environmental impacts, the responsibility of undertaking and approving IEEs and implementing the subsequent environmental monitoring plan (EMP) are delegated to the concerned sectoral ministries. The DOI is under the MOWR. Both DOI and MOWR have environmental sections that liaise with each other. The Environmental Section within DOI was established in 1988 and is located within the Surface Water Irrigation Division (SWID).

71. The revised Schedule 1 of Section 2 of the EPR stipulates the environmental assessment requirements for irrigation schemes. It stipulates that an initial environmental examination (IEEs) is required for the rehabilitation of irrigation schemes which has new headworks or change in the main canal alignment. Since the proposed sub project is a simple rehabilitation of the existing FMIS, a formal IEE in accordance with EPR amendment 2008 will not be required.

72. **Institutional arrangements and responsibilities.** At the DOI headquarters level, a central project management office (CPMO) has been set up with class-I engineer as full time project director, and will be responsible for overall environmental management, under technical support and guidance from Environmental Section in SWID. At the regional level, regional project support unit (RPSU) has been established with director of the Regional Irrigation Directorate as project manager of each region and will be responsible for day-to-day implementation of the Project. RPSU will have an assigned staff to manage environmental activities with the assistance of the consultants. At the field level, subproject management unit (SMU) has been established in each division headed by the chief of the irrigation development division/ subdivision (IDD/IDSD), which will undertake field operations including environmental planning and monitoring under supervision by RPSU. Specific institutional responsibilities during the subproject implementation cycle are stipulated as below.

**Table 3: Institutional Responsibilities for Environmental Management**

Subproject Stage	Responsible Organization	Responsibilities
Overall	ISPM Consultants	Support capacity development of environmental planning, monitoring, and management
	EB in SWID	Guidance for environmental planning, monitoring, and mitigation
	MEQCB in PD MED	Management of monitoring and evaluation data
Screening RPSU/SMU		Screen the project results in light of environmental and other criteria
Planning RPSU/SMU/firms		Prepare IEE (included in SIP), minimize avoidable losses, incorporate mitigation measures, and prepare EMP
	CPMO-EB in SWD	Endorse IEE and SIP
	Subproject Appraisal Subcommittee	Approve IEE and SIP
	Ministry of Water Resources	Approve IEE (which fall under schedule 1,

		section 2 of EPR 1997, amendment, 2008)
WUA formation	RPSU/SMU/NGOs/COs	Strengthen WUA including monitoring capacities
Detailed Design	RPSU/SMU/firms	Assist in preparing RP, incorporate EMP into engineering design and specifications
Construction Contractor		Implement required environmental measures
	RPSU/SMU/firms	Supervise contractor implementation of environmental measures
Agriculture and social support	RPSU/SMU/firms/NGOs Implement	specific environmental mitigation measures incorporated in the agriculture and social development plan.
Operational	DOI	provide budget to undertake annual monitoring and audit
	RPSU/SMU/NGOs (during Project)	Carry-out annual performance audit of completed schemes. Support additional mitigation measures as necessary.
	RID/IDD/IDSD/DDC/DADO (after Project)	Same as above
	WUAs	Monitor agriculture practice and impacts and report them to SMU.

Notes: DB=Design Branch; EB=Environmental Branch; MEQCB=Monitoring, Evaluation, and Quality Control Branch; PDMED=Planning, Design, Monitoring and Evaluation Division; SWD=Surface Water Division



## VIII. ENVIRONMENTAL MANAGEMENT PLAN

73. The Environmental Management Plan (EMP) is prepared to guide implementation of mitigation measures and monitoring requirements. It includes institution and their roles, environmental management activities, environmental management organizational structure and budget for mitigation measures.

74. Essentially, it will be put into operation through data collection at subproject level by SMU with the engagement of private firms as necessary and/or WUA, monitored and supervised by RPSU through regular management review and field confirmation, and processing and analysis by Monitoring and Evaluation Branch of DOI in coordination with DOA. Environmental data will be shared with Environment Division. Monitoring costs have been incorporated into the design of the PPME system for the project. The findings of the monitoring activities will be incorporated in the regular PPME reports prepared by CPMO with the assistance of the consultants engaged under institutional strengthening and project management, and submitted to ADB.

