Appendix 4: Errata Sheet and Environmental Impact Assessment 2007

Corrections and Clarifications

Errata Sheet for: *Draft Environmental Impact Assessment (Prepared by Leo A Daly, 1357, Kapiolani Boulevard, Suite 1230, Honolulu, Hawaii 96814)*

Provided by the Republic of Marshall Islands Ports Authority

This errata sheet logs content errors identified after the document was issued in May 2008.

Page	Reads	Should Read
Title, caption paragraph	United States Federal Aviation Administration standards	United States Federal Aviation Administration and International Civil Aviation Organisation standards
Title, near bottom	This Environmental Impact Assessment ... FAA official.	**Now Deleted.**
1, second paragraph	United States Federal Aviation Administration (FAA) standards	United States Federal Aviation Administration (FAA) and International Civil Aviation Organization (ICAO) standards
1, third paragraph	... potential environmental impacts. The EIA conforms to FAA orders 505.4B ... Policies and Procedures. In addition the EIA conforms to RMIEPA ...	... potential environmental impacts. The EIA conforms to RMIEPA ...
2, second paragraph	The project is funded ... coming from the Republic of the Marshall Islands.	**Now Deleted.**
2, tabulated section under 'Approving Agency'	United States Federal Aviation Administration	Republic of Marshall Islands Environmental Protection Agency
3, first paragraph	The proposed action will realign the roadway out of the RSA, to comply with Federal Aviation Administration (FAA) standards.	The proposed action will realign the roadway out of the RSA, to comply with ICAO and FAA standards.
8, section 3.3	3.3 Funding Source ...	**Now Deleted.**
8, section 3.5	The following permits and/or approvals are required for the proposed action: • FAA Approval • RMIEPA ...	The following permits and/or approvals are required for the proposed action: • RMI Approval • RMIEPA ...
23, section 11	11.0 Determination (FAA ONLY)	11.0 Determination
24, fourth and fifth references	Federal Aviation Administration, April 28 ... Federal Aviation Administration, June 08 ...	**Now Deleted.**

Republic of the Marshall Islands (RMI) Ports Authority
P.O. Box 109 Majuro, Marshall Islands 96960
692-625-8805

Airport Road Realignment at Amata Kabua International Airport Majuro, Republic of the Marshall Islands

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

This EIA examines the possible environmental impacts caused by the airport road realignment at the Amata Kabua (Majuro) International Airport. The only road linking the community of Laura to the communities of Delap and Rita, transverses through airport property on the west side of the Runway 7. A segment of this road is now located within the runway safety area (RSA). The proposed action will realign the roadway outside of the RSA, to comply with the United States Federal Aviation Administration standards.

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This Environmental Impact Assessment becomes a Federal document when evaluated and signed and dated by the responsible FAA official.

Name ______________ Date ____________

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Tables

Appendix

List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AC	Advisory Circulars
AIP	Airport Improvement Program
AKIA	Amata Kabua International Airport
BMP	Best Management Practices
DOT	United States Department of Transportation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FAA	United States Federal Aviation Administration
FONSI	Finding of No Significant Impact
NEPA	National Environmental Protective Agency
RMI	Republic of the Marshall Islands
RMIEPA	Republic of the Marshall Islands Environmental Protective Authority
RMIPA	Republic of the Marshall Islands Ports Authority
RSA	Runway Safety Area

1.0 Summary

This project is for the airport road realignment at the Amata Kabua (Majuro) International Airport (AKIA). The only road linking the community of Laura (located west of the airport) to the communities of Delap and Rita (located to the east), transverses through airport property on the west side of Runway 7. A segment of this road is now located within the runway safety area (RSA). The RSA is an area defined as an area 500 feet wide and 1,000 feet long from the end of the runway. Currently the road is approximately 400 feet from the runway centerline.

The proposed action will realign the roadway outside of the RSA, to comply with the United States Federal Aviation Administration (FAA) standards. The RSA will be filled and graded to conform to FAA AC 150/5300-13 Section 305. This will entail embankment and construction revetment in both the lagoon and ocean. A security fence will also be built around the RSA to comply with FAA AC 107-1.

This Environmental Impact Assessment (EIA) examines the effects that the Realignment of the Airport Road Project will have on the environment and the people of Majuro. It addresses the effects and provides measures to avoid or mitigate any potential environmental impacts. The EIA conforms to FAA orders 5050.4B NEPA Instructions for Airport Actions and 1050.1E Environmental Impacts - Policies and Procedures. In addition the EIA conforms to RMIEPA Environmental Impact Assessment Regulations, 1994.

The EIA looks at two project alternatives: the Proposed Action and the No Action Alternative. The Proposed Action will have some impact to the environment. The short-term impacts from noise, traffic, and dust will be generated during construction and will be of a temporary nature. Conditions will return to normal after construction is completed. The long-term effects include the loss of land and of reef flat. Parts of both the lagoon and ocean need to be filled and graded for the RSA to meet FAA standards. Once the project is completed, the area will be fenced and inaccessible to the public.

The No Action Alternative would leave the RSA as it is, because no project would take place. This alternative has the least effect on the environment. However, this alternative is not recommended because it fails to address the issue of public safety. The preferred alternative addresses all public safety issues and best fits the purpose and need for this project.

Several controls have been set to help mitigate the impacts caused by the proposed action. A dust management plan and regulation of work hours will be implemented to help control the projects effect on noise, vibration and air quality. To ensure that traffic flows as smoothly as possible, a traffic management plan will be developed. Plants removed from the project site will be replanted, and once construction is finished new plants will be planted to replace those removed. When possible, coral affected by the use of fill material will be removed and transplanted elsewhere. The loss of land and reef flat will not be mitigated.

The Road Realignment Project is estimated to take a year to complete from the start of construction and will cost approximately 9.9 million dollars. The project is funded through a grant from the FAA Airport Improvement Plan. This grant pays for 95% of the project with the remaining 5% coming from the Republic of the Marshall Islands.

This EIA finds that the proposed action does not have a significant impact to the environment and does not require an environmental impact statement. The EIA anticipates a finding of no significant impact (FONSI).

Location:	Amata Kabua International Airport (AKIA), Majuro, Republic of the Marshall Islands
Project Area:	AKIA - West End of Runway 7
Land Use Plan:	Airport
Ownership:	RMI Ports Authority (RMIPA) Through Lease Agreement
Approving Agency:	United States Federal Aviation Administration RMI Environmental Protection Authority
Proposing Agency:	RMIPA P.O. Box 109 Majuro, Marshall Islands. 96960 692-625-8805
Consultant:	LEO A DALY COMPANY 1357 Kapiolani Boulevard, Suite 1230 Honolulu, Hawaii 96814 808-521-8889

2.0 Purpose and Need

The primary need for this project is public safety. The RSA enhances the safety of airplanes that undershoot, over-run, or veer off the runway, and it provides greater accessibility for fire fighting and rescue equipment during such incidents. Also, the proximity of road to the runway leaves vehicles vulnerable to jet blast from aircraft preparing for departure. The proposed action will realign the roadway out of the RSA, to comply with Federal Aviations Administration (FAA) standards.

Recently the FAA changed the dimensions of the standard RSA to improve the margin of safety for aircraft. Prior to these changes, a modification to standards could be issued if the RSA did not meet the dimensional standards. Currently, a modification to standards cannot be issued concerning a RSA.

