



Technical Assistance Consultant's Report

Project Number: TA 4456 - KIR
December, 2007

Kiribati. Preparing the Outer Island Growth Centers Project – Phase 2 (Water Supply and Sanitation)

Working Papers (Volume 2)

Working Paper No 7: Summary Initial Environmental Examination

(Financed by the Asian Development Bank)

Prepared by the designated Project Team Members, TA 4456 - KIR

Sinclair Knight Merz (SKM)

Melbourne, Australia

For Ministry of Finance and Economic Development (MFED)
 Ministry of Line and Phoenix Islands Development (MLPID)

This consultant's report does not necessarily reflect the views of ADB or the Government concerned, and ADB and the Government cannot be held liable for its contents. (For project preparatory technical assistance: All the views expressed herein may not be incorporated into the proposed project's design.

Asian Development Bank

Report Structure – Volume 2

The Working Papers contained in this volume detail work completed in Kiritimati Island, Kiribati, during October - December, 2007, in respect of a feasibility study undertaken for a proposed ADB investment project in water and sanitation. The feasibility study was undertaken as the main output of Phase 2 of the *TA No. 4456 - KIR: Preparing the Outer Island Growth Centers Project (Kiritimati Island)*.¹

The results of the TA are contained within 3 main reports;

- the Executive Report (Volume 1);²
- the Working Papers (Volume 2 - the current volume) which provide the detail of the overall feasibility study and the summary Executive Report, and
- the draft Kiritimati Island Development Plan (KIDP - Volume 3) which addresses overarching island development issues and directions on Kiritimati Island.

The Working Papers are contained in this volume in the following order;

1. Hydrology
2. Water Supply
3. Sanitation
4. Economic and Financial Analysis
5. Social and Poverty Analysis
6. Initial Environmental Examination
7. Summary Initial Environmental Examination
8. Environmental Information and Assessment
9. Institutional Arrangements for Improved Island Planning and Development
10. Existing Infrastructure Survey for Water and Sanitation

¹ The team comprised Paul Jones, Development/ Planner/Team Leader, Tony Falkland, Civil Engineer and Water Resources, Tony McDonald, Environmental Adviser, Jonathan Powell, Community Development Adviser, Marcus Napud, Economist and Ian White, Water Resources/Engineer. Ms. Makurita Bauro proved liaison support to the TA while based in Tarawa. Special thanks to Ms. Maketara Ioane, Resource Economist, from the MLPID and GoK TA counterpart for her valuable assistance and support in Kiritimati Island.

² A draft ADB Report and Recommendations to the President (RRP) was also prepared for internal ADB consideration. The Executive Report is based on the information contained in the draft RRP.



Technical Assistance Consultant's Report

Project Number: TA 4456-KIR
March 2008

Kiribati: Preparing the Outer Island Growth Centers Project – Phase 2 (Water Supply and Sanitation)

Working Paper No. 7: Summary Initial Environmental Examination (Volume 2)

(Financed by the Asian Development Bank)

This consultant's report does not necessarily reflect the views of ADB or the Government concerned, and ADB and the Government cannot be held liable for its contents. (For project preparatory technical assistance: All the views expressed herein may not be incorporated into the proposed project's design.)

Table of Contents

Summary Initial Environmental Examination	1
1. Introduction	1
2. Description of the Project	1
3. Description of the Environment	2
1. Physical Environment	2
2. Socio-economic Environment	2
3. Biological Environment	3
4. Cultural Environment and Historical Heritage	3
4. Forecasting Environmental Impacts and Mitigations Measures	4
1. Environmental Impacts Caused by the Project Location	4
2. Impacts Related to Design	4
3. Impacts during Construction and Mitigation Measures	4
4. Long-Term Impacts and Mitigation Measures	5
5. Institutional Requirements and Environmental Management and Monitoring Plan	6
6. Public Consultation and Information Disclosure	7
7. Findings and Recommendations	8
8. Conclusion	8

Summary Initial Environmental Examination

1. Introduction

This SIEE offers a succinct summary of the IEE produced for the proposed Loan and Technical Assistance for Kiritimati Island, Republic of Kiribati. As an outer island of a country with small land resources, Kiritimati Island enjoys a very low density of population which is in massive contrast to the capital of the nation, South Tarawa. It is not surprising therefore that in the new millennium that Kiritimati Island has been nominated as a major growth centre for population and development by the government.

