

Appendix-5 Soft Component Plan

(1) Background

Killinochchi water supply services had been conducted by NWSDB before the conflict; however, at present, the water supply system has been abandoned for years due to the destruction in the conflict in this region. The water supply system will be rehabilitated to maintain the original capacity of 3,000m³/day and consequently the number of service connections will increase instantaneously by the implementation of the Project.

Current water supply system in Killinochchi is to take water from dug wells and supply directly to the people by bowsers, and actual operation and maintenance is conducted by an operator and a security person who stays in a small quarter adjacent to the pump house. NWSDB plans to enhance the present water supply system, to install a temporal water treatment unit and to increase staffs to 11. But for the water supply system which will be rehabilitated by the Project the number of staffs shall be increased about 30 before the completion of the Project.

The language that is spoken in Killinochchi is not Sinhalese but Tamil. The former NWSDB's staffs who had been involved in operation and maintenance of the water supply system had left Killinochchi and/or retired already. NWSDB has staffs that are competent to operate and to maintain the newly rehabilitated water supply system in Killinochchi; however, to appoint appropriate staffs who can communicate fluently with people in Killinochchi will be a difficult subject. Taking into this aspect to hire the new staffs in Killinochchi will be inevitable for NWSDB. Especially the difference of languages shall be taken into account. To hire new staffs who understand Tamil will be important for NWSDB to organize well relation with their users through good communication.

However, it is considered not easy for NWSDB to recruit appropriate personnel that would possess the required knowledge and skills considering the current status of Northern Province. This means NWSDB have to develop their own human resources by themselves. This will take time and it is not secure, in short run, after the hand over the facilities to be reconstructed by the Project will be operated and maintained properly.

A well built management and engineering support with the soft component program to establish the operational system and technology transfer for facility operation of a new system and business operation are necessary.

(2) Objectives

The objective of the Project is to provide safe, reliable and adequate water supply to the people of Killinochchi with sufficient facility operation and management based on sound water supply services.

This soft component program will focus on the training on technical component including knowledge and technology transfer for operation and maintenance for the new water supply facilities and management of

water meters. This program will enhance the NWSDB's capacity to secure the reliability of water supply service in Killinochchi and its suburbs the aspects of quantity and quality of water supply.

(3) Outputs of Soft Component Program

This Soft Component Program will expect the following outputs:

- i) Water treatment plant operation
 - Operators and their assistants will understand the water treatment plant, and properly operate the plant.
- ii) Water treatment plant maintenance
 - Supervisors, fitters and labours will understand the water treatment plant, and properly operate and maintain the plant.
- iii) House connection and water meter installation
 - Supervisors, fitters and labours will understand the water treatment plant, and properly operate and maintain the plant.
- iv) Mechanical/electrical facility maintenance
 - Mechanical and Electrical Engineers, Mechanics and Electricians will understand the water treatment plant and its equipment, and properly maintain the plant.
- v) Water quality monitoring and control
 - Chemist and its assistants will understand the water treatment plant and distribution system in Killinochchi, and properly monitor and control water in the facilities and distribution network.

(4) Expected Results and Means of Evaluation

Objectives and outputs of each program are shown in **Table-1**. Instructors will check the training results by simple tests. In case some trainees fail to satisfy their requirement supplementary training will be imposed.

Table 1 Monitoring of the Outputs of Soft Component

Program	Monitoring	Expected Output	Requirement
1. WTP Operation	To conduct a simple test	① To understand the component of water supply facilities and objectives/function of each facilities	70 % of the test mark
		② To adequately operate raw water pump to maintain required water production.	-ditto-
		③ To operate roughing filters running and washing the filters to maintain required water.	-ditto-
		④ To operate slow sand filters running and washing the	-ditto-

Program	Monitoring	Expected Output	Requirement
		filters to maintain required water.	
		⑤ To control chlorination system to maintain clear water to drinking water standard.	-ditto-
		⑥ To drain the sludge pit and remove sand wash residues and sludge	-ditto-
		⑦ To implement daily inspection and keep records of each component of water supply facilities	-ditto-
		⑧ To check water quality on turbidity, colour, pH and residual chlorine at each treatment process.	-ditto-
		⑨ To adequately operate clear water pump to maintain water level in water tower.	-ditto-
2. Distribution Network Maintenance	To conduct a simple test	① To understand the functions of water distribution facilities	70 % of the test mark
		② To understand the water levels at the Clearwater Reservoirs and water towers	-ditto-
		③ To understand how to measure water flow and water pressure and the meanings of the measures results	-ditto-
		④ To train how to clean water pipes	-ditto-
		⑤ To train hoe to find leakage	-ditto-
3. House Connections	To conduct a simple test	① To understand the boundary limit of NWSDB and house-owners	70 % of the test mark
		② To understand importance of water meters	-ditto-
		③ To install house connections	-ditto-
		④ To install/repair water meters	-ditto-
4. Mechanical/ Electrical Facilities Maintenance	To conduct a simple test	① To understand the component of water supply facilities and objectives/function of each facilities	70 % of the test mark
		② To understand the importance of regular and preventive maintenance	-ditto-
		③ To implement regular maintenance and keep records of each mechanical/electrical equipment	-ditto-
		④ To check and select appropriate repair shops in town	-ditto-
5. Water Quality	To conduct a simple test	① To understand the importance of monitor and control water quality	70 % of the test mark
		② To set regular water quality monitoring points in the distribution network.	-ditto-
		③ To understand the component of water supply facilities and objectives/function of each facilities	-ditto-
		④ To set the water quality target at each treatment process.	-ditto-

(5) Activities

Details of the Soft Component Plan are summarized in Table-2.

Table 2 Details of Activities and Inputs

Description	Achievement	Method	Required Input
i) WTP Operation			
<ul style="list-style-type: none"> ① To understand the component of water supply facilities and objectives/function of each facilities ② To adequately operate raw water pump to maintain required water production. ③ To operate roughing filters running and washing the filters to maintain required water. ④ To operate slow sand filters running and washing the filters to maintain required water. ⑤ To control chlorination system to maintain clear water to drinking water standard. ⑥ To drain the sludge pit and remove sand wash residues and sludge ⑦ To implement daily inspection and keep records of each component of water supply facilities ⑧ To check water quality on turbidity, colour, pH and residual chlorine at each treatment process. ⑨ To adequately operate clear water pump to maintain water level in water tower. 	<ul style="list-style-type: none"> - Daily operation record - Daily inspection - Regular maintenance record format 	<ul style="list-style-type: none"> - Training Plan - Training Manual (Maintenance Guideline) - Reporting Format (Maintenance Report) - Trainees' evaluation 	<ul style="list-style-type: none"> - Water Treatment Specialist (Japanese Consultant) 1 x 2 month
ii) Water Distribution Maintenance			
<ul style="list-style-type: none"> ⑥ To understand the functions of water distribution facilities ⑦ To understand the water levels at the Clearwater Reservoirs and water towers. ⑧ To understand how to measure water flow and water pressure and the meanings of the measures results ⑨ To train how to clean water pipes ⑩ To train hoe to find leakage 	<ul style="list-style-type: none"> - Daily operation record - Daily inspection - Regular maintenance record format 	<ul style="list-style-type: none"> - Training Plan - Training Manual (Maintenance Guideline) - Reporting Format (Maintenance Report) - Trainees' evaluation 	<ul style="list-style-type: none"> - Water Distribution Specialist (Japanese Consultant) 1 x 1 month
iii) House Connections			
<ul style="list-style-type: none"> ① To understand the boundary limit of NWSDB and house-owners ② To understand importance of water meters ③ To install house connections ④ To install/repair water meters 	<ul style="list-style-type: none"> - Daily operation record - Daily inspection - Regular maintenance record format 	<ul style="list-style-type: none"> - Training Plan - Training Manual (Maintenance Guideline) - Reporting Format (Maintenance Report) - Trainees' evaluation 	<ul style="list-style-type: none"> - Piping Specialist (Japanese Consultant) 1 x 1 month
iv) Mechanical/ Electrical Maintenance			
<ul style="list-style-type: none"> ① To understand the component of water supply facilities and objectives/function of each facilities ② To understand the importance of regular and preventive maintenance ③ To implement regular maintenance and keep records of each mechanical/electrical equipment ④ To check and select appropriate repair shops in town 	<ul style="list-style-type: none"> - Daily operation record - Daily inspection - Regular maintenance record format 	<ul style="list-style-type: none"> - Training Plan - Training Manual (Maintenance Guideline) - Reporting Format (Maintenance Report) - Trainees' evaluation 	<ul style="list-style-type: none"> - Mechanical Engineer (Japanese Consultant) 1 x 1 month - Electrical Engineer (Japanese Consultant) 1 x 1 month

Description	Achievement	Method	Required Input
v) Water Quality ① To understand to clarify the boundary between public and private premises ② To understand how to install and fix water meter ③ To train pipe fixing skills for house connect water quality monitoring points in the distribution network. ④ To understand the component of water supply facilities and objectives/function of each facilities ⑤ To set the water quality target at each treatment process. i) - v)	- Daily operation record - Daily inspection - Regular maintenance record format	- Training Plan - Training Manual (Maintenance Guideline) - Reporting Format (Maintenance Report) - Trainees' evaluation	- Water Quality Specialist (Japanese Consultant) 1 x 1 month - Local Engineer (Translation) 1 x 2 month - Local Engineer (Interpretation) 1 x 2 month

(6) Implementation Methods

This soft component program will be conducted by Japanese consultants and local engineers in class-room training, exercise training and on-the-job training.

- ① Water Treatment Specialist (Japanese Consultant): 1 x 2 month
- ② Water Distribution Specialist (Japanese Consultant): 1 x 1 month
- ③ Piping Specialist (Japanese Consultant): 1 x 1 month
- ④ Mechanical Engineer (Japanese Consultant): 1 x 1 month
- ⑤ Electrical Engineer (Japanese Consultant): 1 x 1 month
- ⑥ Water Quality Specialist (Japanese Consultant): 1 x 1 month

Basic requirement for the Japanese consultants are as follows:

- To possess competent knowledge and experience in each assignment filed
- To be competent to design training manuals (maintenance guidelines)
- To be competent to manage training programs
- To understand the problems of water supply systems in developing countries
- To be able to communicate with Sri Lankan engineers in English

The local engineers will also have roles of translation and interpretation of the training program.

Basic requirement for the local engineers are as follows:

- To support preparation of training materials from English to Tamil
- To understand technical terms especially for water supply system
- To possess experience working for some international programs with foreign experts

(7) Schedule

The construction term is assumed as 13 months and the WTP and the water towers will be handed over from the Contractor to the Sri Lankan side after three months initial operation. Taking into consideration of the construction term it is better that the training programs will be started during the commissioning period due to enforce the effectiveness of the training completed. It is also important that to confirm the hand over process to be completed.

The term of the soft component programs is planned to be 2 months; one month overlapping to the commissioning period, and another one month for secure NWSDB to operate and maintains new facilities by themselves.