3.0 Proposed Action

3.1 Project Location

The Republic of the Marshall Islands (RMI) consists of 29 atolls–each made up of many islets–and 5 islands in the central Pacific between 4 degrees and 14 degrees north, and 160 degrees and 173 degrees east. The atolls and islands are situated in two almost parallel chain-like formations known as the Ratak (Sunrise) group and Ralik (Sunset) group. The total number of islands and islets in the whole Republic is approximately 1,225, spreading across a sea area of over 750,000 square miles. The total land area is about 70 square miles. The mean height of the land is about 7 feet above sea level. The RMI has an estimated population at 52,671.

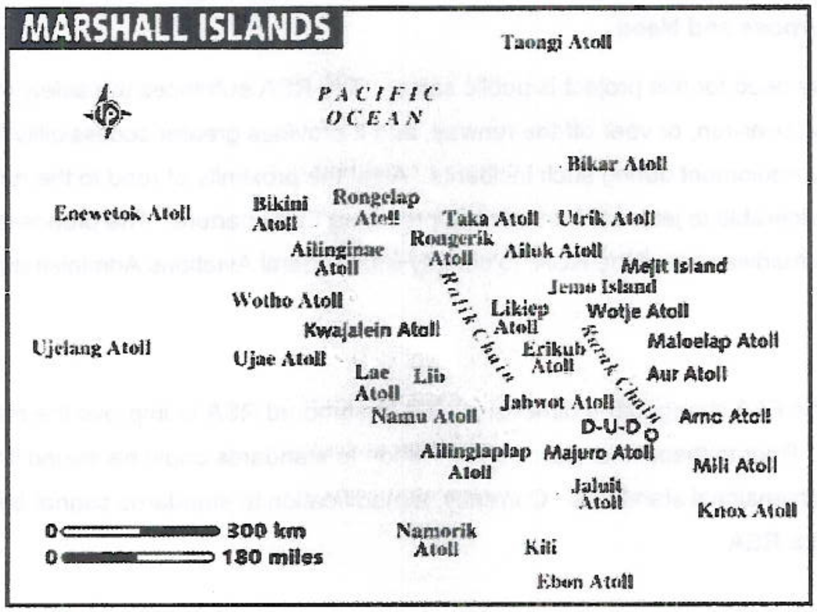


Figure 1 Map of the Republic of the Marshall Islands

Majuro atoll, capital of the Marshall Islands, is the most developed atoll with a thriving commercial and political center and a population of nearly 30,000. Majuro has a tropical oceanic climate influenced by north-easterly trade winds. The atoll is elongated in shape and extends approximately 25 miles east to west and 6 miles from north to south. Majuro is approximately 160 square miles in area with a lagoon of about 150 square miles.

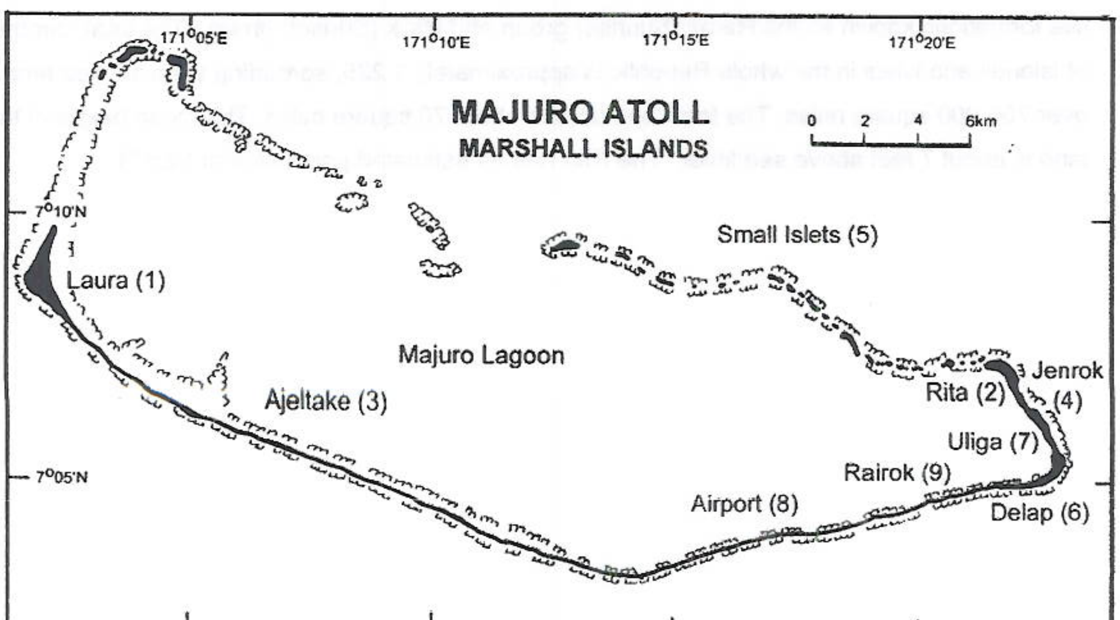


Figure 2 Map of Majuro

AKIA is the main airport for the Marshall Islands; it connects the RMI to Hawaii in the east and Guam to the west. The project site is located on the west end of Runway 7 at AKIA.

Figure 3 West End of Runway 7 (Project Site)

There are no homes or businesses in the area. The site itself includes a grassy area in front of the runway, a man-made ocean pool used for swimming, and a grassy area with some garbage cans, creating a recreation area on the lagoon side, and approximately 11 acres of lagoon.

Figure 4 Recreation Area (Lagoon Side)

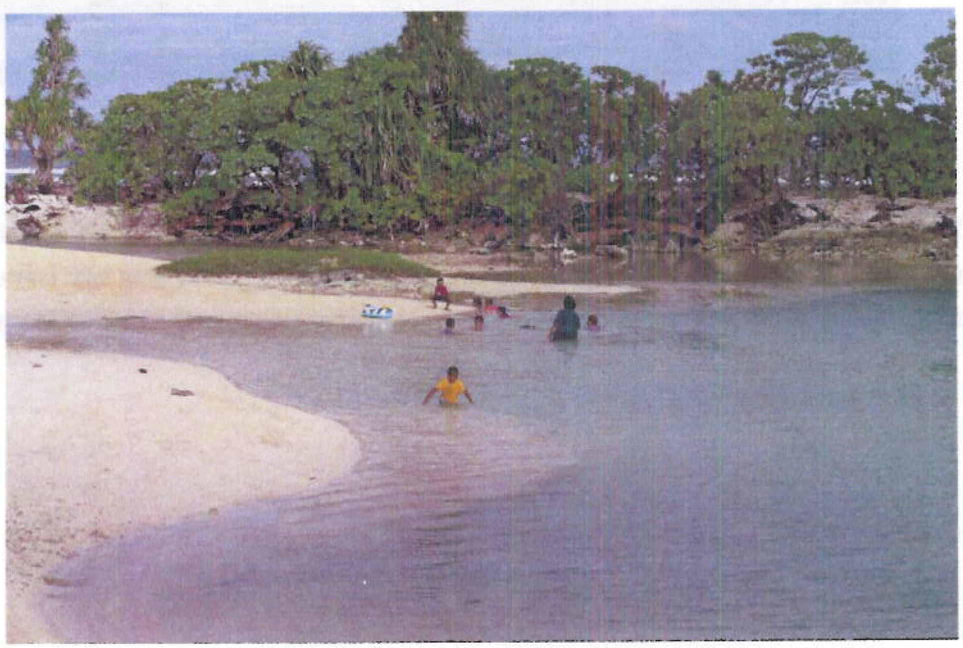


Figure 5 Recreation Area (Man-made Ocean Pool)

3.2 Road Realignment Project

The proposed action will realign the existing roadway to the boundary edge of the RSA. The RSA is defined as an area 500 feet wide and 1,000 feet beyond the runway. Currently the segment of roadway that intrudes into the RSA is only 400 feet from the centerline of the runway. The RSA will be filled and graded to conform to FAA AC 150/5300-13 Section 305. This will entail embankment and construction revetment in both the lagoon and ocean. A security fence will also be built around the RSA to comply with FAA AC 107-1. (See drawing C1.02)

The proposed road segment will be designed as a two-lane rural arterial with consideration for traffic volume, speed, and operational characteristics conforming to requirements of the American Association of State Highway and Transportation Officials (AASHTO). The centerline of the proposed road parallels the north RSA boundary and extends 20 feet beyond the west boundary to begin the transition back into the existing roadway. The roadway is approximately 32 feet wide by 2,070 feet in length along the centerline. It has two vehicle lanes, two-foot paved shoulders, and two-foot paved guardrail strips.