An essential component of increasing population is to ensure that there is provision of sufficient infrastructure. The Project aims to upgrade and implement the construction of appropriate water and sanitation hardware and software to sustain a greater population.

The challenging factor from the environmental perspective is that Kiritimati Island is an asset of international ecological and conservation significance, reported to having the highest species diversity and largest number of breeding seabirds of any island in the world. The island also has a significant diversity of marine resources including ocean, reef and lagoonal species. Prior to independence from the United Kingdom in 1978, the island was declared an area of wildlife protection, a status supported by researchers and organisations but not formally constituted at the international level. The IEE is clear in stating that the present management of the protected resource and the marine resources are not being managed. While the link between management of natural resources and the prospect of a water and sanitation Project may seem tenuous, the potential impetus to population numbers as a consequence of any water and sanitation upgrade will undoubtedly put greater pressure on existing resources. The IEE argues that without considerable addressing the critical problems now, an area of outstanding beauty and a potential and on-going source of income from niche tourism will be lost.

2. Description of the Project

Based on the Household Survey and Existing Water and Sanitation Infrastructure Survey (November 2007), some 58% of households identified that they experience a lack of piped water supply.

Part A; Implementation of Physical Components

Part A is concerned with achieving technical competencies in terms of existing water and sanitation hardware upgrade, additional installation of hardware and establishment of a well resourced proactive maintenance regime. The main physical components of the Project will include the following interventions: (i) construction of 32.7km of primary and secondary trunk lines and 20.6 km of distribution network; (ii); install 14.5 km of sub-terrain water pumping galleries and construct 12 windmills and 12 solar pumping stations, plus rehabilitation to existing water pumping equipment connected to galleries; (iii) installation of ozonator filtration facilities; (iv) construction and rehabilitation of appropriate boreholes; and (v) installation of 284 toilets with pedestal seats, replacement of 342 septic tanks. In addition, the Project will install rain water tanks in communal centers.

Part B; Project Support

Part B of the Project concerns the management of Project software including people and system components that depend upon institutional strengthening, community mobilization, and Project management and implementation support.

3. Description of the Environment

1. Physical Environment

Kiribati is one of the most isolated countries in the Central Pacific being remote from major sea, or airports, major markets and communication networks. At 388 km² it is also the largest island of Kiribati. Kiritimati Island lies just north of equator in the dry equatorial oceanic climate zone where the daily temperature ranges between 26^oC and 32^oC. The landform is predominantly flat and freshwater resources extremely limited, being sourced from a number of discrete groundwater lens which float over a denser saline groundwater. These groundwater lenses are vulnerable to contamination from human activity and livestock. Protecting freshwater lenses for potable water supply and maintaining adequate water quality is a key consideration in atoll living.

Pre settlement, the island lacked any great number of canopy species but over intermittent periods of settlement, the establishment of coconut palm plantations on the island, most particularly in the north, has been successfully achieved. Although many are chlorotic in appearance, they bear a constant supply of nuts for copra and household food source.

The lagoon area of the island holds a spectacular appeal for fly fishing tourists who visit the island in great numbers, angling predominantly for one species. Beyond the lagoon, the island is surrounded by a coral shelf of up to 50 metres, where a reef zone is positioned adjacent the dramatic drop to the ocean floor.

2. Socio-economic Environment

The population on the island is presently estimated to be approximately 6,000 persons (2007) with an annual growth rate of 8%. Based on the results of the Surveys, average household size on the island is 9.5 persons per household, and number of houses and premises 626, of which some 330 of which are for government employees. No-one would go without food on the island and people consider themselves to be food secure. However, at present, although the terms 'poverty' and 'poor' are particularly offensive in Kiribati, causing insult when used to describe a person or group of people, some 16% of Kiritimati Island residents are below the Food Poverty Line for outer islands in Kiribati. This equates to A\$202 pc p.a. and 24% below the Poverty Line for outer islands, which is A\$243 pc p.a.