The detailed schedules of the soft component programs are as shown in the Table 3.

(8) Outputs

Following outputs of the Soft Component are expected.

1) WTP Operation

- ① Training plan
- ② Training material (WTP O&M Manual)
- ③ Daily inspection and regular maintenance record format
- ④ Trainees Evaluation report

2) Distribution Network Maintenance

- ① Training plan
- ② Training material (Distribution Network Maintenance Manual)
- ③ Daily inspection and regular maintenance record format
- ④ Trainees Evaluation report

3) House Connection

- ① Training plan
- ② Training material (House Connection Installation Manual)
- ③ Daily work record format
- ④ Trainees Evaluation report

4) Mechanical/Electrical Facilities Maintenance

- ① Training plan
- ② Training material (Mechanical/Electrical O&M Manual)
- ③ Daily work record format
- ④ Trainees Evaluation report

5) Water Quality

- ① Training plan
- ② Training material (Water Quality Monitoring Manual)
- ③ Daily work record format

④ Trainees Evaluation report

(9) Responsibility of Recipient Country

In order to achieve the object, it is required for NWSDB to secure/ appoint the trainees (staff of water works and local staff) before the commencement of each program.

NWSDB also will support each program by providing the necessary materials and space, etc.

The programs will transfer the basic knowledge and technology for operation and maintenance of the water supply system in Killinochchi including water intake, and the achievement of the programs will be secured by NWSDB's own effort.

Appendix-6 Other Relevant Data

6-1 Screening on Social and Environmental Considerations

Appendix 4. Screening Format

Name of Proposed Project: Rehabilitation of Kilinochchi Water Supply Scheme

Project Executing Organization, Project Proponent or Investment Company: National Water Supply and Drainage Board

Name, Address, Organization, and Contact Point of a Responsible Officer:

Name: Mr KLL Premanath, General Manager

Address: Galle Road, Ratmalana

Organization: National Water Supply and Drainage Board

Tel: 011 2635990

Fax: 011 2636449

E-Mail: gm@waterboard.lk

Date: 30/03/2011

Signature: mm

Check Items

Please write "to be advised (TBA)" when the details of a project are yet to be determined.

Question 1: Address of project site

Wilson Road, Kilinochchi

Question 2: Scale and contents of the project (approximate area, facilities area, production, electricity generated, etc.)

2-1. Project profile (scale and contents)

Water Treatment Plant Capacity – 3000m³/day

Approx. Project Area – 30 sq. km

Distribution Length – approx. 30km pipe length

2-2. how was the necessity of the project confirmed?

(The groundwater was not suitable for drinking purposes and wells dry out during drought season. There was a pipe born water supply scheme existed and thus was damaged during Conflicts)

Is the project consistent with the higher program/policy?

YES: Please describe the higher program/policy. ✓

It is planned to provide 60% of the population safe access to drinking water in year 2020 and 100% population in 2030

NO

2-3. Did the proponent consider alternatives before this request?

YES: Please describe outline of the alternatives

()
NO✓

2-4. Did the proponent implement meetings with the related stakeholders before this request?

Implemented Not implemented

If implemented, please mark the following stakeholders.

Administrative body

Local residents

NGO

Others (farmers)

Question 3:

Is the project a new one or an ongoing one? In the case of an ongoing project, have you received strong complaints or other comments from local residents?

New Ongoing (with complaints) Ongoing (without complaints)

Other ✓

It is a Rehabilitation Project; earlier one was demolished during the Conflict.

Question 4:

Is an Environmental Impact Assessment (EIA), including an Initial Environmental Examination (IEE) Is, required for the project according to a law or guidelines of a host country? If yes, is EIA implemented or planned? If necessary, please fill in the reason why EIA is required.

Necessity Implemented Ongoing/planning

(Reason why EIA is required:)

Not necessary ✓

Other (please explain)

Question 5:

In the case that steps were taken for an EIA, was the EIA approved by the relevant laws of the host country? If yes, please note the date of approval and the competent authority.

<input type="checkbox"/> Approved without a supplementary condition	<input type="checkbox"/> Approved with a supplementary condition	<input type="checkbox"/> Under appraisal
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(Date of approval: Competent authority:)

Under implementation

Appraisal process not yet started

Other ()

Question 6:

If the project requires a certificate regarding the environment and society other than an EIA,

please indicate the title of said certificate. Was it approved?

Already certified

Title of the certificate: ()

Requires a certificate but not yet approved

Not required ✓

Other

Question 7:

Are any of the following areas present either inside or surrounding the project site?

Yes No ✓

If yes, please mark the corresponding items.

National parks, protection areas designated by the government (coastline, wetlands, reserved area for ethnic or indigenous people, cultural heritage)

Primeval forests, tropical natural forests

Ecologically important habitats (coral reefs, mangrove wetlands, tidal flats, etc.)

Habitats of endangered species for which protection is required under local laws and/or international treaties

Areas that run the risk of a large scale increase in soil salinity or soil erosion

Remarkable desertification areas

Areas with special values from an archaeological, historical, and/or cultural points of view

Habitats of minorities, indigenous people, or nomadic people with a traditional lifestyle, or areas with special social value

Question 8:

Does the project include any of the following items?

Yes No ✓

If yes, please mark the appropriate items.

Involuntary resettlement (scale: households persons)

Groundwater pumping (scale: m³/year)

Land reclamation, land development, and/or land-clearing (scale: hectares)

Logging (scale: hectares)

Question 9:

Please mark related adverse environmental and social impacts, and describe their outlines.

No Adverse Impacts

6-2 Environmental Recommendation by CEA

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 மத்திய சுற்றுநாடல் அதிகாரசபை
 Central Environmental Authority



NO/KN/08/ER/41/11
 16.06.2011

“පරිසර පීඨය”, 104, ඩෙන්සිල් කොබ්බෑකඩුව මාවත, බත්තරමුල්ල, ශ්‍රී ලංකාව.
 “பரிசர பியச”, 104, டென்சில் கொப்பேகடுவ மாவத்தை, பத்தரமுல்ல, ஸ்ரீ லங்கா.
 “Parisara Piyasa”, 104, Denzil Kobbekaduwa Mawatha, Battaramulla, Sri Lanka.

Northern Provincial Office, Jaffna, TP: 021 2224050

Secretary,
 Pradeshiya Sabha,
 Karachchi.

**Environmental Recommendation for the Rehabilitation of Kilinochchi
 Water Supply Scheme - Water Treatment Plant**

This has reference to the Basic Information Questionnaire dated 26.04.2011, submitted by Regional Manager, National Water Supply & Drainage Board, Kandy Road, Jaffna to the Central Environmental Authority, Northern Provincial Office, Jaffna for the Environmental Recommendation for the Rehabilitation of Kilinochchi Water Supply Scheme – Water Treatment Plant.

The Environmental Recommendation for the above project is hereby granted subject to the following terms and condition. This Environmental Recommendation is valid for a period of one year from the date of issue of this letter. Extension will be considered on re application one month prior to the expiry of the said letter.

I. General Condition

- 1.1 The NWS & DB should obtain fresh approvals in respect of any alternation or extensions that are intended to be made to the initial project proposal submitted to Central Environmental Authority.
- 1.2 The NWS & DB is bound to ensure that the terms and condition given in this letter are adhered to during project implementation.
- 1.3 The NWS & DB shall intimate to Central Environmental Authority the date of commencement of project activity / construction activities, inclusive of phased implementation scheme.
- 1.4 A copy of this approval letter should be kept at the project site at all times for the purpose of perusal by concerned agencies.

Chairman	Tel : 2872361, 2872348 Fax : 2872347	Director General	Tel : 2872359 Fax : 2872608	Gen. Office	Tel : 2872278, 2872263, 2873447-49, 011 7877277-280 Hot Line : 2888999
Deputy Director General	HRD, Admin & Finance Division Tel : 2865296 Fax : 2872601	Envl. Pollution Control Division	Tel : 2873453 Fax : 2872605	Envl. Mgt. & Asses. Division	Tel : 2872388 Fax : 2872296
Directors	2872607 (Admin) 2872301 (HRD), 7877290 (Finance) 2872601 (Admin), 2872603 (Finance)	2873452 (EPC), 2872606 (Lab) 2872402 (WM)	2872346 (NRM), 2876643 (EIA) 2867263 (R&SP)	2867266 (EEA) Fax : 2872609	2872604 (Legal) Dir. (Western Province) Tel : 2862831 Fax : 2865293

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- 1.5 Necessary approvals from the Karachchi Pradeshiya Sabha, Department of Irrigation and other relevant agencies should be obtained prior to the implementation of the project.
- 1.6 The NWS & DB is responsible for the equity in distribution of drinking water throughout the proposed project area by adopting appropriate mechanisms, in order to ensure the fairness in distribution and to mitigate wastage of drinking water.
- 1.7 Any waste water arising from cleaning and washing shall not be released freely into the environment and such waste water shall be discharged in to a properly constructed soakage pit.

2. Noise & Vibration

- 2.1 Noise levels at the boundary of the site during the construction stage should be maintained at or below 75 dB (A) during day time (between 06.00 hrs to 21.00 hrs) and at or below 50 dB (A) during night time (between 21.00 hrs to 06.00 hrs).
- 2.2 Transport of loading and unloading of material shall be carried out in such a way to minimize the nuisance to the public and adjoining school by way of dust or noise.


3. Disposal of Solid Waste

- 3.1 Solid waste associated with the construction and the work force shall be collected regularly and disposed in consultation with the local Authority – Karachchi Pradeshiya Sabha.

Assistant Director,
Central Environmental Authority,
Northern Provincial Office,
Jaffna.

Assistant Director
Central Environmental Authority
Northern Provincial Office
Jaffna

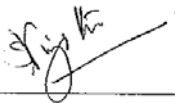
Signd. Deputy Director General -
Environmental Pollution Control Division,
Central Environmental Authority,
Battaramulla.

Copy to:  Regional Manager (J),
National Water Supply & Drainage Board,
Kandy Road,
Jaffna

**The Preparatory Survey on Rehabilitation of Kilinochchi Water Supply Scheme in
Democratic Socialist Republic of Sri Lanka**

Subject: Confirmation of Contents of CEA approval letter (NO/KN/08/ER/41/11) dated June 16, 2011.

1. Meeting Date: June 23, 2011, 9:00-10:00
2. Meeting Place: CEA office, Jaffna
3. Attendants: CEA, Northern Provincial office, Jaffna - Assistant Director,
Mrs. Vijitha Sathiyakumar
JICA Study Team, Kenji Takayanagi
NWSDB: R. Siveenthan, Engineer - Jaffna.
4. Meeting Result
 - (1) CEA approval letter (NO/KN/08/ER/41/11) dated June 16, 2011 is Environmental Clearance Letter by CEA.
 - (2) By this letter, EIA and IEE report are not required and are not necessary for the rehabilitation project of Kilinochchi water supply scheme in democratic socialist republic of Sri Lanka.
 - (3) In the implementation of the Project, constraint conditions described in the CEA Approval Letter NO/KN/08/ER/41/11) dated June 16, 2011 should keep by relating organizations to the Project.