The roadway has an approximate area of 66,240 square feet. It will be constructed with materials consisting of a crushed aggregate base course overtopped with bituminous prime coat and a bituminous tack and/or seal coat finished with a plant mix bituminous pavement. The structural sub-base, which includes a 3:1 sloped revetment sub-grade, requires approximately 28,000 cubic yards of fill material. (See drawing C4.01)

A revetment will be constructed along the lagoon side of the roadway directly on the slope of the newly installed fill material. The armor stone will sit on a geotextile filter layer and a stone bedding layer composed of much smaller stones. The toe of the structures will be tied into the water bottom to provide stability to the road with structural fill behind it. The revetment will continue across the entire length of the slope to provide full coverage and protection for the new roadway and its structural fill. The approximate length of the proposed revetment is 2,000 feet and will cover the entire portion of new road that is constructed over what is currently open water.

The RSA will be filled and graded to conform to FAA Standards. The RSA needs to be 500 feet wide and 1,000 feet long from the end of the runway. To meet this standard, part of the lagoon and the ocean will need to be filled and graded. Approximately 73,400 cubic yard of fill will be required on the lagoon side, and an additional 21,000 cubic yards of fill material will be needed on the ocean side.

To conform to FAA AC 107-1, the proposed security fence will encompass the new RSA. The fence will be constructed of 10 gauge, galvanized steel, chain link fabric, and at a height of 8 feet. It will be topped with three strands of barbed wire, which will be installed at a forty-five degree angle outward. The length of the proposed security fence will be approximately 2, 500 feet. (See drawing C5.01 and C5.02)

3.3 Funding Source

The Airport Improvement Program (AIP) provides grants to public agencies and, in some cases, to private owners and entities for the planning and development of public-use airports. FAA recommends priority of airport projects based on AIP priority ranking. The highest priority is given to safety and reconstruction, which includes airfield pavements, Air Rescue/Fire Fighting facilities, and RSA improvements. This project is 95 percent FAA funded under the AIP, with the remaining 5 percent funded by the RMIPA.

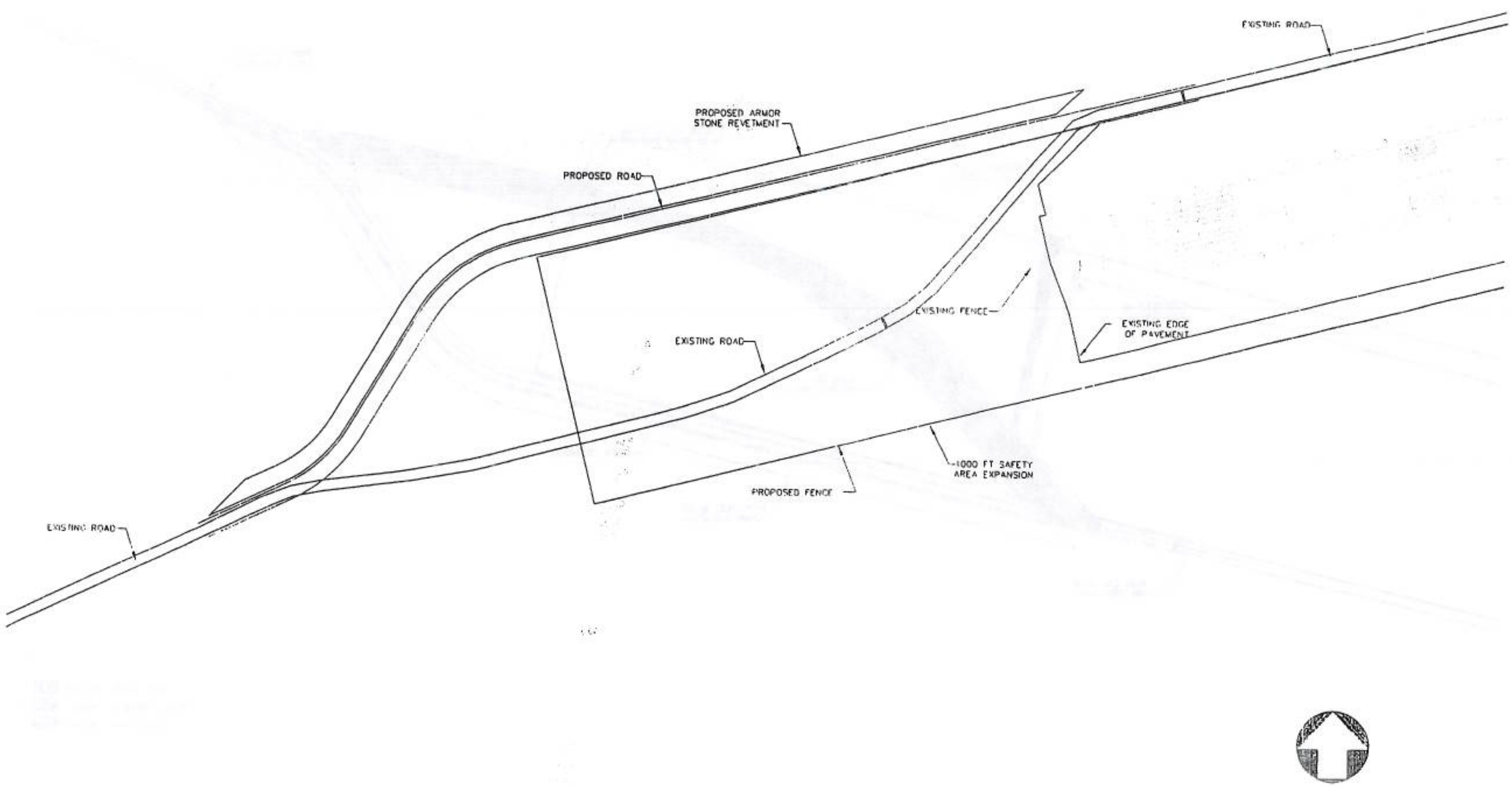
3.4 Cost and Timeline for Proposed Action

The estimated cost of the RSA project is approximately 9.9 million dollars. The timeline for the construction of this project is 12 months.