75. Framework for implementing environmental management plan is shown by Table 4.

**Table 4: Environmental Management Plan**

<b>S</b>	<b>Impact</b>	<b>Mitigation Measures</b>	<b>Location</b>	<b>Method</b>	<b>Cost</b>	<b>Responsible agencies for Implementation</b>	<b>Monitoring parameters</b>	<b>Responsible Agency for Monitoring</b>
<b>1</b>	<b>Environmental Problem due project location</b>							
	Encroachment due to settlement							
	Surface drain of the private property discharge into the canal	Connection of surface drains from the private property should be stopped.	Along the canal alignment			Property owners	WU	A
	Washing and cleaning activities are carried out next to the canal and wastes water is discharge in the canal	Conduct awareness program on the health and hygiene	Settlement along the canal alignment	Conduct awareness campaign	Included in the environmental cost (Budget Rs. 25,000)	IDD/NGO/WUA		IDD/NGO/WUA
		Construct washing area with proper outlet.	Along the canal alignment	Construct the washing area with drainage outlet	Cost shall be borne by the local community	Local community/WUA	WU	A
	Solid wastes are dumped in the canal from the road side	Cover the canal along the road side	Canal along the road side	Provide covers	Included in civil cost	IDD/Contractor		IDD/Contractor
	Canal runs through the core settlement area and suspected the household drains are connected.	Realign the canal which runs through the core settlement area.	Thaiba village	Check the water quality of the canal at the end of the settlement, if found contaminated by sewage, realign the canal	The realignment cost has not been considered in the detailed design.			
<b>C</b>	Canal water gets contaminated from the drainage of private property	Surface drains of private property should not be connected in the canal	Within the sub project	Include in the design	Part of the project cost	RPSU, WUA, Contractor	R	PSU, WUA, Contractor
<b>2</b>	<b>Environmental Problem related to project design</b>							
	Canal management	Prepare sub project specific water management plan and O & M Plan.	Design Office	included in det. design	No cost	Design team	Prepare site specific water	ISPMC

**Table 4: Environmental Management Plan**

<b>S</b>	<b>Impact</b>	<b>Mitigation Measures</b>	<b>Location</b>	<b>Method</b>	<b>Cost</b>	<b>Responsible agencies for Implementation</b>	<b>Monitoring parameters</b>	<b>Responsible Agency for Monitoring</b>
							management plan	
	Passageway P	provide passageway structures	Design Office	Include in det. design	No cost	Design team	provide passage as agreed with the farmers	ISPMC
H	hazards associated with the use of toxic chemicals	Avoid using pesticide to the extent possible. Use IPM technique to control pest	Design Office	Include in Agriculture Development Plan.	No cost	Design team	Include IPM training package in Agriculture Development Plan (ADP.)	ISPMC
<b>3</b>	<b>Environmental Problem related to construction stage</b>							
	Excavation	(i)confine operations in the dry season; (ii) use of silt traps; (iii) spoils shall be disposed of at the designated locations	Within the sub-project	designate the spoil disposal area	Part of civil construction cost	Contractor	spoil disposal sites	SMU/WUA
	Quarry sites							
	<b>Work Camp Location and Operation:</b> (i) temporary air and noise pollution from machine operation; (ii) water pollution from storage and use of fuel, oils, solvents, and lubricants; (iii) unhygienic conditions from laborers;	(i) work camp will be located away from the settlement area. (ii) no trees shall be cut and removal of vegetation shall be minimized (iii) used oil and lubricants shall be recovered and reused or removed from site.	Within the sub-project		Part of civil construction cost	Contractor	Location of the work camp	SMU/WUA
		(iv) will make own arrangements for water and sanitation	Work camp		Included in environmental cost (Budget: Rs 30,000.00)	Imp: Contractor	disposal and sanitary facilities in the work camp	SMU/WUA
		(v) Site will be placed back in the original site condition and shall report in writing that site has been restored to pre-project conditions before acceptance of the works.	Within the sub-project		Included in environmental cost (Budget: Rs, 30,000.00)	Imp: Contractor	Condition of the work camp site before the issue of completion certificate	SMU
	<b>Stockpiling of Materials :</b>	(i) stockpiling will not be permitted	Construction	ensure good	Part of civil	Imp: Contractor	Inspection of the	SMU/WUA