VIJITHA SATHIYAKUMAR
CEA, Jaffna ASSISTANT DIRECTOR

V. Sathiyakumar
Assistant Director
Central Environmental Authority
Northern Provincial Office
Jaffna

AGREEMENT
BETWEEN THE
PROVINCIAL IRRIGATION DEPARTMENT
AND THE
NATIONAL WATER SUPPLY & DRAINAGE
BOARD
FOR
WATER SHARING
FROM
IRANAMADU RESERVOIR (TANK)
FOR THE
JAFFNA PENINSULA WATER SUPPLY SCHEME

**AGREEMENT BETWEEN THE
PROVINCIAL IRRIGATION DEPARTMENT (NEPC) AND THE NATIONAL WATER
SUPPLY & DRAINAGE BOARD FOR SHARING WATER
FOR THE JAFFNA PENINSULA WATER SUPPLY SCHEME**

This agreement is made and entered into by and between the Secretary to the Ministry of Agriculture, Irrigation & Lands, NEPC, Trincomalee for and on behalf of the Director of Irrigation, NEPC, (hereinafter called and referred as the Party of the first part which term of expression as herein used shall as and where the context so requires or admits of construction mean and include the said Secretary to the Ministry of Agriculture, Irrigation & Lands as aforesaid and his successors in the said office for the time being and the officers who for the time being are acting in the office of or are performing the functions now exercised by the Secretary to the Ministry of Agriculture, Irrigation & Lands acting herein for and on behalf of the North East Provincial Council Democratic Socialist Republic of Sri Lanka) and the National Water Supply & Drainage Board, a body corporate established under law No. 2 of 1974 and having its principal place of business at Galle road, Ratmalana (hereinafter called and referred to as the Party of the second part) of the other part.

WHEREAS

- (A) Implementation of the Jaffna Peninsula Water Supply Scheme (under Asian Development Bank Funding) is to be executed by the National Water Supply & Drainage Board, the Party of the second part.
- (B) It has become necessary to form an agreement for abstraction of water from the Iranamadu reservoir (tank) for Jaffna Water Supply Scheme
- (C) Such abstraction shall not have adverse affects on existing water users.
- (D) It is intended to construct a permanent intake structure for the abstraction of water from the Iranamadu reservoir with the approval of the Director of the Irrigation Department, the Party of the first part.
- (E) Such construction or operation of such infrastructure shall not have any adverse affects on the operation and safety of the existing system.

Now it is hereby mutually agreed by and between the parties as follows:

1. The Party of the first part agrees to the Party of the second part abstracting up to 1250 acre feet/month and that the Party of the first part undertakes to facilitate such process and to not take any steps to hinder such abstraction other than as provided in this agreement.
2. The Party of the first part agrees to the construction of permanent intake facilities by the Party of the second part subject to the approval of the designs and construction by the Party of the first part.
3. In order to accommodate the additional water requirement for provision of water for the Jaffna Peninsula Water Supply the Party of the second part shall provide funds for the works required to rehabilitate and extend the embankments, spillways and stilling basin and to rehabilitate, replace or

51395 m³/d.

add radial gates to permit an increase in the full storage level of the dam to 103 feet (31.39 metres) AMSL and to increase the capacity to pass the design flood as determined and agreed between the technical advisors to the Parties of the first and second parts. The works shall be substantially completed prior to the abstraction of water for the Jaffna Peninsula Water Supply.

4. Both Parties undertake to seek Government support through funding by the World Bank, the Japan Bank for International Cooperation and the Asian Development Bank for the rehabilitation of the downstream works of the Iranamadu system including distribution system improvements, crop diversification and institutional development to match the water savings criteria assumed in concluding that 1,250 acre feet per month of water is available for potable water supply. These assumptions were that 20,900 acres of paddy is supplied with irrigation water in Maha and 11,600 acres of other food crops is supplied with irrigation water in Yala. The works referred to in Paragraph 3 shall be substantially completed prior to the abstraction of water for the Jaffna Peninsula Water Supply
5. The Party of the second part undertakes to contribute towards the cost of operation and maintenance of the head works on a pro rata basis of the quantity of water withdrawn by each Party through their respective off-takes. The head works comprise the dam embankment, spillways, radial gates, stilling basin and intake structures.
6. If the Party of the second part intends to modify, rehabilitate or refurbish the intake facilities of the Jaffna Peninsula Water Supply System at a later date with the intention of maximizing O & M efficiency and to minimize operation difficulties it shall be carried out with the prior approval of the Party of the first part.
7. The Party of the second part shall arrange for flow measuring devices at the intake and the Party of the first part shall be allowed to observe the readings jointly with the Party of the second part or individually by means of an agreed mechanism. The Party of the first part shall arrange for construction of new measuring devices to measure the flow in the left and right bank main canals with funding from the Party of the second part. Both Parties shall maintain daily records of the flow measurement of their usage, which shall be reported monthly or as required by the other Party.
8. The Party of the first part will pursue, through the water management committee¹, the right to control rates of or stop abstraction of water by the second Party in the event that the Party of the first part finds that the abstraction is having an adverse effect on cultivation in the command area of the reservoir. During the periods of exceptional water scarcity, priority of water allocation between the two parties shall be decided by the water management committee, comprising officers from the first and second parties, farmer representatives and other water user stakeholders. Priority shall be given to standing crops in Maha season then to domestic use for downstream settlers and cattle but in no instance will the percentile reduction in water provided to the Party of the second part be more than the percentile reduction in water provided for irrigation.
9. It shall be obligatory on the Party of the second part to allow the Party of the first part to inspect and observe any structure or part of it in the water supply infrastructure at any time.

¹ The Water Management Committee shall comprise the following members or their representatives: Government Agents from Kilinochchi and Jaffna; Deputy Provincial Director (NE) of the Irrigation Department; Regional Manager (N) of the NWS&DB; Planning & Development Secretariat, Kilinochchi; Jaffna Municipal Council; five representatives from farmers' organisations; and three representatives of Jaffna District water users.

10. No construction of other structures for the use of the Party of the second part is permitted without the prior approval of the Party of the first part.
11. Staff of the Party of the second part attached to the intake facilities shall be responsible for and shall have free access for the operation and maintenance of the intake facilities and shall be allowed to be stationed at the intake facilities.
12. A representative of the Party of the second part shall be a member of the project management committee of the Iranamadu scheme established under the Irrigation Ordinance and any amendments thereto.
13. Any conflicts arising in implementation of this agreement shall be referred to a joint panel consisting of the Governor of the North East Province and the Secretary of the Ministry under which the NWSDB is placed for settlement in consultation with the Chief Secretary (N&E).

IN WITNESS WHEREOF THE PARTIES HAVE EXECUTED THIS AGREEMENT at the place (s) and date (s) hereinafter mentioned.

PARTY OF THE FIRST PART

Signed by: Suppaiyah Manoharan

Secretary to the Ministry of Agriculture, Irrigation & Lands, North East Provincial Council, Trincomalee
 Ministry of Agriculture, Livestock Development, Lands, Irrigation & Fisheries, Northern Province

[Signature]
 Signature: NEP/KN/DFO/01

At Trincomalee on 15 Day of July of two thousand and six in the presence of the following Witnesses: Eng. S. Sarvaloganathan Chief of Irrigation Northern Province

WITNESS *[Signature]*
 Signature:

Address: Eng. A. C. Dinotharaj
 Deputy Director of Irrigation
 Occupation: KILINCHCHI RANGE
 Signed by:

WITNESS *[Signature]*
 Signature: N. Vethanayahan
 Address: N. Vethanayahan
 Govt. Agent /
 Dist. Secretary
 Kilinochchi District
 Occupation:
 Signed by:

PARTY OF THE SECOND PART

The common seal of the National Water supply and Drainage Board is affixed in the presence of

Signed by S. C. Amarasinghe
Chairman of the
National Water Supply and Drainage Board

[Signature]
Signature

Signed by M. S. Nageer
Working Director of the
National Water supply and Drainage Board

[Signature]
Signature

Rafnabana on 14th Day of Sept.... of two thousand and seven in the presence of the following witnesses.

WITNESS

Signature: [Signature]

WITNESS

Signature: [Signature]

Address: NWSDB, Rafnabana

Address: NWSDB

Occupation: General Manager

Occupation: Chief Eng (ADB)

Signed by: K. L. K. Premaratne

Signed by: C. S. Soudoudene (Mrs)

தே.நீ.வ.உ.ச.வ.ப.ய.வ.ல் தமள் ஒன்றிற்கு 1-2 மணித்தியாலம் மத்தியம்தகன் பாய் குடாருட்டி மக்களுக்கு
 ின் வழங்கப்படுகின்றது எனவும், உத்தேசிக்கப்பட்ட 2028இல் திட்டத்தில் உள்ள மக்களின்
 நீர்தேவை 88500m³/day ஆக இருந்தும் இத்திட்டத்தில் மூலம் 27900 m³/day மட்டும் இருப்பதாகவும்
 மீதிமைய நிலைநிலை செய்ய வேறொரு மாற்றுத்திட்டத்திற்கு அதுவது மாற்றப்பாண தன்னை கவந்திர்ப்புத்
 திட்டம் மற்றும் வேறு திட்டங்களிற்கு செல்ல வேண்டி இருப்பதாகவும் கூறினார். செங்கொண்டி
 புரிந்துணர்வு உடன்படிக்கையில் குறிப்பிட்டுள்ளவற்றை விளக்கமாகக் கூறிப்பதுடன் இத்திட்டத்தில்
 உள்ளடங்கிய கலாநகரத் திட்டங்களையும் கூறினார். இத்திட்டத்தை அமுல்படுத்தவதற்கு கலாநகர
 குழிப்பி. திட்டப்பாசனத் திட்டங்களையும், விவசாயிகள் மற்றும் இங்குள்ள மக்களின் முழு ஒத்துழைப்பும்
 தேவை எனக் கூறிப்பதுடன் தே.நீ.வ.உ.ச.வ.ப.ய.வ.ல் ஏற்கனவே கூறிப்பதற்க்கமைய புரிந்துணர்வு
 உடன்படிக்கையின் கமிட்டி யொழியென்பதும் புரிந்துணர்வு உடன்படிக்கையின் ஒருபக்கக் கூறாகவும்
 விவசாயிகளுக்கு வழங்குவதற்கு 6000 பிரதிகள் தயாராக இருப்பதாகக் கூறினார்.