Water in some villages is distributed for only 2 hours a day and this service can be interrupted. Better-off households are reported to purchase relatively expensive imported plastic-bottled water for drinking, if needed. However, 70% of the population living in the Project area uses unsafe water groundwater wells. Consequently, incidence of waterborne diseases in 2006 was high. Parasitic and communicable gastrointestinal diseases are the most frequent, followed by non-communicable gastrointestinal disease, kidney disease, and skin disease. Some 27% of the population (2005 Census) prefers to use the beach and bush for their toilet. Many of the existing septic tanks in the surveyed households are not

equipped with leak-proof concrete lining and bleed to the groundwater. In general, rapid assessment of school infrastructure for water and sanitation indicates it follows the community standards of un-serviceable and non-serviced septic tank systems.

The improved water supply and sanitation systems will provide opportunities for hardship reduction through: (i) improved health status and well-being of residents by reducing the incidence of waterborne diseases; (ii) creation of new job opportunities during construction; (iii) improved water resource protection and management, including household wells; and (iv) assist in creating an enabling environment for private sector development in Kiritimati Island, including tourism.

3. Biological Environment

Kiritimati Island is the world's largest coral atoll and is an asset of international ecological and conservation significance, reported to having the highest species diversity and largest number of breeding seabirds, of any island in the world. The island is reportedly the home for the largest populations of two threatened species, the Phoenix Petrel, which is endangered, and the White-Throated Storm Petrel which is vulnerable. There are 5 protected areas on Kiritimati Island, a status which has proven difficult to manage. Poaching of birds and disruption of nesting areas by the population is chronic. The marine resources of the Island also have significance with ocean, reef and lagoon species of significance. Tourism to the island is based upon this biological significance.

Numerous authors describe the indigenous flora of Kiribati's atolls as being amongst the poorest on the earth. Until settlement, the predominance of a number of drought hardy salt bush constituted the major growth above 1.0m in height. The paucity of the soils is clearly a major factor on vegetation characteristics. Surveys to investigate and improve coconut growing potential, assessment documentation to support potential protected area status and previous water and sanitation initiatives all affirm the infertility. It is clear from the pronounced chlorotic condition of many mature coconut palms that in some areas soils are nitrogen deficient, pH is high, organic levels almost non-existent, and therefore water holding and nutrient availability severely limited. In parts, it is evident that the hyper-saline conditions which have been the result of closed water bodies/ponds being subjected to long periods of sun, contribute to the rotational incidence of vegetation decline.

As a result of the predominant un-compacted and structureless coral and coarse sand soil profile compositions on the atoll, a large percentage of rainfall can potentially percolate efficiently into the ground. Harvest of rainwater into the lens system is reported at 30%.

4. Cultural Environment and Historical Heritage

Settlement history of Kiritimati Island has been checkered due to its drought prone nature. It has been European led activities that inspired occupation and much of this has been at the initiative of military needs of three different nations; namely, USA, UK and Japan. Post independence, the movement of I-Kiribati people to the island was limited due to the imposition of a "permit" system which aimed to support its protected status. In-migration has occurred from many different islands of Kiribati, one result being that deep seated cultural norms and values have routinely been merged and diluted. The built form represents three styles; traditionally built homes, concrete block modern housing, and reconstituted military buildings from the three periods of military occupation.

4. Forecasting Environmental Impacts and Mitigations Measures

1. Environmental Impacts Caused by the Project Location

The isolation of the island is a consideration. The need to transport almost all equipment into the island means that the ecological footprint of this Project is large. However, when taking into consideration the size of the island, the actual area of Project activity including the area impacted by excavation and installation, is very small.

The coral soils, which comprise the majority of the island beyond the freshwater lens areas, are un-compacted and structureless. Disturbance of any 'topsoil' profile will have minimal effect and attempts to protect and re-use the top layer of soil post excavation would, in the most part, be redundant. The location of new infrastructure including galleries and can be designed to ensure that there are no significant environmental implications. There should be no need for any loss of coconut palms, although the vigorous growing indigenous salt bush shrub may need to be cleared to gain for access for some reticulation piping.

Removal of and transporting and burying the unserviceable existing septic tanks will be a major component of the Project and each septic tank will require emptying by a pump-out truck.

Long-term exploitation of groundwater sources will require on-going accurate assessment of the aquifer's sustainable annual recharge against approved annual yield, most particularly during periods of drought. Adequate waste water systems will need to be developed as well.