3.5 Required Permits and Approvals

The following permits and/or approvals are required for the proposed action:

- FAA Approval
- RMIEPA Earthmoving Permit the Earthmoving Regulations 2004
- RMIEPA Marine Water Regulations 1992
- RMIEPA Solid Waste Regulations 1989
- RMIEPA Environmental Impact Assessment Regulations 1994
- Consideration of Draft RMI Coastal Management Framework 2006
- Consideration of Draft Development Regulations 2006
- The Earthmoving Permit is likely to be issued by the RMIEPA subject to the successful approval of the EIA which includes project compliance of all RMIEPA Regulations



1/C1.02 PROJECT AREA PLAN
SCALE: 1"=100'

AMATA KABUA INTERNATIONAL AIRPORT
AIRPORT ROAD REALIGNMENT PROJECT
MAJURO, REPUBLIC OF THE MARSHALL ISLANDS

Republic of the Marshall Islands Ports Authority

LEO A DALY

KEY PLAN

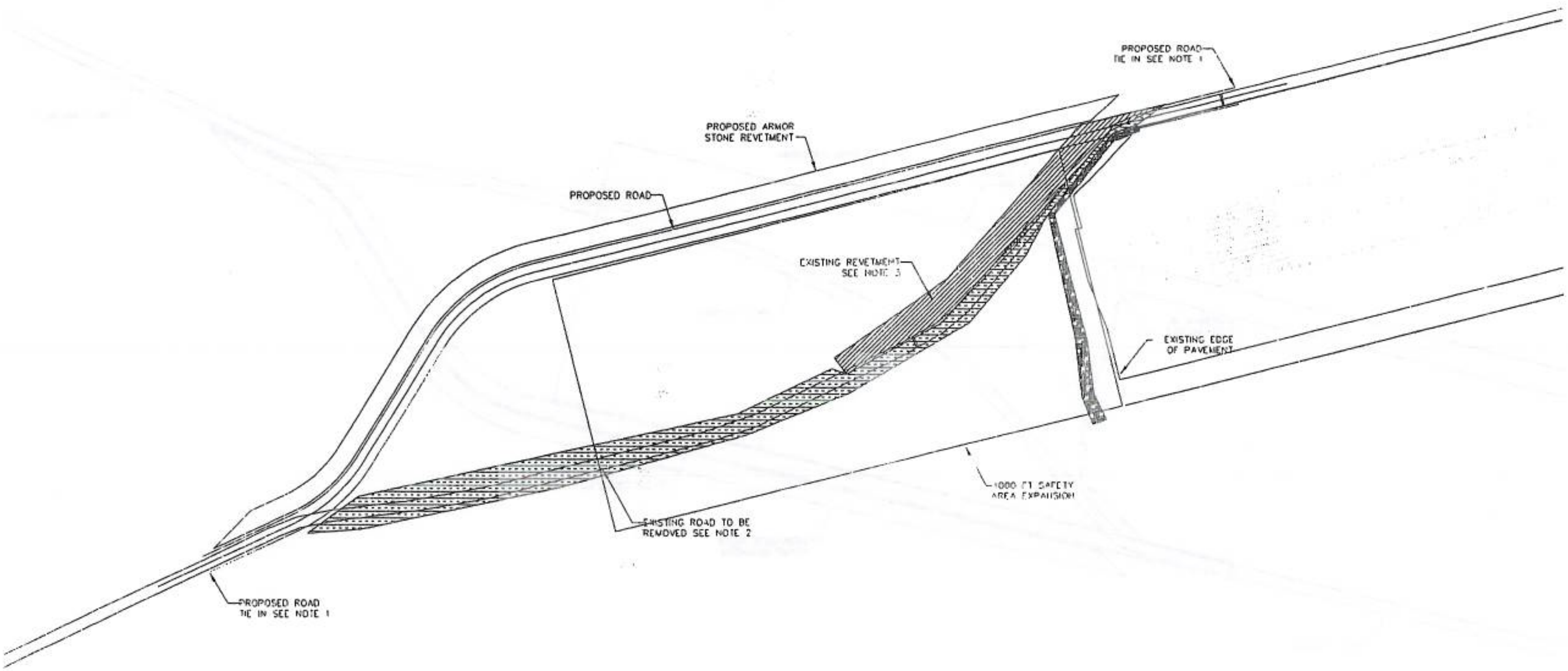
REVISIONS

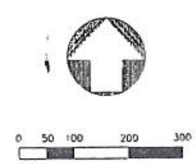
FILE LOG

PROJECT AREA PLAN

C1.02

EXISTING ROAD DEMO
EXISTING REVETMENT DEMO
EXISTING FENCE DEMO





1 / C1.03 DEMO PLAN
SCALE: 1"=100'

AMATA KABUA INTERNATIONAL AIRPORT
AIRPORT ROAD REALIGNMENT PROJECT
MAJURO, REPUBLIC OF THE MARSHALL ISLANDS

Republic of the Marshall Islands Ports Authority
Majuro, Republic of the Marshall Islands

LEO A DALY

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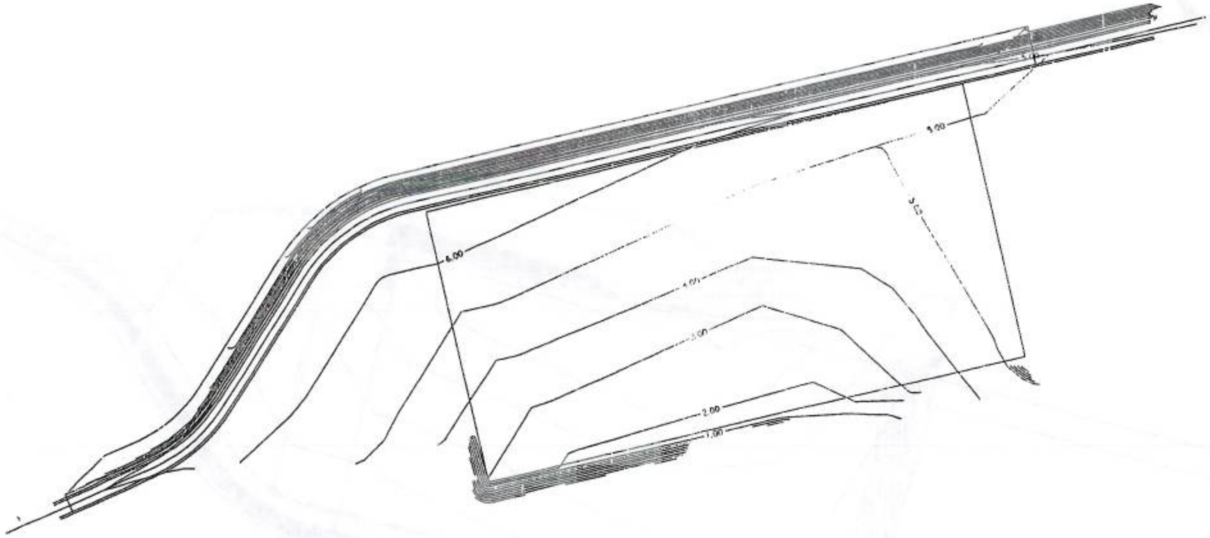
KEY PLAN

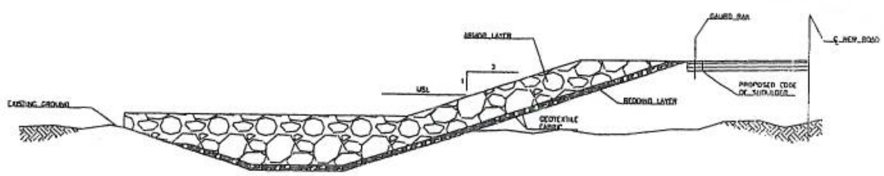
REVISIONS

FILE LOG

DEMO PLAN

C1.05





TYPICAL REVETMENT CROSS SECTION

SCALE: 1"=10'