விவசாயிகளின் சம்பிரதானத்தின் தயாலம்

இவர் திட்டப்பாசனத்தின் விளக்க உடையின் பொது சில சில குறிப்புகளை முன்வைத்து, அவை
 வருமாறு :

- * உடன்படிக்கையில் குறிப்பிட்டுள்ளது போன்ற சர்க்காரணம் கொண்டும் 1250 ஏக்கரை நரை
 விட சேடுதவாக எடுக்க கூடாது.
- * புரிந்துணர்வு ஒப்பந்தத்தில் குறிப்பிட்டதன் பிரகாரம் கிளிநொச்சி மாவட்ட விவசாய நித்
 தேவைக்கு இடையூறு ஏக்கரத்திற்கும் நிகழ அனுமதிக்கப்படாட்டோம்.
- * திட்டப்பாசனத் தொடர்பாக குறைந்தது முன்ன மாதத்திற்கு ஒருமுறைமையது விவசாய
 சம்பிரதானத்தினால் திட்டப்பாசனத் திட்டங்களைத்திட்டும் கலந்துரையாடல் மேற்கொள்ள
 அறியப்பட்டு ஒன்று உருவாக்கப்படல் வேண்டும். அன் அமைப்பில் நீர் வழங்கும் மக்களின்
 பிரச்சனணம் கூறிய விவரத்தில் அமைப்ப வேண்டும் எனவும் வலியுறுத்தினார்.
- * மழைநீரால் முடிந்த பின்னர் ஒவ்வொரு ஆண்டும் திட்டப்பாசனத் தொடர்பான சம்பிர
 கிளிநொச்சி அரசாங்க அதுபா தலைமையில் நடைபெற வேண்டும்.
- * MOU தொடர்பாக அனைத்து விவசாயிகளுக்கும் சிறப்பான முறையில் திட்டப்பாசனத்
 திட்டங்களைத்திட்டி ஒவ்வொரு சமக்கார அறியப்பட்டு திட்டப்பாசன மேற்கொள்ள வேண்டும்

பிரதி திட்டப்பாசனப் பணிப்பாளர்

பிரதி திட்டப்பாசனப் பணிப்பாளர் பொறுப்பாளர் சுகாகரன் அவர்கள் குறிப்பிடும்பொது இத்திட்டத்திற்கு
 தமது திட்டங்களைத்திட்டினால் மேற்கொள்ளப்படவுள்ள குடியேற்றமட்டி வேலைகளுக்கான
 வேலைத்திட்டங்களை அறியப்படுதலாகவும், இத்திட்டத்திற்கு தமது திட்டங்களைத்திட்டினால் உடனடிக்கான
 செயல்தகனவும் இத்திட்டத்தினால் மிகவும் வரட்சியாக உள்ள இம்மாவட்ட மக்களின்
 நீர்தேவையை புரிந்து செய்ய ஏதேனும் திட்டம் இருந்தால் அதையும் இத்திட்டத்தின்
 உள்ளடக்கமையும் தெருவித்தார்.

கலாநகரத்தைப் பற்றிச் செயலாளர்

தமது பிரதேசம் இத்திட்டத்தினால் சேர்த்துக்கொள்ளப்படுமாற மிகவும் கவலைக்குரிய விடயம் எனவும்,
 மது பிரதேசத்தில் குடிநீர் மற்றும் விவசாய தேவைகளுக்காக நீர் தேவைப்படுவதாகவும், அவற்றை
 புரிந்து செயல்தகனக்கு மது பிரதேசத்தினையும் இத்திட்டத்தினால் சேர்த்துக்கொண்ட திட்டங்களை
 மேற்கொள்ள வேண்டும் எனவும் தெரிவித்தார்.

இறுதியாக அரசாங்க அதுபா அனைகள், கிளிநொச்சிக்குள்ள குடிநீர் வழங்கல் திட்டத்தினால் விவசாய
 அளவிற்கு வேண்டும் என தே.நீ.வ.உ.ச.வ.ப.ய.வ.ல் வேண்டுகோள் விடுத்ததுடன், சேர்த்துரைப்பாடலின்
 கலந்துகொண்டு ஒத்துழைப்பினையும், ஆலோசனையினையும் வழங்கிய அனைவருக்கும் நன்றியையும்
 தெரிவித்துக்கொண்டார்.

இக்கூட்டம் 11.30 மீது முடிவடைந்தது.

.....
 திருமதி. ரமயலதி தேவதீஸ்வரன்,
 அரசாங்க அதிபர், கிளிநொச்சி.

திருமதி. ஜா. தேவதீஸ்வரன்
 அரசாங்க அதிபர்/
 மாவட்ட செயலாளர்
 கிளிநொச்சி மாவட்டம்

Translation of the Minutes of the Discussion that GA, Kilinochchi and the relevant officials had with representatives of the Farmers Federation about supply of water to Jaffna from Iranamadu Tank.

Venue : Kilinochchi District Secretariat, Auditorium
Time : 10.30 am
Date : 12th October 2010

The Discussion with the farmers began at 10.30 a.m at the Kilinochchi District Secretariat Auditorium with the Kilinochchi Government Agent Mrs. Rubawathy Ketheswaran in the chair. Project Director, The National Water Supply & Drainage Board (NWS&DB), the Engineers of the Provincial Irrigation Department, the Deputy Director of the Irrigation Department, the Divisional Secretaries of Kilinochchi and the Representatives of the Farmers Federation (attendants register is attached herewith). In the opening address of the Government Agent she welcomed the officials who attended at the meeting She informed that the people of this district have been stressing the need for the rehabilitation of the tank in the past.

The Project Director, NWSDB in his address, welcomed all these who took part in the discussion and informed them that this project was proposed in 2006 and the time has come for its implementation. This project involves in the rehabilitation of the Iranamadu Tank, the supply of water for the Farmers of Kilinochchi and the supply of drinking water for the people of Jaffna. The project will implement the rehabilitation of the Iranamadu tank through the Provincial Irrigation Department with the funds of the Asian Development Bank. NWS&DB will undertake the water supply and Sanitation Project for the people of Jaffna and Kilinochchi. He explained the aims of the NWS&DB and its targets with maps. After that he explained the present condition of the Iranamadu Tank;

- It could hold 106,500 acre feet of water
- The tank can store water up to a depth of 28.30 ft instead of the 31 feet full supply depth, because the tank bund and the radial gates are damaged. The surplus water is allowed to drain off.
- The main supply channels are damaged to the water goes to waste.
- The cultivation in highlands has been interrupted because the water supply has not been restored.

He said that the highland cultivation and the "Maha Season" cultivation and the people living along the channel in the lower reaches could get water for their use and for the cattle, if the tank bund is raised by 2 feet.

The Project Director in his speech said that out of 50,000 m³/day, 27,000 m³/day could be sent to Jaffna for the supply of drinking water, 2000m³/day for Poonagary, Palai and other places. 4000 m³/day could be provided for Killinochchi water supply could be used. Further 8000 m³/day could be supplied for the second stage of the Kilinochchi town water supply and Iranamadu Tank will not be used for any other

purpose. As mentioned in the MOU the water will be taken with the consent of the Farmers and that the Farmers of Kilinochchi would continue to get water as they get now and they could also get additional water for highland cultivation. He further said that the NWS&DB supplies water only for 1-2 hours in the Jaffna Peninsula and that in the proposed demand in 2028, water would be 88,500m³/day. To obtain the balance needs of water we have to depend on various other projects. He spoke about the sanitation programs also. Further he thanked the Government Agent, the Irrigation Department, the Farmers and the People for their cooperation in implementing this project. As informed by the NWSDB earlier, the 6000 copies of the Tamil translation of the MOU and the one page summary notice giving the main points are ready to be distributed among the Farmers (6000 copies are ready).

The President of the Farmers Federation raised some points during the explanation of the Project Director, they are as follows;

- As mentioned in the MOU under no-circumstances will more water should be taken other than the agreed 1250 acre feet/month.
- We would not permit any hindrance to the Kilinochchi Farmers at any time as mentioned in the MOU.
- A committee should be setup to discuss with the Farmer's Federation and the Irrigation Department at least once in three months regarding water distribution. In that committee Farmer representation should be in the majority.
- A meeting regarding water distribution should be held presided by the Kilinochchi Government Agent at the end of the rainy season every year.
- The Irrigation Department should meet each Farmer organization and explain the MOU.

Deputy Director of Irrigation Eng. Suthaharan said that they will start the program for rehabilitation of the Iranamadu Tank and that they will provide all possible help for the project. He further said that if there is any other project that is useful to fulfill the need for water in this very dry district that should also be included in this project.

Divisional Secretary Kandavalai said that, he was very sad that his division was not included in this project and that his division needs water for agriculture as well as drinking purposes. He requested that his division should be included in the project to full fill the needs of the division

Finally the Government Agent requested the NWS&DB to start the water supply project for Kilinochchi quickly and thanked all officers for their participation cooperation and suggestions.

The meeting ended by 11.30a.m.

6-5 Letter of Department of Wild Life

Wild Life Ranger,
Department of Wild Life,
Kachcheri,
Vavuniya.
2011.05.02.

Regional Manager,
National Water Supply and
Drainage Board,
Jaffna.



Rehabilitation of Kilinochchi
Water Supply Scheme.


Your Reference No. RM/JAF/KILI/2011.

We wish to refer to your letter of 26.04.2011
with regard to the above subject.

In this connection, we wish to inform that the
mentioned area is not falls under our Wild Life.

Therefore, we have no objection or hesitation to
carry out said project.

Thanking you,


.....
Wild Life Ranger.

සී.ඒ.බී. ජේෂ්වී
වන සත්ව අධිකාරී දෙපාර්තමේන්තුව
විසේලකම කාර්යාලය
වවුනියා


6-6 Confirmation Note on Dumping Site


Dumping Site for Surplus Excavation Soil

June 10, 2011

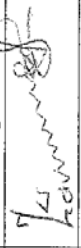
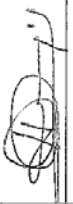

- ① Location of Dumping Site
- ② Address / Show the location on the map.
- ③ How much is the dumping fee /m³? 24
- ④ Who is the owner (private/public)?
- ⑤ Regarding dumping, what office supervise the dumping site?
- ⑥ Area of Dumping site, (_____ m²)

- ① UMAYAL PURAM
- ② UMAYAL PURAM
KILINOCHCHI
- ③ Per m³ 496/-
- ④ KARACHHI PRADSHYASABA State Land
- ⑤ " " "
- ⑥ 82500 m² (20 Acres)


Technical Officer
Karachi Pradeshiya Sabha
Kilinochchi


10/06/11
K. Thavasothy
Secretary
Karachi Pradeshiya Sabha
Kilinochchi.

Karachchi, Redegia, Sabr JICA Preparatory Survey on Rehabilitation
 of Kilinochchi Water Supply Scheme in Democratic
 Socialist Republic of Sri Lanka
 Friday June 10, 2011

Name	Designation	Organization	TEL	Signature
Mr. K. Thanasothy	Secretary	Karachchi: P.S	021 228 5761	
MR. C. C. NASEL	TECHNICAL OFFICER	" "	0775285628	
Kenji TAKAYAMA	Environmental and social consideration Specialist	JICA Study Team	0777617794	

6-7 Social Survey

1. SOURCES OF ECONOMIC AND SOCIAL DATA

The key socio-economic data used in this Study for Killinochchi Water Supply Rehabilitation Project are drawn from both primary and secondary sources. Secondary data were sourced from existing government and external reports while primary data were collected by means of (i) socio-economic surveys, (ii) focus group discussions with community members, and (iii) discussions with the key staff working in the private / public institutions. Specific findings relating to household income, health, access to water and sanitation, ability and willingness to pay for improved water supply services and other issues relevant to this Study are largely based on the results of the surveys and focus group discussions. Where appropriate, these findings are compared with available secondary data, which generally relate to Killinochchi District as a whole.