**Table 4: Environmental Management Plan**

<b>S</b>	<b>Impact</b>	<b>Mitigation Measures</b>	<b>Location</b>	<b>Method</b>	<b>Cost</b>	<b>Responsible agencies for Implementation</b>	<b>Monitoring parameters</b>	<b>Responsible Agency for Monitoring</b>
	(i) siltation and pollution of surface water resulting from uncontrolled runoff from storage piles; and (ii) disturbance to private property.	during the rainy season unless covered by a suitable material; (ii) stripped material will not be stored where natural drainage will be disrupted; (iii) protection of materials from erosion prior to rainy season; and (iv) storage on private property will be allowed only with the written permission from the owner.	sites c	construction practice	construction cost		construction material stocking site.	
	<b>Operation of construction equipment and transport</b> : emission of air pollutants, high concentration of air borne dust resulting and excessive noise resulting annoyance and potential hazard to human populations	(i) Stockpiled sand and soil shall be slightly wetted before loading particularly in windy conditions; (ii) vehicles transporting sand and soil shall be covered with a tarpaulin; and (iii) limit and control working practices through contract provisions.	Construction site	ensure good construction practice	Part of civil construction cost	Imp: Contractor	SM	U/WUA
	Occupational health and safety	(i) Buy accident insurance to all workers. (ii) provide safety gears such helmets, boots, ear plug, mouth mask to the worker and labours	Construction site	Provide safety gears	Included in environmental cost (Budget Rs. 19,000.00)	Imp: Contractor	insurance policy	Mon: SMU/WUA
	Temporary closure of irrigation system	Plan the intake construction during dry season	Intake site		No cost	Imp: Contractor	Construction plan	Mon: SMU/WUA
		Make alternative arrangement to keep the canal running	Canals		Part of civil construction cost	Imp: Contractor	Enquiry on canal closure	Mon: SMU/WUA
<b>Environmental Problems Resulting from Project Operations</b>								
	Hazards associated with the use of toxic chemicals	Avoid using pesticide to the extent possible. Use IPM technique to control pest	Command area	Pest control by IPM	No cost	Imp: Farmers	Use of pesticide in the crops	Mon: DADO
	Hazards associated with the use of mineral fertilizer	Use recommended dose of inorganic fertilizers	Command area	Application of fertilizers	No cost	Imp: Farmers	Use of chemical fertilizer in the	Mon: DADO

**Table 4: Environmental Management Plan**

<b>S</b>	<b>Impact</b>	<b>Mitigation Measures</b>	<b>Location</b>	<b>Method</b>	<b>Cost</b>	<b>Responsible agencies for Implementation</b>	<b>Monitoring parameters</b>	<b>Responsible Agency for Monitoring</b>
				crop			s	
<b>Realization of Enhancement Potentials</b>								
	Employment to the local people	Provide employment to local people in priority	Within Sub project area	Hire local labour to the extent possible	No cost	Imp: Contractor	Payroll of contractor	Mon: WUA
	Livelihood programs for landless households	Provide Livelihood enhancement Program (LEP) training to the targeted people	Within sub project area	Training I	include in LEP cost	Imp: SMU	Training on LEP	Mon: WUA
F	Feasibility of cooperatives	Provide institutional development training	Within sub project area	Training I	include in Institutional development plan cost.	Imp: SMU	Training on Institutional development training	Mon: WUA

## IX. PUBLIC CONSULTATION AND DISCLOSURE

76. This IEE report has been in close consultation with WUA members and lead farmers who participated in the walk through survey. The walk through survey was carried out from 30<sup>th</sup> to 31<sup>st</sup> January 2009. The existing situation of the headworks and canal was noted by GPS tracking. A long list of the required intervention was noted. The required intervention was prioritized in consultation with the participating farmer. On 31<sup>st</sup> January 2009 itself a formal meeting was held with the WUA members and agreed with them on the proposed intervention that could be undertaken by the project. All the highly prioritized interventions were included whereas the medium and low priority interventions were excluded.

77. A list of the WUA members is presented below:

1. Mr. Suresh Bajrachrya Chairman
2. Mr. Basu Ram Maharjan Secretary
3. Mr. Janak Lal Maharjan Treasurer
4. Ms. Shobha Maharjan Member
5. Mr. Ram Krishna Maharjan Member
6. Mr. Gyan Lal Maharjan Member
7. Mr. Raju Maharjan Member
8. Ms. Laxmi Shobha Maharjan Member
9. Ms. Indra Maya Maharjan Member
10. Ms. Sunita Maharjan Member
11. Ms. Jit Gobinda Maharjan Member

78. The participants from WUA and locals during the Walkthrough Survey were Mr. Suresh Bajracharya WUA, Chairman, Mr. Gyan Pd. Maharjan, VDC Representative, Ms. Rebati Maharjan, WUA, Member and Mr. Kiran Bajracharya, Leading Farmer

## **X. FINDINGS AND RECOMMENDATIONS**

79. The principal findings are that the Subproject provides for inherently environmentally friendly irrigation interventions and contributes to significantly improved living conditions through (i) community emphasis on subproject design and implementation, (ii) extensive technical support in eliciting sustainable practices in irrigated agriculture and (iii) addressing institutional needs for sustained and equitable O&M.