AMATA KABUA INTERNATIONAL AIRPORT, AIRPORT ROAD REALIGNMENT PROJECT
MAJURO, REPUBLIC OF THE MARSHALL ISLANDS

Republic of the Marshall Islands Ports Authority

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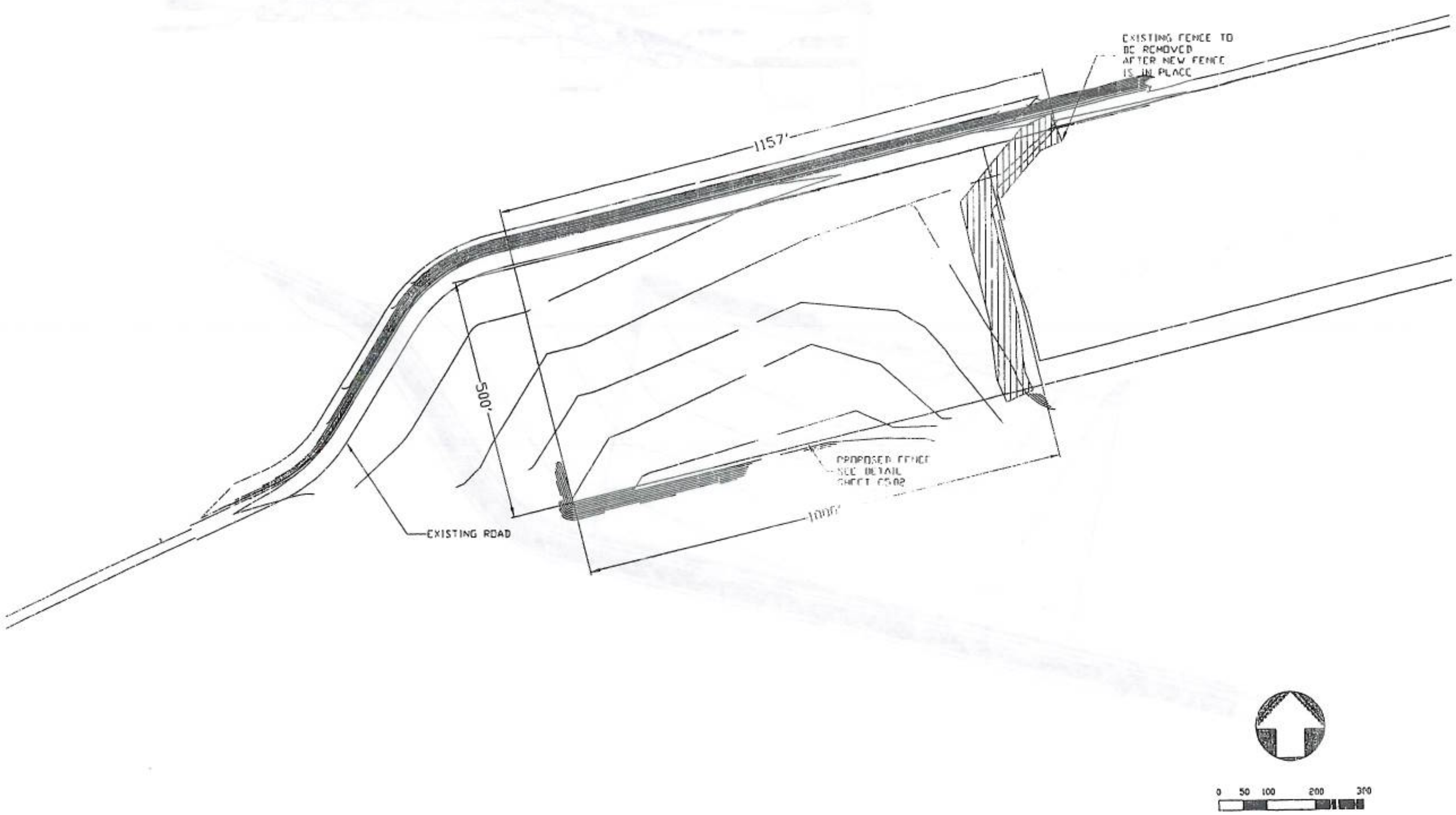
REVETMENT PLAN

C4.01

PROPOSED FENCE

EXISTING FENCE DEMO



1 / C5.01 PROJECT AREA FENCE PLAN
SCALE: 1" = 100'

AMATA KABUA
INTERNATIONAL AIRPORT,
AIRPORT ROAD
REALIGNMENT PROJECT
MAJURO, REPUBLIC OF THE
MARSHALL ISLANDS

Republic of the Marshall Islands
Ports Authority

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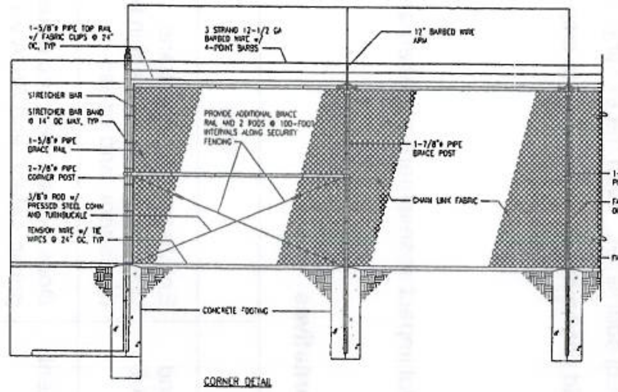
KEY PLAN

REVISIONS

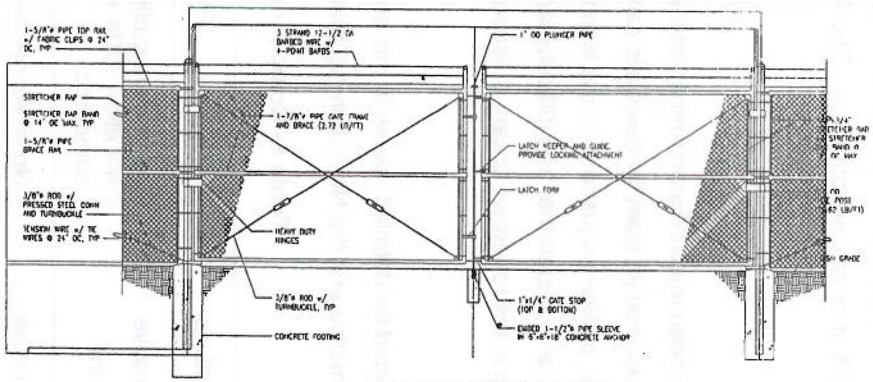
FILE LOG

FENCE PLAN

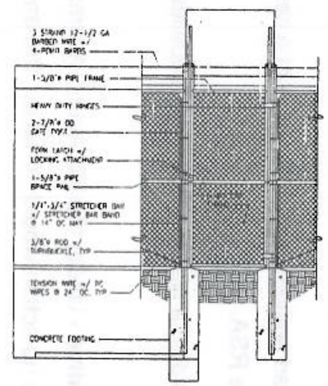
C5.01



1 CHAIN LINK FENCE DETAIL
C5.02 SCALE: NTS



2 DOUBLE VEHICULAR GATE DETAIL
C5.02 SCALE: NTS



3 SINGLE PEDESTRIAN GATE DETAIL
C5.02 SCALE: NTS

AMATA KABUA INTERNATIONAL AIRPORT, AIRPORT ROAD REALIGNMENT PROJECT
MAJURO, REPUBLIC OF THE MARSHALL ISLANDS

Republic of the Marshall Islands Ports Authority,
Majuro, Republic of the Marshall Islands

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KEY PLAN

REVISIONS

FILE LOG

FENCE - DETAILS

C5.02

4.0 Alternatives

This section looks at other options to the proposed action that might be available.

Alternative 1 - Preferred Alternative (Proposed Action): Road realignment adjacent to the RSA and the filling and grading of RSA to conform to AC 150/5300-13 Section 305.

Alternative 2 - Road realignment in the form of a causeway, which would be located adjacent to the boundary of the RSA.