1.1 Socio-economic Surveys

Socio-economic surveys were conducted among households and institutions/ businesses in selected Grama Niladhari Divisions (GNDs) of proposed water supply distribution area of the Killinochchi water supply scheme. Issues addressed in the socio-economic surveys included the incidence of poverty; the health status of the population, and incidence of water-borne and water related diseases; existing sources of water, and access to the nearest water source; community perceptions of the quality and availability of water; water use; sanitation facilities; gender issues; maintenance and sustainability issues; and community member's ability and willingness to pay for improved water supply.

Two survey questionnaires were designed by the Sociological Team: one for householders and the other for institutions and small businesses. Field activities were undertaken by a Socio –Economic Specialist with extensive experience in conducting socio-economic surveys. All Fourteen GNDs planned to be served under the proposed project were selected from two Divisional Secretary Divisions (DSDs) of Karachchi and Kandawalai in the Killinochchi District. Selection of the households was on the basis of population density and the extent of GND coverage by the proposed project. Sample size was 512 Households (HH) out of the total planned coverage of 3000 HH. The sample represents approximately 17% of the target HH. The following factors were considered when selecting the sample in each GND.

- a) Population Density of the GND (high / low)
- b) Proposed Water Supply Coverage in the GND (high / low)

Households were selected randomly but covering each and every community cluster and the core-areas of the GND as the sample of the survey. Households were selected from the area to be covered under the proposed project within the GND area. Enumerators selected households counting every fifth unit until they reached the target of households determined in each cluster of community.

Table 1 GN Divisions and Number of Households Selected For Household Survey

DS Division	GND	Total HHs	Population Density	Proposed Coverage	Sample Size (%)	Sample Size (HH)
Karachchi	Kanagambikikulam	559	High	High	12%	66
Karachchi	Thondamannagar	274	High	High	12%	33
Karachchi	Ratnapuram	390	High	Low	8%	30
Karachchi	Kanagapuram	415	Low	High	8%	32
Karachchi	Thirunagar South	373	Low	High	8%	31
Karachchi	Thirunagar North	472	Low	High	8%	36
Karachchi	Killinochchi Town	385	High	High	12%	45
Karachchi	Udayanagar East	637	High	Low	8%	50
Karachchi	Muruthanagar	441	Low	Low	4%	17

DS Division	GND	Total HHs	Population Density	Proposed Coverage	Sample Size (%)	Sample Size (HH)
Karachchi	Anandapuram	661	High	Low	8%	52
Karachchi	Kaneshapuram	261	Low	Low	4%	10
Karachchi	Vivekandanagar	507	Low	Low	4%	20
Kandawalai	Kumaranpuram	380	Low	Low	4%	18
Kandawalai	Paranthan Town	648	High	High	12%	72
Total		6,403				512

Fifteen institutions and businesses were selected to take part in the second survey, selected to represent a wide range of type of institution. Details of the institution selected are given in the **Table 2**

Table 2 Types of Institutions

	Category	No. of Staff	Avg. No. of Visitors per day
1	NGO –Mine clearing	07	80
2	NGO	30	50
3	Private Service provider -Telecom	06	75
4	Shop	04	250
5	Tailoring Shop	05	50
6	Bank	11	60
7	Hospital	200	600
8	Government Institution (Education Office)	12	70
9	Government Institution (Technical College)	115	75
10	Government Institution (Administration Office)	11	50
11	Hotel	04	120
12	Hotel	05	60
13	Hotel	04	50
14	Hotel	04	60
15	Hotel	09	100

To conduct the survey, a team of ten experienced researchers/enumerators were engaged. One day training was provided to enumerators on the survey formats and survey methodology.

1.2 Focus Group Discussions

To aware the people in the area regarding the household survey and to validate the results of the survey, three focus group discussions were held. Around twelve persons took part in each of the discussions which were held in an informal manner

2. POPULATION PATTERNS AND FUTURE DEVELOPMENT

Within the boundaries defined, proposed project area consists of 14 GNDs with a total population of approximately 20,300 persons living in 6,400 households. While population growth rates for Killinochchi town itself are not available, it is expected that the area will experience high population growth with resettlement of people parallel to the rapid infrastructure development programs envisage in the area.

2.1 Household Composition and Housing Condition

Most households in the survey sample comprise nuclear families, with 15 percent headed by females. The average number of household members in the sample population is 4.2, which is slightly higher than the

National average of 4.1 indicated in the Household Income and Expenditure Survey (HIES) 2006/07. 23 percent of sample households, however, consist of a relatively large number of members (more than 5 members).

Table 3 Distribution of Population by Age

Description	Number	Percentage (%)
No of Adults in the family (over 18 years)	1,223	57
No of Children in the family (less than 18)	817	38
No of Adults outside family living in the house	64	3
No of Children outside family living in the house	38	2
Total	2,142	100

The percentage of the sample population below 18 years is 40 percent.

The ethnic composition of Killinochchi town is predominantly Tamil which represent 99% of the sample surveyed. In the survey sample, there were 2 Muslim families and one Sinhala family.

The majority (55 percent) of households surveyed occupy permanent houses. Balance 45 percent of households occupies non-permanent type houses.

2.2. Households Income and Assets

Killinochchi District is primarily an agricultural area. Occupations details are given in the **Table 4**.

Table 4 Occupation of Household Members

Occupation	Number	Percentage (%)
Government service	68	7.5
Private / NGO sector	27	3.0
Skilled worker- carpentry, masonry, tailor, hair cutter etc.	118	13.0
Agriculture activities - paddy, vegetables growing etc.	64	7.0
Animal husbandry- cows, goats, poultry farming etc.	13	1.4
Unskilled casual worker - agricultural or non agricultural	12	1.3
Self employed - Beedi wrapping, sawing, three wheel driving etc.	32	3.5
Trade –shop, boutique, trade on bicycle, fishing boat owner etc.	18	2.0
Small industries – buckets making, lathe work etc.	4	0.4
Unemployed	418	45.9
Other	137	15.0
Total	911	100

As there is no permanent income (salaried occupations) in most of the families, some of the adults are engaged in more than one occupation indicated above. However, for the survey, only main occupation was identified.

According to the survey results, almost 46 percent of the people in the area are unemployed. This is substantially high compared to the National average of 4.9 %. Only 10.5 percent of the people have jobs in the government/private and NGO sectors. Apart from this, most of the other households rely on government subsidies and seasonal income from various sources such as casual works. This indicates that the poverty situation in the area is high.

Average household income is given in the **Table 5**

Table 5 Average Household Income

Income Range	No of HH	Percentage (%)
Less than Rs 5,000	132	25.8
Rs. 5,000 – Rs. 10,000	143	27.9
Rs. 10,000 – Rs. 20,000	155	30.3
More than Rs. 20,000	62	12.1
No response	20	3.9
Total	512	100

As household income is the most significant indicator of economic status. Therefore, data on income from all sources were given particular attention in the socio-economic survey. Average household monthly income from all sources in the surveyed area is estimated at LKR 12,853. According to the National Statistics, the mean income of Sri Lanka households is Rs. 20,427 (HIES 2009/10). Therefore, the average income in Killinochchi area is lower than the mean income of households of Sri Lanka.

According to the HIES 2009/10 report, the 20 percent of the population in Sri Lanka who get the lowest income receive an average of Rs. 8,211. In the surveyed area, 25.8 percent of households have an income less than Rs. 5,000. The total households less than Rs 10,000 income is 53.7 percent. Therefore more than half of the population in the surveyed area can be classified as poor.

Income patterns among the surveyed households indicate that the highest income contribution (46 percent) comes from self-employments such as casual /skilled laborers, agricultural activities etc. 22 percent of the households depends on salaried jobs. 24 percent households have indicated that they rely on other sources such as house members working abroad and assistance from NGOs.

3 INFORMATION ON EXISTING WATER SERVICES

3.1 Household Access to Services

Almost 98 percent of the households use same water source throughout the year while little over 2 percent of the households switch to alternative water sources during drought periods. Therefore, droughts have no major impacts on their drinking water sources. Access to water services by sample households is given in the **Table 6**.

Table 6 Access to Water Services by Sample Households

Water source	No. of HH	Percentage (%)
House connection-piped system	2	0.4
Stand post-piped system	0	0
Pumping from own protected well	39	7.6
Protected well-1(private)	180	35.2
Protected well-2 (neighbour)	96	18.7
Protected well-3(common)	32	6.2
Unprotected well-1(private)	83	16.2
Unprotected well-2(neighbour)	59	11.5
Unprotected well-3(common)	9	1.8
Deep hand pump	6	1.2
River/ Stream /Irrigation Tank/canal	0	0
Rain water collection	0	0
Bowser supply	1	0.2
Other	5	1.0
Total	512	100

According to the Table 6, 97 percent of households use dug wells as their drinking water source. Dug wells

are the most common rural water supply source in Sri Lanka. However, particularly in the event of high population density, there is a risk of contamination of shallow dug wells due to seepage of waste water from toilet pits and other waste water sources. 30 percent of the dug wells are unprotected and therefore has high potential for contamination. The balance 70 percent of the households use protected dug wells where the contamination risk is low compared to unprotected dug wells. According to the survey 44 percent of the households have protected dug wells at their own premises which provide free access to the water source in relatively short fetching time.

As plenty of dug wells available in the area, no household is using surface water sources such as streams, ponds or irrigation channels as the drinking water source. There are no major piped water supply systems in the area. However, 2 households are taking water from a piped system established locally to cover few households.

3.2 Water Quality

Out of the total 512 households surveyed, 343 households (67%) have complained about the water quality. Perception of the surveyed households on water quality is given in the **table 7** below;

Table 7 Perception of the surveyed households on water quality

Quality	Wet season	Dry season
Bad colour	51	48
Bad smell	39	41
Bad taste	47	53
Water is heavy	146	137
High content of algae	56	69
Sediment in water	45	59
White sediments are accumulated in container used to boil water	163	159
Other (specify)	5	10

There is no significant difference in water quality during the wet season and the dry season. One reason for this situation is that the most of the households use same water source throughout the year. This results also indicates that the area has good drainage system and flooding is not a major hazard in the area.

High incidence of “Heavy” water reported in the area. “Heavy” water means high content of Calcium and / or Magnesium in the water. This is also called the hardness. According to the survey result, hardness issue is prevailed in around 30 percent of the households. This result is confirmed by the result that white sediments are accumulated in containers used to boil water. This high level of hardness may be due to limestone layers in the shallow underground in the area. People may get kidney diseases with the long term consumption of this water and therefore is a potential health hazard in the long run.