80. The identified adverse environmental impacts will be addressed through proper planning, design, implementation, and O&M while incorporating identified mitigation measures. The screening process carried out in the IEE has not identified any significant negative environmental impacts likely to be caused by the Project. Environmental issues were considered throughout development of the Project and necessary changes were made to the designs to reduce or avoid impacts. Potential negative impacts associated with construction activities can be mitigated by the application of standard health, safety, and environmental clauses in contract documents, close supervision, and close attention to transparency in tendering, and to quality control and supervision on site. Mitigation measures for other impacts are provided in detail in the IEE.

## **XI. CONCLUSION**

81. The project is not expected to give rise to any significant negative environmental impacts, and therefore does not require an ADB Environmental Impact Assessment.

82. The proposed subproject is rehabilitation of existing irrigation system, which is already in operation. Hence, the environmental impact during the operation phase will not be very much different than the existing situation. Rather the existing system lacks basic structures like intake, cross drains, the proposed intervention will be providing basic civil engineering structures for the operation of the canal. From the proposed intervention some adverse impacts of low magnitude have been identified during the construction stage but they are of short-term duration and could be easily mitigated. The proposed intervention will provide round year irrigation to the entire command area. Taking into consideration the adverse impact of low magnitude and extensive positive impacts, this subproject is recommended for implementation on the environmental perspectives. Mitigation of minor adverse environmental impacts can be carried out as an integral part of the Subproject, during both the detailed design and implementation stages. Appropriate measures will be included in the tender documents for the civil works.



**Annex 1: Details of Proposed Intervention in the Subproject**

**2. Canal Systems (Existing )- Main canal 1**

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch
	Fro m	To					
1	0+00	Headworks	Headworks	Temporary Headwork	Maintenance after each flood required	Gabion Weir with Cut off through out the Weir	
2	0+21	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
3	0+47	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
4	0+05	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
5	0+55	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
6	0+75	0+320	Lining existing	Leakage	Leakage from canal Section	Canal Lining (M)	
7	0+14	Foot Bridge	Foot Bridge	Track Crossing	Damage by crossings	Foot Bridge (M)	
8	0+91	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
9	0+83	0+494	Lining	Leakage	Leakage from canal Section	Canal Lining (H)	

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch	
	Fro	m						To
10	0+5	23	0+543	Lining	Leakage Seep	age from canal Section	Canal Lining (H)	
11	0	+587	Out	let	No S tructure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
12	0+6	30	Out	let existing	Should be repaired	No controlled outlet causing bank erosions	Existing Out let s hould be repaired (M)	
13	0+6	65	Out	let	No S tructure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
14	0+6	65	0+671	Lining oneside	Leakage	Leakage from canal Section	Canal Lining one side(H)	
15	0+7	29	Out	let	No S tructure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
16	0+7	47	Foot	t Bridge	Track Crossing	Damage by crossings	Foot Bridge (L)	
17	0+7	47	0+754	Lining	Leakage	Leakage from canal Section	Canal Lining (H)	
18	0+7	61	0+842	Lining	Leakage	Leakage from canal Section	Canal Lining (H)	
19	0+8	04	Out	let	No S tructure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch
	Fro	To					
20	0+837	0+840	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
21	0+84	0+899	Foot Bridge	Track Crossing	Damage by crossings	Foot Bridge (L)	
22	0+892	0+899	Lining	Leakage	Leakage from canal Section	Canal Lining (H)	
23	0+896	0+900	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
24	0+913	0+917	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
25	0+951	0+957	Lining	Leakage	Leakage from canal Section	Canal Lining (H)	
26	1+013	1+017	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
27	1+019	1+023	Foot Bridge	Track Crossing	Bank Damage by crossings canal	Foot Bridge (L)	
28	1+087	1+091	Lining	Leakage	Leakage from canal Section	Canal Lining (H)	
29	1+096	1+100	Bank Lining (trapezoidal-existing)	Leakage Seep	Leakage from canal Section	Canal Lining should be repaired (H)	