2. Impacts Related to Design

Design options available for Project water supply are few as the reticulation system requirements are simple and will optimize the location of trunk lines and secondary reticulation lines along existing road corridors and in areas implying no or minor environmental concerns. However, at design stage, measures can be taken to ensure that pipeline construction will cause temporary occupation of State land along road corridors and within settlement areas. Measures can also be taken to avoid any encroachment close to the lagoon area or sites of historical and archaeological importance, if any, during construction works.

3. Impacts during Construction and Mitigation Measures

Occupation of Land around Settlement. Measures will be taken at the design stage to avoid minimal encroachment on land around settlement. This includes optimizing the laying of reticulation systems to minimize disruption to private buildings, houses, schools and maneabas.

Increased Traffic. During the course of construction, there will of course be an increase in traffic. However, excavation for pipeline is not specified to be deep and therefore the time for revealing, installing pipe and making good the site can actually be very quick. When working close to the schools, increased safety measures will need to be enforced by contractors in accordance with the national code for traffic safety.

Use of Machinery. Temporary environmental concerns related to the use of excavators and trucks during construction works will include: (i) noise and dust from construction sites,

and (ii) safety for workers and inhabitants. Measures will include: (i) avoiding work with noisy equipment in settled areas at night; (ii) careful management of excavation, earthmoving works, and transportation of earth, particularly within settled areas; and (iii) use of masks by operators.

Soils. As a result of the predominant un-compacted and structureless coral and coarse sand soil profile compositions on the atoll, the excavation and groundwork will be very easy. However, the same un-compacted nature of these soils also makes them very vulnerable to rapid effects of pollution agents. Soil protection measures that aim to monitor and manage any pollution of groundwater during construction will be adopted during the design stage. Excess soil or spoil from excavation will be required to be removed off site and used to make good areas on the island with previous excavated sites, of which there are many.

Waste Management. Measures adopted during construction will include the adoption of a systematic collection of all refuse and solid waste associated with Project implementation. This includes sludge removal and drying in the agreed collection centers. Care will be taken to cover the sewage laden masonry which is removed from unserviceable septic tanks. After completion of construction works, all sites will be cleaned and appropriately made good. Sanitation facilities will be constructed at the work sites.

Historical and Cultural Sites and Landscape. The Project area does not coincide with any known archeological nor historical monuments. Any discovery of archaeological remnants during excavation works will be reported immediately to the authorities.

4. Long-Term Impacts and Mitigation Measures

Groundwater deposits. Although monitoring and measurement of the freshwater lens system has been a component of the IEE stage, it must be understood that such work is presently not an exact science. Of four different reports that have estimated groundwater reserves, the four have found four different estimates. However, the present investigation is based upon more detailed data, with withdrawal rates based on conservative estimates. However, as planned extraction from targeted groundwater deposits is substantially higher than current extraction levels, it is important that monitoring and data compilation is subsequently more rigorously applied in the future. Therefore, it will be important that regular data monitoring be established as a critical component under Project institutional strengthening. It is clear that there is currently too greater emphasis upon outside technical assistance to understand and manage these resources.

Wastewater. The Project targets full coverage of water supply service through individual connections and indications are that significant grey water volumes will be produced. Increased amounts of water used for domestic needs will be recycled through grey water effluent basins and then to domestic gardens.

Protection of Water Resources and Water Quality. Protection of the area above the freshwater lens is an important consideration for design and ongoing management of impacts. Previous Project attempts have established marker points around the water reserves and major pipelines. Such a system is recommended to be included as part of the community awareness component of the Project

Impacts Caused by the Project Infrastructure Operation. Water disinfection will be implemented using electrically driven equipment that injects ozone into the water. These disinfection / filtration facilities will be placed in separate units associated with village header

tanks, as well as at the main freshwater field pumping points. This technology is superior and more cost effective to that of chlorination, leaving very little room for error in dosage rates.

5. Institutional Requirements and Environmental Management and Monitoring Plan

An environmental management and monitoring plan (EMP) has been prepared. It distinguishes between (i) monitoring and mitigation of potential environmental impacts from site selection and design, (ii) monitoring and mitigation of potential environmental impacts from the construction phase, and (iii) monitoring and mitigation of potential environmental impacts from operations and maintenance. The parameters to be monitored, as well as the frequency of monitoring and reporting, will need to be established, tested and adjusted as needed during the Project. However, at this stage it is considered that the Project is a non-sensitive category B and will have minimal environmental effects.