Out of the total surveyed households, only 33 percent has not reported any water quality issue. According to the survey results, other than hardness, other water quality issues are reported in about 18 percent of the sample surveyed. Therefore hardness is the single most important water quality issue according to the survey. This indicates that improved water supply service is necessary to maintain good health condition in the area.

3.3 Impact on Economic Activities due to Time Spend on Water Collection

214 households (42 %) travel outside the premises to collect water. Mode of travel and the distance of travel by household members are given in the **Table 8** below;

Table 8 - Mode of travel and the distance of travel by household members

Mode of	Distance (m)	Total
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travel	0-100	100-250	250-500	>500	
Walking	166	24	12	5	207
Foot Bicycle	4	2	0	1	7
Total	170	26	12	6	214

207 households (40.4 %) walk to fetch water while 7 households (1.4%) use foot bicycles to collect water. Therefore no household is spending money to collect water as they are not hiring outside laborers or use fuel consumed vehicles for this purpose. 170 households (33.2 %) travel less than 100m to collect water. Total households travel more than 100m is 44 (8.6%) while 6 (1.2%) of them are travelling more than 500m.

Those households who take water from sources outside the premises, on average travel 4 times a day to fetch water. Average time to fetch water can be assumed as 10 minutes per trip. Therefore fetching water takes around 40 minutes every day for 42 percent of households who are going outside their premises to collect water. Of this group, around 20 percent spend more than an hour per day to collect water as they travel over 100 m.

However, only 8 households (1.6 %) responded positively to the question on the impact on economic activities due to time spend on collecting water. According to this results, majority of the residents in the area do not consider the time spend on water fetching as lose of time. 14 households (2.7%) believe that water fetching affects children's education. These results indicate that there are adequate members in families who are not involved in economic related activities and can spend time on fetching water.

3.4 Water Use Practices

Details of Household members that boil water before drinking is given in the **Table 9** below;

Table 9 - Details of Household members that boil water before drinking

Category	No of HH	Percentage (%)
All	250	48.8
Only children	29	5.7
Only older members of family	6	1.2
Only children & Old members of family	7	1.4
None	220	42.9

Close to 49 percent of households drink water after boiling. Only 43 percent do not drink boiled water at all while some 8 percent boil water only for children and/or old people. This is a reasonably good situation compared to typical rural areas of Sri Lanka where percentage of people who boil water before drinking is comparatively low. In most rural parts of Sri Lanka finding fire woods for water boiling is costly while boiling using kerosene or gas is expensive. Availability of sufficient firewood may be a one reason for using boiled water by a comparatively higher percentage of households. This outcome also indicates that people have fairly good awareness on hygiene aspects. It was reported in few households, kidney and heart patients use bottled water for drinking on the advice of medical doctors.

3.5 O & M of tube well/ common shallow well

Only 65 households (13 %) reported to be used common water supply facilities. Management methods of these facilities are given in the **Table 10** below;

Table 10 – Common Facilities Management Methods

Method	Number	Percentage (%)
Care taker & Consumer groups jointly	1	1.5

By individual household	46	70.8
PS (Local Authority)	0	0
NWSDB	3	4.6
CBO	7	10.8
Other	8	12.3
Total	65	100

More than 70 percent of the common facilities are managed by user households without any formal organizational structure such as community based organizations or consumer societies. Formal managements can be seen only in 15 percent of common facilities. It is important to note that the Local Authority has not involved in operation and maintenance of any of the common water services.

4. SANITATION SITUATION

4.1 Type of Existing Sanitation Facilities

Table 11 shows the existing sanitation facilities in the sample households

Table 11- Household Sanitation Facilities

Type	Number of HH	Percentage
Water sealed latrine (closet) with cistern	145	28.4
Water sealed latrine – pour flush	13	2.5
Water sealed latrine – public	4	0.8
Permanent pit latrine (private)	140	27.4
Permanent pit latrine (public)	11	2.1
Temporary pit latrine (private)	58	11.3
Neighbor’s latrine	60	11.7
No latrine & open defecation within premises	16	3.1
No latrine & open defecation outside premises	62	12.1
No response	3	0.6
Total	512	100

Among the surveyed households, almost 85 percent use latrines. This is less than the National average for rural areas of 94.7 (HIES 2007). However, considering the conflict situation prevailed in the areas for 30 year, sanitation condition could be considered as satisfactory. Almost 31 percent have either pour flush or water sealed toilets, and 39 percent have pit latrines. 3 percent use public latrine while 12 percent use neighbor’s latrines. Therefore, altogether 70 percent has their own latrines while 30 percent rely on neighbor’s latrines, common latrines or open defecation. This 30 percent of the households are in need for private sanitation facilities.

15 percent of households defecate openly. This average is higher than the national average of 3 % (HIES 2007). Open defecation practices not only pose health risks to themselves, but also to the entire community living in the surrounding area. In addition, women, particularly grown up girls suffer mostly due to lack of sanitary facilities. Therefore, it is necessary to implement a sanitation improvement program parallel to water supply improvement in order to achieve health benefits of propose water supply development.

Most latrines in the surveyed households were connected to soakage pits, with associated risks of seepage and contamination of ground water. Therefore, in future sanitation improvement programs, awareness on communities on health risks associated with improper disposal of excreta is important. Further services of Public Health Inspectors have to be obtained to identify suitable locations for construction of latrines.

4.2 Condition of the Latrine

Physical conditions of latrines are summarized in the **Table 12** below;

Table 12- Physical conditions of latrines

Condition of the Latrine	No of HH	Percentage (%)
Wattle-doubled with thatched roof	123	34.6
Cadjan cover with cadjan ¹ roof	25	7.0
Brick work with tiled roof	29	8.1
Brick work with thatched roof	142	39.9
Damaged pit	22	6.2
Damaged superstructure	32	9.0
Total private latrines	356	

According to the survey results, 356 households (70 %) use their own latrines. Only 6.2 percent of households have latrines with damaged pits. These pits may be harmful to the environment due to entrance of flies, bad smell etc. Superstructure condition of the latrine is mostly concern with social status and aesthetic values rather than hygienic or environmental issues. According to the survey, only 9 percent of existing latrines have damaged superstructure. Almost half of the latrines have permanent superstructure with brickwork.

Survey enumerators have classified 9 percent of the latrines are in very good condition and 63 percent are in satisfactory condition. Only 27 percent of latrines are in unsatisfactory condition. Reasons for unsatisfactory conditions are mainly due to lack of money for maintenance, poor knowledge on hygiene and / or lack of water for proper maintenance.

4.3 Reasons for not constructing toilets

Altogether, 179 households (35 %) expressed desire to construct new toilets. Main Reasons for not constructing toilets are given in the **Table 13** below;

Table 13 - Main Reasons for not Constructing Toilets

Reason	No. of HH	Percentage (%)
No land to construct a latrine	8	4.4
Live in rented house	11	6.1
Live in encroached crown land	3	1.7
Temporary residence	54	30.2
Dispute over the site selected for latrine	3	1.7
No money to construct a latrine	100	55.9
Total	179	100

Majority expressed that lack of money is the main reason for not constructing a latrine. The other main reason is they are living in temporary residence.

5 WATER-RELATED HEALTH ISSUES

Only 7.4 percent of surveyed households reported that they have experienced water-related health problems within the last year. Total number of water borne diseases incidence were 95. Those most affected were children. There were 91 cases of medical treatment for water related diseases. Main causes were hepatitis and fever associated with stomach pain or vomiting. The average money spend per incidence is Rs. 1,068 for medicine, Rs. 246 for transport and Rs. 22 for other expenses. Considering the average monthly income of around Rs. 12,800 per month, this is a substantial cost.

¹ Cadjan: matted roof leaves

11 incidences of kidney related diseases and 151 incidences of dental fluorosis cases have been reported in the sample. This indicates that the ground water contains fluoride, in addition to high calcium /magnesium content reported under water quality aspects. The main problem with fluoride in rural areas is that this substance cannot be identified without proper laboratory testing. There is no taste, smell or any short term side effect indicating presence of high concentration of fluoride in water. In North Western, Eastern and Northern provinces of Sri Lanka, there is high incidence of kidney failures. Fluoride has been considered as the main cause for this health problem although this fact is yet to be scientifically proved.

6 SPECIFIC GENDER ASPECTS AND ISSUES

As the main users of water for domestic purposes, women are most affected if their families' main source of water is insufficient, difficult to access, contaminated or unreliable. In addition, with the main responsibility for the care of infants, differently able and the elderly falling to women, poor health among family members due to water-related or waterborne diseases can result in a significant additional burden on women.

Distance to drinking water source impacts directly on women, since it is often (although certainly not always) the task of women to fetch water each day. As around 90 percent of surveyed households' main water source less than 100 meters (within the premises or within 100 m from the premises), the task of fetching water each day is somewhat eased. Even when the water source is nearby, however, the daily burden of fetching water may be better understood when viewed in terms of the number of trips required, and the number of pots carried, to meet the average family's needs. Children, and girls in particular, are often required to fetch water in the morning before school, which may cause them to be late or even miss school. In addition, carrying heavy pots or buckets of water can, over long periods, cause injury to the hip or spine – and is particularly inadvisable for young girls or pregnant women. Security may also be a concern for some women who are obliged to walk long distances to fetch water.

The quality of water, particularly for drinking, also directly impacts on women. The task of boiling water for drinking generally falls to women, and given the additional time and fuel required to carry out the task, it is hardly surprising that water is only boiled if considered absolutely necessary.

Access to private latrines is particularly important to women, including the availability of water in the latrine for personal washing. While the majority of households in the sample reported having satisfactory latrine facilities, about 15 percent lacked their own latrines or access to neighbor's latrines, forcing family members to excrete in the open air. In addition to the obvious threat to health that unhygienic disposal of human excrement poses, women in particular suffer from lack of privacy and even fear of molestation.

7 DEMANDS FOR THE PROJECT AND COMMUNITY PREFERENCES

The survey results and findings from the focus group discussions reveal that there exists a high demand for piped water supply. This finding has confirmed with the findings of the household survey conducted in the area as shown in the **Table 14** below;

Table 14 - Water service preference

Preference for Improved Water Supply	Number of HH	Percentage
Piped water supply-house connection	450	87.8
Piped water supply- stand post	23	4.5
Piped water supply- yard tap	1	0.2
Private shallow well	16	3.1
Common shallow wells	1	0.2
Deep tube well	6	1.2
Shallow well with hand pump	3	0.6
Rain water harvesting system	1	0.2
Other	3	0.6
No response	8	1.6

Total	512	100
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Altogether 92.5 percent has preferred piped water supply. 95 percent of the households opted for piped water supply, have been given their preference for house connections while balance 5 percent has preferred yard taps or stand posts. Only other significant option is private shallow wells which has preferred by 3.1 percent. According to these results, demand for piped water supply in the area is very high.