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch
	Fro	m					
30	1+13	1+313	Lining	Leakage	Leakage from canal Section	Canal Lining (M)	
31	1+90	Foot	Bridge	Track Crossing	Damage embankment by crossing canal	Foot Bridge (L)	
32	1+17	HP_ro	Road crossing	Road is crossing	Road Crossing	VRB Hume pipe (L)	
33	1+24	HP_ro	Road crossing	Road is crossing	Road Crossing	VRB Hume pipe (L)	
34	1+44	1+589	Lining	Leakage	Leakage from canal Section	Canal Lining (H)	
35	1+44	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
36	1+63	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
37	1+13	Cover	Canal (optional)	Buildings are very near to canal	Solid waste disposal into the canal and may fall man and animal in the canal.	Covered canal (M)	
38	1+42	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
39	1+10	Outlet	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch
	Fro	m To					
40	1+5	58	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
41	1+6	01	Foot Bridge	Track Crossing	Damage bank by crossing canal	Foot Bridge (L)	
42	1+6	09	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
43	1+6	34	1+661	Lining	Leakage	Leakage from canal Section	Canal Lining (H)
44	1+6	57	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
45	1+6	95	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
46	1+7	15	1+767	Lining	Leakage	Leakage from canal Section	Canal Lining (H)
47	1+7	56	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
48	1+7	78	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
49	1+8	35	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch
	Fro	m					
50	1+8	63	Outlet	Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
51	1+8	90	Outlet	Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
52	1+9	24	Outlet	Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
53	1+9	55	Retaining Wall	Ground condition	Canal can collapse	Retaining wall 9m-L, 3.5m-H (H)	
54	1+9	98	Foot Bridge	Track Crossing	Damage bank by crossing canal	Foot Bridge (L)	
55	2+0	50	Outlet	Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
56	2+1	25	Outlet	Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
57	2+1	69	Outlet	Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
58	2+2	02	HP crossing	Road is crossing	Bank damage by Road Crossing	VRB Hume pipe (L)	
59	2+2	32	Outlet	Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch	
	Fro m	To						
60	2+2	60	2+266	HP road crossing	Road is crossing	Bank damage by Road Crossing	VRB Hume pipe (L)	
61	2+3	38	Division Box	Water Distribution	To distribute water to Branches	Division Box (H)		
62	2+3	66	Sub branch	Diversion for command area	Fulfill demand of Command area	Repair Sub Branch (M)		
63	2+4	41	Foot Bridge	Track Crossing	Damage bank by crossing canal	Foot Bridge (L)		
64	2+4	68	Outlet & Branch Canal & Division Box	Diversion for command area	Fulfill demand of Command area	Outlet and Branch Canal (H) & Division Box (M)		
65	2+4	90	Existing_Pond					
66	2+5	12	Foot Bridge & Outlet	Track crossing and improper outlet	Damage bank by crossing canal	Foot Bridge (L) & Outlet (H)		
67	2+5	26	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)		
68	2+5	77	HP crossing road	Road is crossing	Bank damage by Road Crossing	VRB Hume pipe (L)		
69	2+6	55	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)		

Item No	Chainage & WayPoints		Structure	Condition	Severity of the Problems on System Operation	Solution (Priority: H, M, or L)	Sketch
	Fro m	To					
70	2+6	96	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
71	2+7	47	Outlet & Division Box	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet & Division Box(H)	
72	2+8	40	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
73	2+8	62	Outlet	No Structure, uncontrolled	No controlled outlet causing bank erosions	Outlet (H)	
74	2+9	03	Foot Bridge	Track Crossing	Damage by crossings	Foot Bridge (L)	
75	2+9	60	Foot Bridge & Outlet	Track crossing and improper outlet	Damage bank by crossing canal	Foot Bridge (L) & Outlet (H)	
76	2+9	74	Foot Bridge	Track Crossing	Damage bank by crossing canal	Foot Bridge (M)	
77	2+9	99	HP Road Crossing	Road is crossing	Damage bank by Road Crossing	VRB Hume pipe (L)	
78	3+1	75	Canal structure and Outlet	No structure, uncontrolled	Large amount of water passes and erosion	End point of main canal (M)	