Environmental Impact Assessment: Under Part III of the Environmental Protection Act (Clause 14), any developer carrying out Prescribed Development, defined in the Schedule to the Act to include amongst other things, Infrastructure Development or Watershed Management must firstly make application to the Minister advising on the type of development. This Schedule may be amended at any time (Clause 13.2) by the Minister with advice from Cabinet. In assessing a Prescribed Development, the Minister shall take into account the affect the development will have on the environment and any other matter that may be defined in the regulations under the Act. No prescribed development shall proceed unless the developer has submitted the necessary documentation and received Development Consent, or has been granted exemption by the Minister (Clause 16). In the case of the Initial Environmental Evaluation Report (Clause 17-19), the Act describes the contents required for the report. The Minister may also with the advice of Cabinet require the developer to submit further information. When the Minister, with advice from Cabinet is satisfied with the Initial Environmental Evaluation Report, he shall release the report to the public and call for written objections. Public comments and objections to the proposed Prescribed Development are required within 30 days. Based on all the above information, the Minister, with advice of Cabinet shall make one of the following three decisions:

- **consent to the development with or without conditions;**
- **require an EIS to be produced, or**
- **refuse consent to the development.**

Technical Assistance

The Environmental Specialist has identified the need for specific technical assistance to be offer in the way of that it contributes to the strengthening of Environmental Management. The objective of this TA is to work with and mentor individuals, local business groups and the community so as assist in creating an enabling environment for improved environmental conservation and management. A number of factors have led to the environmental resource of Kiritimati Island being under significant pressure including lack of employment, unchecked population growth and an emphasis on living for today. Greater respect for the natural resource will require a major shift in knowledge, attitudes and practice regarding the management and conservation of the bio physical environment of Kiritimati Island. This is

a long term process which is best led by the local community rather than outsiders if Kiritimati Island is sustain its unique environmental resources. The TA would; (i) assess the current state of the environment in Kiritimati Island including issues and threats, (ii) mobilize community groups and individuals interested in conserving and protecting the environmental resource on which the islands future depends, (iii) understand existing community values, norms and attitudes and how these translate into current activities, (iv) identify local champions and groups willing to be active in preserving the environment and provide them with policy and institutional support to grow into formal structures such as an NGO, (v) assist such groups in developing action plans and identifying practical community based measures including school education, (vi) identify various means of support to assist such groups in mobilizing action, (vii) undertake training in leadership, good governance and the importance and benefits of keeping the resource healthy, and (viii) develop a long term integrated program of actions to conserve, protect and enhance the environmental future of Kiritimati Island in line with appropriate sustainable economic opportunities.

6. Public Consultation and Information Disclosure

Two levels of public consultation were conducted during the course of the investigation for this IEE. All public consultation focused on the Project-affected people and beneficiaries of different age groups, genders, educational backgrounds and occupations as well as other stakeholders.

The Environmental Specialist preparing the IEE took part in a total of four meetings which were held with specific groups including; the leading civil servants, local government councillors, women's groups and church leaders. Concerning more specific resource management issues including the marine and the aviflora, numerous meetings were held with individuals involved in the fishing industry. This included divers and pet fish export companies, tourism industry stakeholders including Fly Fishing Guides, hotel operators and the Tourism Department. Field trips that included visiting sites all over the island were conducted. In addition, informal discussions were conducted with Fly Fishing Visitors and tourists from visitors cruise ships during the period of the mission.

At the commencement of the mission, the local radio station was also used to flag the activities of the Project Team and to welcome input from all people in all villages. In particular, the radio message flagged the individual Household Survey that was being conducted in over 85 homes. This stratified survey also collected information regarding environmental concerns. The primary objective of the meetings, discussions and survey was to gather and share information on public concerns about the Project. There was general consensus that availability of drinking water on a continuous base would constitute a substantially positive improvement for health and sanitation but people do not wish to see population increase. There is overwhelming support for the Project with the expectation that there can be little negative environmental impacts. However, in discussing environment, people mainly expressed concern for issues related to management of fish and bird resources.