Most households indicated that they are willing to pay for improved water supply. Details of willingness to pay are given in the **Table 15** below;

Table 15 - Willingness to pay cash for water

Range Rs. /month	Number	Percentage (%)
<100	111	21.7
100-250	271	52.9
250-500	62	12.1
>500	29	5.7
No response	39	7.6
Total	512	100

In relation to households' ability and willingness to pay for piped water, 92.4 percent expressed both ability and willingness to pay an envisaged monthly charge. 70.7 percent of household are ready to pay more than Rs. 100 as the monthly bill while 21.7 percent prefer to pay less than Rs. 100. According to the existing tariff of the NWSDB, total bill for 10 cum/month is Rs. 100 and for 15 cum/month is Rs. 175. At the same time, 17.8 percent of households are willing to pay more than LKR 250 per month.

If the average monthly water bill of a household is Rs. 200, this represent approximately 1.6 % of the average monthly income of Rs. 12,800. It can be assumed that the poorest segment of the community who earn around Rs. 5,000 per month, can be obtained 10 cubic water per month at a cost of Rs. 100. This represents 2% of the monthly income. Therefore, based on the present billing rates of the National Water Supply and Drainage Board, piped water consumption rates can be considered as affordable.

8 WATER DEMAND IN THE NON - DOMESTIC SECTOR

As a part of the socio-economic survey, present water supply situation and the water demand in the Non Domestic Sector was assessed. Total of 15 institutions including 4 Government Institutions, 2 NGO Offices and 9 private sector institutions were selected randomly for the assessment. **Table 16** shows the summary of the outcome of the survey.

Table 16 – Summary of the Outcome – Survey of Non - Domestic Places

Category	Present Water Source	Adequate water available?	Present cost of water /month (Rs)	Preference to get pipe borne water	Preferred amount to be paid for water / month (Rs)	
1	NGO –Mine clearing	Dug Well	Yes	none	yes	750
2	NGO	Dug Well	Yes	none	yes	500
3	Private Service provider -Telecom	Bottled water	yes	4,500	yes	3,000
4	Shop	Dug Well /Bottled Water	Yes	9,000	yes	500
5	Tailoring Shop	Bottled Water	yes	12,000	yes	500

6	Bank	Dug Well /Bottled Water	yes	9,000	yes	750
7	Hospital	Dug Well	yes	Electricity cost (not known)	yes	No idea
8	Government Institution (Education Office)	Dug Well	Yes in most months Inadequate in Aug-Sept	none	yes	750
9	Government Institution (Technical College)	Dug Well	Yes	none	yes	750
10	Government Institution (Administration Office)	Bottled water	yes	15,000	yes	2,000
11	Hotel	Dug Well	Yes in most months Inadequate in Aug-Sept	Electricity cost (not known)	yes	750
12	Hotel	Dug Well	Yes	Electricity cost (not known)	yes	500
13	Hotel	Dug Well	Yes	none	yes	325
14	Hotel	Tube Well	Yes	1,000	yes	150
15	Hotel	Dug Well	Yes	none	yes	500

8.1 Existing Water Source

Existing Water sources of the surveyed institutions are given in the **Table 17** below;

Table 17 – Existing Water Sources of Institutions

Water Source	Number	Percentage (%)
Dug well	8	53
Tube Well	1	7
Bottled Water	3	20
Bottle Water + Dug Well	3	20
Total	15	100

More than 50 % of the institutions use dug wells as the water source. This includes all the hotels surveyed. These dug wells are prone to pollutions from nearby toilet soakage pits and waste disposed from households and other institutions. Therefore risks of contamination of dug wells are high. Nevertheless all institutions surveyed have indicated that they are satisfied with the water quality of existing water sources. This may be due to lack of awareness on water quality issues.

It was also noted that, some of the office staff brings water from houses for their consumption. 20 % of institutions use bottled water for drinking while another 20% use bottle water in addition to the dug well water. Bottled water is the most expensive option for water supply. 1 liter of bottled water costs Rs. 50 (1 Cu. M costs Rs. 50,000). This indicates that some of the office managements in the area has understand the quality risks of water in the area and are spending substantially high amount of money to provide safe water to their staff. Only one institution which represents 7 % of the sample use a tube well, which is relatively safe compared to dug wells.

8.2 Cost of Water and Preference for Piped Water Supply

Present expenses in relation to water supply and anticipated water fee for piped water supply system is shown in the **Table 18**

Table 18 – Cost of Existing Water Services and Anticipated Piped Water Fee

Monthly fee (Rs.)	None	1-500	500-1500	> 1500	Not Known
Existing Service	6 (40 %)	0 (0%)	1(7%)	5 (33%)	3 (20%)
Proposed Piped Service	0 (0%)	7 (47%)	5 (33%)	2 (14%)	1 (7 %)

6 (40 %) Institutions get water free of charge, i.e using their own dug wells using bucket and rope. 3 (20%) institutions get water from dug wells using electric pumps but they were not clear about the power cost as same electricity connection is used for other purposes of the institution. 5 (33%) institutions pay over Rs. 1,500 per month (with an average of Rs. 9,900) for purchasing bottled water.

All 15 institutions prefer to get water services from a common piped water system. 7 (47%) institutions prefer to pay less than Rs. 500 for the services while 5 (33%) institution prefer to pay Rs. 500-1,500 as the monthly water fee.

According to shop owners, visitors to the town area prefer to drink bottled water as no piped water system available in the area. The average cost of 1 liter of bottled water is Rs. 50. This amount is not affordable to poor people, including most of the school children who rely on the water provided from shallow dug wells of the area.

9 SUMMARY

The proposed project area is predominantly rural area of Northern Sri Lanka. People in the area have suffered heavily due to the conflict situation prevailed in the area for last 3 decades. After normalization of situation in year 2009, considerable progress has been made in resettlement, infrastructure development and in the provision of community services.

People in the area are mostly relying on shallow, open dug wells to obtain their drinking water needs. Serious shortages of drinking water during dry season have not been recorded and most people use the same water source throughout the year. Almost 60 percent has water sources within their premises while the balance travels outside to obtain drinking water. Water quality of existing water sources is a serious issue considering percentage of the households complained about water quality. Health risks further aggravate due to the fact that about 15 percent of households do not have access to latrine facilities and practice open defecation.

It was also found that the Institutions, hotels and other common places in the area do not have safe drinking water sources. Domestic residents as well as staff / workers of institutions have shown their interest in obtaining piped water services.

Due to these reasons improvement of water supply and sanitation facilities in the area is a vital step to improve the living condition of people.

6-8 Base Map Preparation

Prior to conduct the outline design the JICA Study Team produced a digital base map in accordance with following procedures.

- ① To collect digital information from Department of Survey of Sri Lanka which prepared to produce the maps of Sri Lanka
- ② The digital map was produced in 1897, before the conflict had become fiercer. Therefore the Study Team conformed current situation such as new roads, new buildings on site and take digital information of them by GPS (Global Positioning System).
- ③ Based on the previous information of Department of Survey's map the collected current situation was overlapped and supplementary.

6-9 Survey Works

Prior to conduct the outline design the JICA Study Team carried out survey works and all the surveyed information was digitalized by the JICA Study Team.

Survey Works

Item	Contents
Topographical Survey	Water Intake and WTP site: Approximately 8,300 m ² Killinochchi Central College site: Approximately 3,700 m ² Paranthan Water Tank site: Approximately 500 m ²
Route Survey	Transmission line: Approximately 14.9 km Distribution line: Approximately 36.7 km Elevation data taken each 20m and bridges and culvert points Scale: H=1/1000、 V=1/200

6-10 Soil Investigation

Prior to conduct the outline designs the JICA Study Team carried out a soil investigation to collect soil information under the water supply facility sites.

Soil Investigation

Item	Contents
Water Intake and WTP site	Boring Point: 3 <ul style="list-style-type: none">- Core Boring Depth: 12.4 m ~16.6 m- Standard Penetration Test: 35 times (10 + 12 + 13)- Bearing Strength was confirmed by N-value exceeding 50- Hard rock bearing stratum was confirmed
Paranthan Water Tank site	Boring Point: 3 <ul style="list-style-type: none">- Core Boring Depth: 10.4 m- Standard Penetration Test: 9 times- Bearing Strength was confirmed by N-value exceeding 50- Hard rock bearing stratum was confirmed

6-11 Water Quality Investigation

Prior to conduct the outline deigns the JICA Study Team a water quality investigation to collect water quality information of Dry Aru, the water resource of the Killinochchi water supply system.

Water Quality Investigation

Sampling Place	Contents
Water Intake point for Killinochchi water supply system (Dry Aru Tank)	Sampling: 2 times 1 st : 8 March 2011 2 nd : 2 June 2011 Measured Parameters: Colour, Odour, Taste, pH, Conductivity, Chloride, Alkalinity, Ammonia, Nitrate, Nitrite, Total residue, Total hardness, Iron, Sulphate, Total Phosphates, Turbidity, Fluorine, Magnesium, Copper, Manganese, COD, BOD, Agricultural Chemicals (MCPA, Glyphosate), Arsenic, Cadmium, Cyanide, Lead, Zinc, Mercury, Chromium, E-coli, Algae

6-12 Specifications for Mechanical/Electrical Equipment

M-1. Intake Pump

Purpose: To pump raw water from the intake tank to the receiving well.

Quantity: 2 sets

Type: Submersible mixed flow pump

Rated: 2.85m³/min x 13.0m, IP68

Motor: 11kW-3phase, 400V, 50Hz, IP68

Material Casing: Cast iron or equivalent
Impeller: Stainless steel casting or equivalent
Main shaft: Stainless steel or equivalent

Standard accessories: Detachable unit: 1 lot
Guide pipes: 1 lot
Lifting chain: 1 lot (7m)
Pressure gauge: 1 lot
Bolts & nuts: 1 lot (SUS304)
Others

M-2. Lifting Device for Intake Pump

Purpose: To lift up the intake pumps for maintenance.

Quantity: 1 set

Type: Manual chain block with I-beam and post

Rated: 0.5ton, H=4m

M-3. Transmission Pump

Purpose: To pump clear water from the clear water reservoir to the water tower-1.

Quantity: 2 sets

Type: Horizontal centrifugal pump, indoor type

Rated: 2.64m³/min x 41.0m

Motor: 30kW-3phase, 400V, 50Hz, IP44

Material Casing: Cast iron or equivalent
Impeller: Browns or equivalent
Main shaft: Steel (S35C) or equivalent

Standard accessories: Common base: 1 lot
Foot valve: 1 lot
Coupling cover: 1 lot
Pressure gauge: 1 lot
Bolts & nuts: 1 lot (SUS304)
Others

Level: Clear water reservoir: LWL: +17.20
HWL: +19.80
Pump room floor: FL: +20.30
Water tower: LWL: +40.60

HWL: +47.60

M-4. Lifting Device for Transmission Pump

Purpose: To lift up the transmission pumps for maintenance.

Quantity: 1 set

Type: Manual chain block

Rated: 1.0ton, H=3m

M-5. Chlorination facilities

General: The chlorination facilities are composed of chlorine booster pumps, chlorinators, chlorine gas cylinders, chlorine neutralization tank and chlorine gas detector. The facility shall be installed in the chlorination room, and neutralization tank shall be installed outside adjacent to the chlorination room. The chlorination facility shall be able to feed chlorine solution at variable rates by manual operation as needed by the quantity and quality of the water to be treated at the transmission discharge point.