Alternative 3 - Building a wall to protect automobiles from jet blast with no improvements to the existing roadway.

No Action Alternative - Under the No Action Alternative, the Road Realignment Project would not happen. Since no action would be taken, the environment would remain in its current state.

Alternative 2 was rejected from further review because it does not address the purpose and need for this project. While it does remove the roadway from the RSA, it fails to meet FAA regulations by leaving the RSA in its present condition. The RSA must be modified in order to conform to FAA standards.

Alternative 3 has been rejected from further review because it also fails to address the RSA. While properly designed jet blast fences/walls can substantially reduce or eliminate the damaging effects of jet blast, jet blast is just one of the issues this project addresses. With the existing, non-conforming RSA, any aircraft that had difficulty landing would not have adequate room to stop and could end up in the roadway, ocean, or lagoon.

Alternatives selected for detailed review in this environmental impact assessment are Alternative 1-Preferred Alternative and the No Action Alternative.

Table 1- Comparison of Alternatives

Alternatives	Pro	Con
Preferred Alternative (Proposed Action)	Addresses public safety and will allow AKIA to meet FAA standards.	Entails embankment and construction revetment in both the lagoon and ocean.
No Action Alternative	No effect on the environment.	Does not address the issue of public safety, and AKIA will fail to meet FAA standards.

Appendix A

Biological Reconnaissance Surveys of Terrestrial and Reef Environment

Biological reconnaissance surveys of terrestrial and reef environments at the west end of Amata Kabua International Airport, Majuro, Republic of the Marshall Islands[1]

July 12, 2007 | *Draft* | *AECOS* No. 1144

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Introduction

This report describes natural environments present in the area of a proposed landfill extension for the runway at Amata Kabua International Airport. The airport is located in the Riarōk Subdistrict of the Raktak District, Majuro (or Mājro) Atoll, Republic of the Marshall Islands (Fig. 1). The existing airport runway and associated water catchment facility occupy most of the width of the islet of Ānen-elip for a distance of some 2.4 km (1.5 mi). A narrow coastal road runs along the north (lagoon) side, connecting districts to the west with the main population center of Majuro Atoll to the east. The project site entails constructing an extension at the west end of the runway for the purpose of enlarging the runway runoff area and improving the airport security zone. Landfill is required to be placed on a portion of the lagoon reef (Area "A" in Fig. 2) in order to move the coastal road out of the runway safety zone. A new road would follow the northern edge of the fill as shown in the satellite photograph. A small area of fill (Area "B" in Fig. 2) would extend the runoff safety zone on the ocean side.

Environmental Setting

Majuro is an atoll, an oceanic reef feature of variable shape, but typically one that surrounds a central lagoon. The reef may be a more or less continuous ribbon with one to several shallow to deep breaks (called passes) through which ocean and lagoon waters exchange under the influence of the tide. Ocean water also enters the lagoon wherever ocean waves drive water across the shallow reef platform. However, wave action also creates sand and reef debris deposits on the shallow reef

[1] Prepared for Leo A. Daly, Honolulu, Hawai'i to be used in an environmental assessment (EA) for the airport project and therefore to become part of the public record.
[2] Bernice P. Bishop Museum, Honolulu, Hawai'i

surface, and such accumulations can become more or less "permanent" land features called islets. Typically, islets are anchored in place by reef structure remaining from a higher stand of the sea or (more commonly) consolidated limestone know as beach rock that forms within the beach under the influence of fresh or brackish water accumulating within the islet sediment deposits (see Fosberg, 1990). Thus, a typical atoll will include a seaward reef (or seaward part of the atoll reef), a lagoon reef (or lagoon-facing part of the reef), and terrestrial land in the form of consolidated and unconsolidated material derived from and accumulated on the top of the reef. Man-made modifications include joining scattered islets with causeways and creating developable land by extending islets with fill typically obtained from borrows (pits from which reef rock is extracted). Much of the current airport is located on fill land that extended the islet of Ānen-elip and joining it to the islet of Lo-kōjbar to the west (Manoa Map Works, 1989).

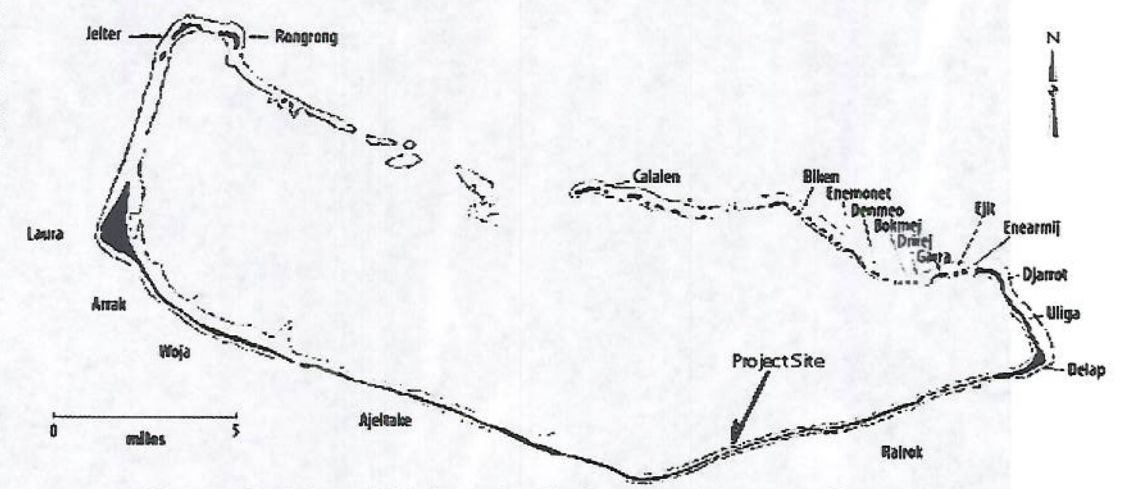

Figure 1. Map of Majuro Atoll showing location of proposed runway safety area extension.

Terrestrial and Shore Environments

The terrestrial environment at the project site consists the islet of Lo-kōjbar, with fill land armored by large boulders on the east (runway) end and remnants of a quarry operation in the islet's center (Fig. 3). A causeway extends 1.2 km (0.75 mi) from the west end of Lo-kōjbar to the next islet (Lōjemwā) along the atoll reef to the west. A moderately large quarry operation is present on both ocean and lagoon sides of this causeway.

Figure 2. Satellite image showing features in the project area at the west end of the airport runway. Areas "A" and "B" are proposed fill areas.

Figure 3. The central part of the islet of Lo-kōjbar has been dredged, creating a protected pool now popular as a recreational feature.

Typically, the relationship between man-made armoring and reef/shoreline features provide clues as to what is fill land and what is not, but this distinction is only meaningful to understanding the dynamics between reef and land on atolls. Land created by armoring and backfilling may be otherwise indistinguishable from natural islet land protected by armoring, in the main because atoll soils tend to be "poorly" developed (see Fosberg, 1990; Aregheore, 2002). Essentially, man-made fill has the same basic properties as "fill" deposited above the reef by storm waves.

Vegetation

At the project site, much of the terrestrial environment is park-like. This is an area used (especially on weekends) for picnics, school functions, and family get-togethers. The coastal road runs roughly down the middle of the islet, bordered on the south by trees and shrubs, and on the north by open, grassy areas with a scattering of trees and shrubs. Most of the southern half of the islet is an old borrow pit, seen in 1983 aerial photos by the ACOE (see Manoa Map Works, 1989). An area off the end of the runway is a cleared field supporting ruderal weeds.