7. Findings and Recommendations

The Project is substantially aimed at improving the health of 6,000 people who currently suffer from lack of water supply and inadequate sanitation facilities. Negative impacts are limited and can be prevented by implementing the EMP and can eventually be readily mitigated. Verification of groundwater recharge and their sustainable utilization is required.

Failure to implement the Project would lead to a deterioration of health and increase in hardship as in-migration to the island continues. Procedures for examination of environmental compliance are well in place and tested. It is recommended that the Project should proceed and implement the proposed EMP and revise it in a timely manner, when appropriate.

If implemented, the proposed Project generates the opportunity for the island population to increase, as per the GoK strategic planning. This consultant finds that as present management of a highly significant environment is severely compromised, that any increase in population will put greater pressure on a diminishing resource. However, this population increase is also seen to be outside of and beyond the scope of work for the project. The specific issue is one that needs to be dealt with at a macro level for the GoK.

8. Conclusion

According to the categorization B and after the completion of the IEE, it is recommended that this Project can go ahead without an EIA.

Environmental Management Plan - Impact Mitigation and Institutional Requirements for Implementation and Monitoring

Impact	Mitigation Measure	Implementation Responsibility	Potential Institutional Monitoring / Community Contribution	Indicator	Comment on Projected Costs	Proposed Length of Program
1. Environmental Impacts Arising From Site Selection and Design						
Any negative disturbance to water source.	A Source Protection Plan developed and applied.	Design Team	Whole of Government Responsibility Tarawa / Kiritimati	No disturbance on the groundwater lens sites	Cost Neutral	On-going program with frequent reinforcement
Potential contamination of groundwater lens from spilt fuel.	Comprehensive plan required to identify areas of vulnerability associated with proximity to water lenses, protected areas.	Construction / Implementation team	Whole of Island response - Kiritimati	90% of all population understand and practice protection of lens plan by end of first Project year	\$15,000 Community Awareness Program on Water resources	On-going program with frequent reinforcement
Groundwater will be used for toilet flushing which can lessen efficiency of septic tank processes.	Groundwater in areas such as London and Banana have high levels of bacteria. London's is recognised as being polluted with contaminants. On-going monitoring of water being used for flushing needs to be a part of project design.	Construction / Implementation team	Public Works Kiritimati	Groundwater quality monitoring required at various points in each settlement.	More effective use of existing budget costs for monitoring as included in Water - Sanitation Unit, MLPID	On-going groundwater monitoring program required.
Growth in Settlement in Poland means greater potential human intrusion to protected areas.	Comprehensive plan required to identify areas of vulnerability associated with proximity to water lenses, protected areas	Lands Department Tarawa / Kiritimati	Lands Department Tarawa / Kiritimati	Limits to settlement growth in Poland area	Incorporate in Community Awareness Program on Population Impacts	Maintain a limits to growth policy in Poland.
Water standing can attract mosquitoes & incidence of malaria.	All Tanks to be sealed to ensure no access to mosquitoes.	Construction / Implementation team	All island community on Kiritimati	Incidence of Malaria needs to be reported to entire community.	Incorporate in Community Awareness Program on Water Resources	On-going program with frequent reinforcement

Impact	Mitigation Measure	Implementation Responsibility	Potential Institutional Monitoring / Community Contribution	Indicator	Comment on Projected Costs	Proposed Length of Program
2. Environmental Impacts Arising From Construction Phase						
Without understanding and ownership of the project, people will not benefit.	As project implementation commences, education program will be undertaken; Hygiene, NRM, PHAST.	Implementation Team	Whole of Government & Community Responsibility Tarawa / Kiritimati	90% of all population understand and practice ownership of the project by end of first Project year	Included as part of \$150,000 TA for Environmental and Community Management program	Life of project
Disturbance to immediate flora along the trench lines.	Implementation plan in detailed Project Design to include site procedures that detail minimal disturbance to all Terrestrial flora, fauna and habitat	Construction / Implementation team	Construction / Implementation team	At completion of ground works, all site has been made-good with minimal disturbance.	\$50 per household allowed in Project costs for trench rehabilitation, replanting, etc	Life of project
Potential offensive odours and air-borne bacteria from sludge removed from existing septic tanks.	Strategy that ensure all waste is covered, kept damp & carefully relocated to shallow evaporation pits for dewatering is required. Dried Material can be used as organic agent for horticulture.	Construction / Implementation team	Construction / Implementation team follow Safe Transportation Plan	Zero complaints from Community during construction phase.	Included as part of \$150,000 TA for Environmental and Community Management program (health and hygiene component)	Life of project
Without appropriate base to these pits there will be a concentrated leaching to groundwater.	Dewatering Pits to be implemented following Detailed Project Design Specifications.	Construction / Implementation team follow specified dewatering plans	Construction / Implementation team follow specified dewatering plans	Establish dewatering pits before commencement of any sludge removal.	\$300 per household allowed in Project costs for break out of old septic tank, remedial works including dewatering.	Life of project and beyond.
Soils need to be transported to	Soil excavation and transportation to be implemented	Construction / Implementation team	Construction / Implementation team	All sites where soil has been	Included as part of \$300 per household allowed	Life of project