Quantity: 1 lot

Chlorine Booster Pump

Quantity: 1+1 (duty + standby)

Type: Vertical turbine pump

Rated: 0.04m³/min x 22m, 0.37kW (3p-400V)

Chlorinator

Quantity: 1+1 (duty + standby)

Type: Vacuum type with ejector

Rated: 0.5kg/hr

Chlorine Gas Cylinder

Quantity: 2

Type: Cylindrical tank with auto changeover unit

Rated: 68kg

Chlorine Neutralization Tank

Quantity: 1 lot

Type: Dry type or manufacturer standard

Rated: for 68kg chlorine gas

Chlorine Gas Detector and Alarm: 1 lot

Control Panel: 1 lot

Standard accessories: 1 lot

M-6. Sand Washer

Purpose: To wash skimmed sand by manual

Quantity: 1 set

Type: Movable hydraulic type without water feed pump

Washing capacity: 0.7m³/hr

Material: Mild steel (SS400)

Standard accessories: 1 lot

E-1. LV Incoming Panel

Purpose: To receive power from the incoming pole at 400V, 3-phase and 50 Hz with an interlock mechanism, metering and protection devices.

Quantity: 1 set

Type: Indoor, self-supporting, metal-clad switchgear IP42

Rated insulation voltage: AC600V

Rated current: 600A

Control circuit voltage: AC 230V

Main breaker: MCCB 4P 225AF with mechanical interlock

Current transformer (CT): 3 sets, Molded type

Voltage transformer (VT): 2 sets, Molded type

Measuring instrument As shown on the drawings

Protective relay As shown on the drawings

Indications: 1 lot

Standard accessories: 1 lot

E-2. DG Incoming Panel

Purpose: To receive power from the stand-by generator at 415V, 3-phase and 50 Hz with an interlock mechanism, metering and protection devices.

Quantity: 1 set

Type: Indoor, self-supporting, metal-clad switchgear IP42

Rated insulation voltage: AC600V

Rated current: 600A

Control circuit voltage: AC 230V

Main breaker: MCCB 4P 225AF with mechanical interlock

Current transformer (CT): 3 sets, Molded type

Voltage transformer (VT): 2 sets, Molded type

Measuring instrument As shown on the drawings

Protective relay As shown on the drawings

Indications: 1 lot

Standard accessories: 1 lot

E-3. LV Distribution Panel

Purpose: To distribute power to pump starter panels and other DBs at 400V, 3-phase and 230V, single phase with protection devices.

Quantity: 1 set

Type: Indoor, self-supporting, metal-clad switchgear IP42

Rated insulation voltage: AC600V

Rated current: 600A

Control circuit voltage: AC 230V

Main breaker:	As shown on the drawings
Measuring instrument	As shown on the drawings
Protective relay	As shown on the drawings
Indications:	1 lot
Standard accessories:	1 lot

E-4. Intake Pump Starter Panel

Purpose: To startup and control for the intake pump

Quantity: 2 sets

Type: Indoor, self-supporting, metal enclosed IP42

Rated insulation voltage: AC600V

Rated current: 200A

Control circuit voltage: AC 230V

Starter: VVVF (Variable voltage and variable frequency drive) with DOL bypass x1set

Type: Multi level voltage source inverter and PWM converter

Adapted motor: 11kWx1 submersible motor [KM-IP-1]

Main breaker: As shown on the drawings

Measuring instrument: As shown on the drawings

Control switch: As shown on the drawings

Protective relay As shown on the drawings

Indications: 1 lot

Standard accessories: 1 lot

E-5. Transmission Pump Starter Panel

Purpose: To startup and control for the transmission pump

Quantity: 2 sets

Type: Indoor, self-supporting, metal-clad switchgear IP42

Rated insulation voltage: AC600V

Rated current: 200A

Control circuit voltage: AC 230V

Starter: Soft-starter with DOL bypass x1set

Adapted motor: 30kWx1 squirrel-cage motor [KM-TP-1]

Main breaker: As shown on the drawings

Measuring instrument: As shown on the drawings

Control switch: As shown on the drawings

Protective relay As shown on the drawings

Indications: 1 lot

Standard accessories: 1 lot

E-6. Stand-by Diesel Generator Set

Purpose: To supply power as back-up

Quantity: 1 lot

Base rating: Prime

Output capacity: 100 kVA

Diesel engine: 1 set

Type: 4-cycle, turbocharged, radiator cooling

Capacity: 90kW or over for each set

Governing system: Electronic control

Engine silencer: 85 dB at 1m away

Radiator silencer: 85 dB at 1m away

Alternator: 1 sets

Type: Brushless, 4 pole, synchronous alternator

Output: 400V, 50Hz, 3 phase, 100kVA

Insulation: Class F

Housing: Acoustic enclosure, 85 dB at 1m away

Control pane: 1 set

Type: Indoor, self-supporting, metal enclosed, IP42

Rated voltage: AC 400V

System highest voltage: AC 600V

Measuring instrument: As shown on the drawings

Protective relay: As shown on the drawings

Control switch: 1 lot

Indication lamp: 1 lot

Day fuel tanks: 1 lot

Capacity: Capable for 24 hours continuous running at full loads

Accessories: Hand pump, Mechanical level indicator

Air intake filters: 1 lot, with sound attenuators

Standard accessories: 1 lot

E-7. UPS

Purpose: To distribute UPS power for instrumentations and monitoring equipment.

Quantity: 1 set

Type: Indoor, self-standing, metal enclosed, IP21

Input voltage: 230V±10%

Output voltage: 230V±2%

Capacity: 5kVA with 30 minutes backup

Battery: Sealed lead acid, Maintenance-free type

Charger: Silicon controlled automatic rectifier type for continuous use, 30A

Distribution board: MCCB30A, MCB x5

Protective relay: As shown on the drawings and the general specifications

Mounted device: As shown on the drawings

Indications: As shown on the drawings

Standard accessories: 1 lot

E-8. Intake Pump Local Panel

Purpose: To control the intake pumps by manual at the site

Quantity: 1 set

Type: Metal enclosed, with stanchion, Outdoor use, IP54

Rated insulation voltage: AC 600V

Control circuit voltage: AC 230V

Protective relay: As shown on the drawings

Mounted device: As shown on the drawings

Indications As shown on the drawings

Standard accessories: 1 lot

E-9. Transmission Pump Local Panel

Purpose: To control the transmission pumps by manual at the site

Quantity: 1 set

Type: Metal enclosed, with stanchion, Outdoor use, IP54

Rated insulation voltage: AC 600V

Control circuit voltage: AC 230V

Protective relay: As shown on the drawings

Mounted device: As shown on the drawings

Indications As shown on the drawings

Standard accessories: 1 lot

E-10. Intake Sump Level

Purpose: To detect pump pit level for the intake pump control

Quantity: 1 set

Type: Electrode Type Level Switch

Measurement liquid: Raw water

Number of electrode: 3 pieces

Material of electrode: Stainless steel, type 304

Protection pipe: 1 lot

Mounting device and accessories: 1 lot

Standard accessories: 1 lot

E-11. Intake Flow

Purpose: To measure and monitor intake flow

Quantity: 1 set

Type: Electromagnetic Flow Meter

Sensor

Fully submersible type, IP 68

Flange connection: ISO PN10
Material: body and flange: Stainless steel 304 or equivalent
Electrodes: Stainless steel 316 or equivalent
Size (diameter): 200A

Transmitter

Remotely installed from sensor, IP 54
Power: AC230V (UPS)
Indicator: Inbuilt flow rate and total flow display
Output: Isolated analog 4~20mA DC
Overall accuracy: better than +- 0.5%

Standard accessories: 1 lot

E-12. Intake Turbidity

Purpose: To measure and monitor intake turbidity
Quantity: 1 set
Type: Scattered laser type, LED and photo-diode receiver
Power: AC230V
Output: Isolated analog 4~20mA DC
Overall accuracy: better than +- 2.0%
Standard accessories: 1 lot

E-13. Clear Water Reservoir Level

Purpose: To detect and monitor pump pit level for the transmission pump control
Quantity: 1 set
Type: Submersible type level meter
Measurement liquid: Clear water
Power: AC230V (UPS)
Output: Isolated analog 4~20mA DC
Overall accuracy: better than +- 1.0%
Protection pipe: 1 lot
Mounting device and accessories: 1 lot
Standard accessories: 1 lot

E-14. Transmission Pressure

Purpose: To detect and monitor for the transmission pressure
Quantity: 1 set
Type: Pressure gauge transmitter
Measurement liquid: Clear water
Power: AC230V (UPS)
Output: Isolated analog 4~20mA DC
Overall accuracy: better than +- 1.0%

Protection pipe: 1 lot
Mounting device and accessories: 1 lot
Standard accessories: 1 lot

E-15. Transmission Flow

Purpose: To measure and monitor transmission flow

Quantity: 1 set

Type: Electromagnetic Flow Meter

Sensor

Fully submersible type, IP 68

Flange connection: ISO PN10

Material: body and flange: Stainless steel 304 or equivalent

Electrodes: Stainless steel 316 or equivalent

Size (diameter): 100A

Transmitter

Remotely installed from sensor, IP 54

Power: AC230V (UPS)

Indicator: Inbuilt flow rate and total flow display

Output: Isolated analog 4~20mA DC

Overall accuracy: better than +- 0.5%

Standard accessories: 1 lot

E-16. Instrumentation Panel

Purpose: To accommodate devices for instrumentation and to monitor value of those.

Quantity: 1 set

Type: Indoor, self-standing, metal enclosed, IP42

Mounted device: As shown on the drawings

Indication: As shown on the drawings

Main components: PLC, Integrating flow recorder, GSM modem

Standard accessories : 1 lot

Note: The flow data shall be transmittable from the flow recorder by a removable device with CSV data format.

E-17. Monitoring Panel

Purpose: To monitor the process values and alarms at the monitoring room

Quantity: 1 set

Type: Indoor, wall-mounted, metal enclosed, IP22

Graphics: Acrylic board with printing screen type

Mounted device: As shown on the drawings

Indication lamp: As shown on the drawings

Standard accessories: 1 lot

E-18. Water Tower Level

Purpose: To detect and monitor water tower level for the transmission pump control

Quantity: 1 set

Type: Submersible type level meter

Measurement liquid: Clear water

Power: AC230V (UPS)

Output: Isolated analog 4~20mA DC

Overall accuracy: better than +- 1.0%

Protection pipe: 1 lot

Mounting device and accessories: 1 lot

Standard accessories: 1 lot

E-19. GSM Modem

Purpose: To collect the water level signal and send alarm signals to the instrumentation panel in WTP by GSM network.

Quantity: 1 set

Type: GSM telemetry data transmitter, IP67

Power: AC230V (UPS) with battery backup

Transmission data: HH, H, M, L, LL and power failure