Table 1 is a list of the plants identified from the project area potentially impacted by the proposed construction of a new coastal road lagoonward of Lo-kōjbar islet and establishment of a runway runoff safety zone. Although the listing is for the entire terrestrial area between the runway security fence and the causeway at the western end of Lo-kōjbar, not all of the vegetation in this area would be lost to complete the project. Plant species observed within roughly 5 m of the marine transect start points were noted and included in Appendix 1.

Table 1. Listing of plants (flora) observed May 19-21, 2007in the project area, Lo-kōjbar Islet, Majuro Atoll.

FAMILY *Genus species*	Common name	Status	Notes and Abundance	
FLOWERING PLANTS DICOTYLEDONS				
ASTERACEAE (COMPOSITAE)				
Bidens alba (L.) DC	beggartick	Nat.	C	(1)
? *Chromolaena oderata* (L.) King & Rob.	Siam weed	Nat.	U	(3)
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	Nat.	U	(2)
BORAGINACEAE				
Tournefortia argentea L. fil.	*kiden*, tree heliotrope	**Ind.**	O	(2)
CLUSIACEAE				
Calophyllum inophyllum L.	*lukwej, jijo*	**Ind.**	C	(2)
CONVOLVULACEAE				
Ipomoea pes-caprae (L.) Sweet	*Topo*	**Ind.**	O	(2)
EUPHORBIACEAE				
Chamaesyce hirta (L.) Millsp.	garden spurge	Nat.	U	(1)
Phyllanthus amarus Schum.	*jiljino-awa*	Nat.	U	
FABACEAE				
Vigna marina (Burm.) Merr.	*markinenjojo*	**Ind.**	C	(2)
GOODENIACEAE				
Scaevola sericea Vahl	*könnat*	**Ind.**	C	(2)
LAURACEAE				
Cassytha filiformis L.	*kaōnōn*, false dodder	**Ind.**	O	
VERBENACEAE				
Premna serratifolia L.	*Kaar*	**Ind.**	O	(2)
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	Nat.	U	
FLOWERING PLANTS MONOCOTYLEDONS				
ARECACEAE				
Cocos nucifera L.	*ni*, coconut palm	**Abo.**	O	(2)
CYPERACEAE				
Cyperus javanicus			U	
Cyperus ligularis			R	
Cyperus polystachyos Rott.	---	**Ind.**		
Fimbristylis cymosa spathacea Roth	*pādālijmaan*	**Ind.**	C	(2)
Fimbristylis spathacea			U	

Table 1 (continued).

FAMILY *Genus species*	common name	Status	Notes and Abundance	
PANDANACEAE				
Pandanus tectorius Parkinson	*bōb*, screw pine	Ind.	O	(2)
POACEAE (GRAMINEAE)				
Axonopus cf. *fissifolius* (Raddi) Kuhlm.	carpetgrass	Nat.	O	
Bothriochloa bladhii (Retz.) S.T. Blake	Australian beardgrass	Nat.	C	
Cenchrus echinatus L.	*lōklōk*. sandbur	Nat.	O	
Dactyloctenium aegyptium (L.) Willd.	beach wiregrass	Nat.	O	
Eragrostis tenella (L.) P. Beauv. ex Roem. & Schult.	love grass	Nat.		
Eleusine indica (L.) Gaertn.	*katejukjuk*	Nat.	C	
Lepturus repens (Forst, f.) R. Br.	wūjooj	Ind.	C	(2)
Paspalum cf. *dilatatum* Poir	Dallis grass	Nat.	U	
Sporobolus virginicus		Ind.	R	
Thuarea involuta (G. Forst.) R. Br ex Roem. & Schult.		Ind.	R	(2)
Indet.	finger grass	Nat.	C	

Local names after Merlin (2005), Spennemann (2000) and other sources.

Status = distributional status
- Abo. = aboriginal introduction.
- End. = endemic; native to the Marshall Islands and found naturally nowhere else (only 1 species).
- Ind. = indigenous; native to the Marshalls, but not unique to these Islands.
- Nat. = naturalized, exotic, plant introduced and well-established outside of cultivation.

Abundance = occurrence ratings for plants by area on May 19-21, 2007
- R = Rare - only one or two plants seen.
- U = Uncommon - several to a dozen plants observed.
- O = Occasional - found regularly, but not abundant anywhere.
- C = Common - considered an important part of the vegetation and observed numerous times.
- A = Abundant - found in large numbers; may be locally dominant.
- AA = Abundant - abundant and dominant; defining vegetation type.
- P = Present - noted just outside of study area; abundance not recorded.

Notes:
- (1) Observed especially along the roadway r-o-w and other ruderal places.
- (2) A species characteristic of the coastal strand in the tropical Pacific
- (3) Observed plant(s) lacked flowers or fruit; identification uncertain.

A total of 30 species (including one yet to be identified grass) were observed in the project area. Although the majority of these species are plants typical of Marshall Islands islet environments, this number is boosted by the variety of weedy or ruderal plants present in the fields bordering the roadway. The number and listing is very similar to results obtained for a proposed ARFF project not far away (Chen & Dashiell, 2006).

Eleven of the plant species listed are regarded as native (indigenous), and one is an aboriginal introductions to the atoll. These 12 species comprise 40% of the flora at the site. No plants of special interest or concern were recorded from the project area.

Shoreline

At the east end, adjacent to the lagoon reef, the land is protected by relatively massive armoring to protect the coast road and adjacent runway from erosion (see Fig. 4). All of the lagoon shore of the islet of Lo-kōjbar is marked by massive beachrock formations, inland of which occur beach deposits of sand and/or rubble reached only by high tides (Fig. 4). Some armoring is present along the ocean side of the road where, for example, the causeway leading off to the west is exposed to ocean waves.

Figure 4. Massive beachrock formations (foreground) typify the islet shore, inland of which are deposits of sand or rubble. Here, at the east end of the natural islet, a revetment protects the coast road on fill (background).

Wherever boulders or rock outcrops occur at the upper (high to supratidal shore), shore crabs (*Metopograpsus*) and several species of mollusks (*Nerita plicata*, *N. polita*, and *Littorina coccinea*) are present, as are terrestrial hermit crabs (*Coenobita* sp.) further up the shore in the vegetation. In areas where a protective lip forms on the landward face of the beachrock, colonies of small mussels (?*Septifer bilocularis*) occur in dense clusters, along with periwinkles. On the frontal face of the beachrock, drupes (*Thais* sp.) are present but rare. *Melampus* snails occur in vegetation litter just above the shoreline.

Marine Reef Environment

As noted, the proposed project involves extending fill land out onto a portion of the lagoon reef and across a shallow (man-made) channel on the ocean reef (Fig. 2). The lagoon fill would extend out to a new reveted shore as required to realign the coastal roadway out of the runway safety zone. The reef area that would be directly impacted by the proposed fill is shown in Fig. 2 ("Area A").

Marine Survey Methods

Five transects were laid out from the upper shore (vegetation line) to establish distributional information about bottom type and organism distributions (especially corals) within and adjacent to the impact area on the lagoon reef. The locations of these transects are shown in Fig. 5. Transects were run from the vegetation line (upper shore) out to the lagoon fringing reef margin and down the frontal slope, covering distances of 160 to 170 meters, depending upon the depth of water at the end of the transect line as only snorkeling gear was used, and depths over 6-7 m (18-20 ft) pose a limitation on access. Two of the five transects were established outside of the proposed fill area: Transect "A" to the west and Transect "B" to the east. Three of the transects were located within the area of proposed fill, spaced roughly evenly apart. These were labeled transects "1", "2", and "3" from west to east.