Impact	Mitigation Measure	Implementation Responsibility	Potential Institutional Monitoring / Community Contribution	Indicator	Comment on Projected Costs	Proposed Length of Program
previously disturbed sites.	following Detailed Project Design Specifications.	follow specified dewatering plans	follow specified spoil removal plan	transported to are left in 'made-good' condition	in project costs for break out and removal	
Noise / Dust affect nearby residents and schools	A strategy to minimise noise and dust is adopted. Hours of work are scheduled to minimise conflicts and appropriate coverage of all material to be transported will minimise dust.	Construction / Implementation team	Community wide monitoring	Zero complaints from community	Included as part of TOR and costs of project management consultants	Life of project
Increase in vehicular traffic	All vehicular activity to be implemented following Detailed Project Design Specifications.	Construction / Implementation team	Community wide monitoring	Zero complaints from community including schools at drop and collection times	Included as part of TOR and costs of project management consultants	Life of project
3. Environmental Impacts Arising From Operation and Maintenance						
Potential for highly localised leaching from septic tank evapo-transpiration beds.	Steady program ensures all tanks are monitored and managed to ensure that at no time would the tank be full.	Each household with support from the septic tank maintenance and collection team.	Each household with support from the Septic tank Maintenance & Collection team.	Evapo-transpiration beds to be placed and maintained at highest level allowing for output gravity feed from tank.	\$300 per household allowed in Project costs for placement of evaporation basins, backfilling with sand, construction of gravity fed rubble pit, etc	On-going monitoring
Without a well designed base to these pits there will be a concentrated leaching to	Dewatering Pits to be implemented following Detailed Project Design Specifications.	Septic tank maintenance and collection team	Septic tank maintenance and collection team.	Implementation of specified requirements at construction and	Maintenance and operations costs included in budget for Water - Sanitation Unit,	On-going monitoring

Impact	Mitigation Measure	Implementation Responsibility	Potential Institutional Monitoring / Community Contribution	Indicator	Comment on Projected Costs	Proposed Length of Program
groundwater.				after each cycle of sludge collection.	MLPID	
During periods of intense rain there is the potential for leaching basins to contaminate	If implemented well, the entire project will contribute to the steady demise of this problem.	Each household with support from the septic tank maintenance team.	Each household with support from the septic tank maintenance team.	Rainwater levels above sides of evapo-transpiration beds	Incorporate in Community Awareness Program on Water Resources (health hygiene)	Monitor during rain periods.
Fuel and chlorine can both potentially pollute the groundwater lens	All fuel and chlorine to be stored in appropriate centralised yards. Only trained staff to have access to use. Routine reinforcement of the importance to follow procedures.	Water Supply management and maintenance Team.	Water Supply management and maintenance Team.	Safe keeping procedures adopted and maintained for all fuel and Chlorine	Workplace and occupational health and safety procedures included in budget for (i) Water - Sanitation Unit, MLPID and (i) Public Vehicles Unit.	On-going monitoring
Sludge - Potential health and contamination risk.	Sludge to be placed on appropriately designed drying beds. For re-use in agriculture, a recommended 2 year period is required.	Septic tank Maintenance and collection team	Septic tank Maintenance and collection team	Safe transportation and dewatering procedures adopted and maintained for Sludge removal and treatment	In Project costs, \$100,000 allowed for new sludge removal truck: \$20,000 allowed for sludge treatment and collection center	On-going monitoring
Grey Water - Potential health and contamination risk.	Shallow Evapo-transpiration beds are specified to take grey water and effluent waste from each septic tank. .	Each household with support from the septic tank maintenance and collection team.	Septic tank maintenance and collection team	Each household knows & practices management of grey water effluent associated with daily household activities.	Included as part of \$150,000 TA for Environmental and Community Management program (health and hygiene component)	On-going monitoring

Environmental Monitoring Plan - Kiritimati Island Growth Center Water Supply and Sanitation Project

Impacts To Be Monitored	Parameters To Be Monitored	Location	Monitoring Frequency	Responsible For Monitoring	Comment on Cost
1. Impacts Arising From Site Selection and Design					
Any negative disturbance to water source	Disturbance on land with settlement, animals, with pollutants.	Above all groundwater source sites	On-going – constant vigilance.	Whole of Government & Community Responsibility Tarawa / Kiritimati	Cost Neutral
Fluctuating saline levels in groundwater not conducive to septic tank operation.	Salinity levels of groundwater used for flushing	Groundwater Monitoring sites across settlement areas	Monthly monitoring & recording of data.	Septic tank Maintenance & Collection team	Cost Neutral
Increase in the incidence of standing water	Occurrence of malarial mosquitoes	Across all settlement areas	On-going routine	Design Team / Specification	Cost Neutral
Growth in population areas beyond the recommended northern growth corridor.	Settlement is positioned close to protected areas and contributes to increase in disturbance and poaching	Specifically the village of Poland is identified as an area requiring monitoring.	On-going routine	Whole of Government & Community Responsibility Kiritimati	Cost Neutral
2. Impacts Arising From Construction Phase					
Offensive odours and air borne particles from excavation.	Each excavation to be completed and filled in to minimize odour and dust.	Across all settlement areas	During entire construction phase.	Construction / Implementation team	Cost Neutral
Leachate from dewatering beds enters groundwater.	Dewatering pits to be designed and specified with non-permeable membrane below bed of sand.	Pits to be established on existing site close to Agricultural station in consultation with community.	On-going routine	Construction / Implementation team	
Excavation for tank will require that soil is taken off site	Procedures to ensure soil is transported and deposited in appropriate manner.	Across all settlement areas and spoil deposit sites	During entire construction phase.	Construction / Implementation team	Cost Neutral

Impacts To Be Monitored	Parameters To Be Monitored	Location	Monitoring Frequency	Responsible For Monitoring	Comment on Cost
Increase in vehicle traffic	Vehicles do not become a nuisance or damage roads	Across all settlement areas and spoil deposit sites	During entire construction phase.	Construction / Implementation team	Cost Neutral
3. Impacts Arising From Operation and Maintenance					
Community maintain old ways of sanitation	No defecating in sea or vegetated areas – supported by Education and awareness program.	Adjacent all settlement areas	On-going routine	Whole of Government & Community Responsibility Tarawa / Kiritimati	Cost Neutral
Vegetation disturbed in construction	Unnecessary clearance of vegetation for trenches	Along water supply pipeline route	Daily until trenching completed	Construction / Implementation team	Cost Neutral
Leachate from evapo-transpiration beds	Minimal leaching of waste from evapo-transpiration beds	At HH - Area around evapo-transpiration beds	Periods of high rainfall.	Construction / Implementation team	Cost Neutral
Leachate from dewatering beds	Minimise leaching of liquid waste from dewatering beds	Specific zone around dewatering beds	Ongoing monitoring	Construction / Implementation team / Septic tank Maintenance & Collection team	
Any potential pollutant to groundwater source.	Protection markers around groundwater lens areas are acknowledged and abided by.	At perimeter around the four ground water lens areas.	Ongoing monitoring	HH, Local Groups, MELAD / Construction / Implementation team / Septic tank Maintenance & Collection team	Iconic Markers locally developed – 200 X \$25
Sludge - Potential health and contamination risk	Establish sludge removal / recycle service & create incentives for people to use it	All villages	Service required on needs-by basis	Monitored by HH, Local Groups & MELAD Septic Tank Service.	\$10.00 per pump-out
Grey Water - Potential health and contamination risk	Appropriate disposal of grey water at Household level.	All Households	At completion of construction / at each Septic Tank pump out	Monitored by HH, Local Groups & MELAD Septic Tank Service.	Cost Neutral