Along each transect the following measurements/observations were made: 1) general observations to develop gross reef environment descriptions, 2) water depth at 5 m intervals (not always possible), 3) general observations and photographs of fishes and macroinvertebrates, and 4) quadrat-frame photographs of the bottom at pre-selected intervals. The use of a camera frame (Fig. 6) to obtain bottom photographs of a known area (0.165 m^2 in this case) greatly enhanced quantitative data collection and additionally providing a permanent record of the effort (see Fig. 7). However, this approach was hampered by shallow depths on the reef flat at low states of the tide. At the time of the surveys, tides were too low in the afternoon to effectively utilize the camera frame[3]. In some cases transect lines had to be laid again the next day to complete a photographic sequence.

[3] Some photos were obtained from above the water surface, but this required absolutely calm conditions.

Transect lines were used to note changes in the nature of the substratum and reference other positions of interest observed during the surveys, but mainly to establish where each quadrat photograph was to be taken, reducing bias from the process. In areas of little or no coral on the shallow inner reef flat photographs were taken at the 5 m marks. In areas of abundant coral on the outer reef flat and reef frontal margin, photographs were taken at every even meter mark (every 2 m).

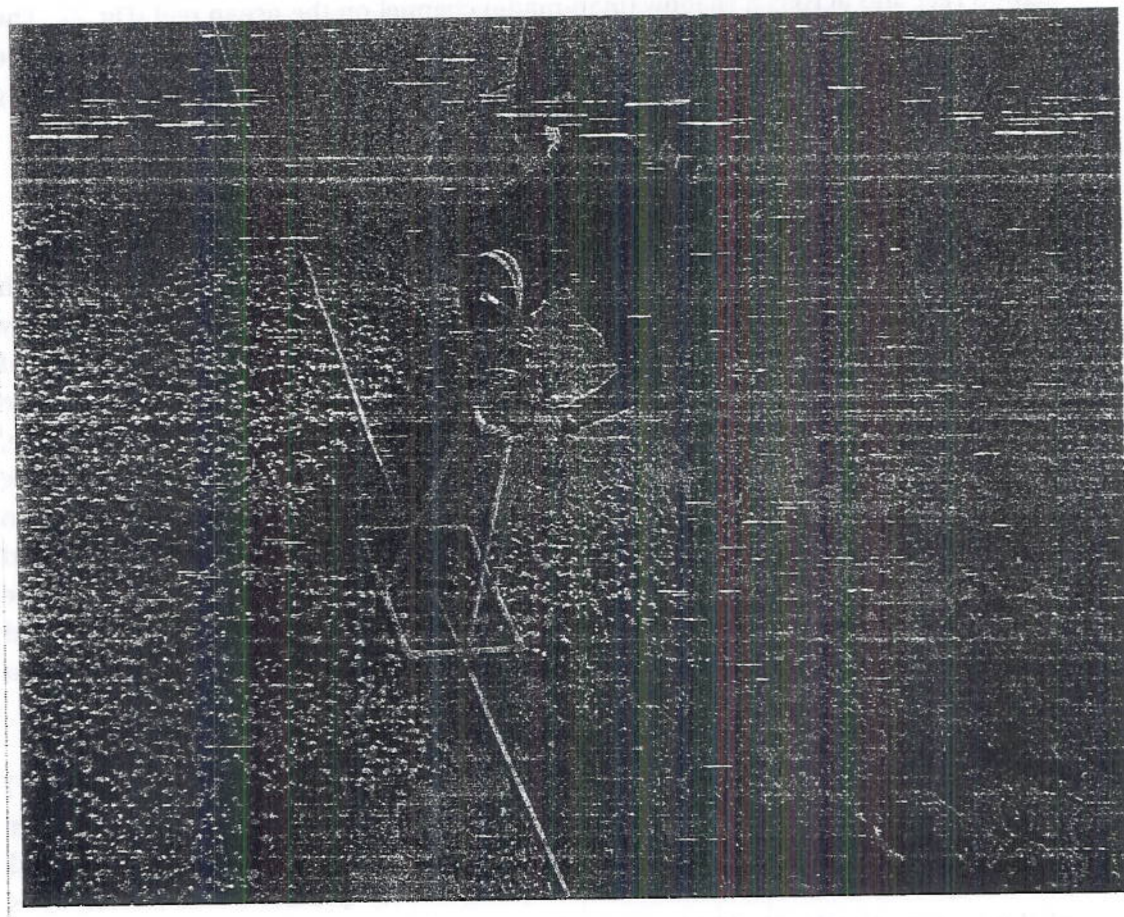

Figure 6. Transect line and camera-on-frame obtaining quadrat photograph over *Porites rus* colony at 168 m along Transect 3 in water 4-5 m deep on the frontal margin of the lagoon reef.

Algae, invertebrates including corals, and substratum type were enumerated from the quadrat photographs using a program, which quantitatively estimates area coverage from the number of points intercepted by an organism or substratum type. This program automatically inserts a desired number of sampling points on a computer image, either randomly or in a grid. For this effort, 25 points were utilized assigned in a random pattern. One of the biologists (Coles) then processed the images by assigning a "category" to each of the 25 points. The program then calculates totals and averages for each quadrat and each transect in Excel, allowing further manipulation of the count data.

Figure 7. Resulting photograph for Transect 3, Quadrat 168m (see Fig. 6) after cropping out the quadrat frame (note vertical support attachments just visible on each edge) in preparation for computing bottom type coverage.

Fishes were surveyed by snorkeling along each transect, but mostly by spending time in the slightly deeper water with extensive coral bottom on the outer part of the reef and on general snorkeling surveys undertaken to obtain a broader picture of the nature of each area. Quantitative methods were not used.

Observational data obtained along each transect are given in Appendix 1 of this report. Photograph count data by transect are provided in Appendix 2. Table 2 summarizes the quantitative data for each transect broken down by inner and outer reef flat zones as defined above.

Lagoon Reef Environment Description

The project area subject to the most fill is a lagoon reef extending as a shallow platform lagoonward from the beachrock shore. The nature of the shoreline and nearshore substratum for each transect is given in the observational data presented in Appendix 1. In general, with but a few exceptions, the physiography of the reef flat in the survey area is similar from place to place, being a shallow platform that extends seaward and consists of a surface of low limestone outcrops and complex fragments ranging from fine sand through small boulders, over a more or less consolidated base of the same material. Near the outer edge, the reef front drops either in a series of steps or somewhat precipitously to the lagoon bottom. Notable exceptions to this physiography within the project Area A are borrow pits (areas of former dredging for material removal) and a part of the reef flat adjacent to one of the borrows where limestone blocks are stacked on the reef.

Table 2. Percent cover by category for the impact and control area transects broken down by inner and outer reef flat areas. Number of photoquadrats used given in parenthesis.

TRANSECT:	1		2		3	
CATEGORY	Inner (17)	Outer (13)	Inner (20)	Outer (17)	Inner (18)	Outer (19)
Macroalgae	56.3	25.8	59.0	42.2	36.5	38.1
Coralline algae	0.0	0.0	0.0	0.0	0.0	0.0
Coral	0.5	32.0	8.6	46.2	17.8	17.3
Lmstn rubble	4.7	27.2	7.3	4.4	12.8	13.4
Substratum	38.5	15.0	25.0	7.2	32.9	31.2

TRANSECT:	A		B	
CATEGORY	Inner (22)	Outer (13)	Inner (8)	Outer (13)
Macroalgae	27.8	20.0	59.2	24.3
Coralline algae	0.0	0.0	0.0	0.0
Coral	8.92	40.8	12.5	59.1
Lmstn rubble	8.0	16.6	4.8	9.0
Substratum	55.2	22.0	23.5	7.3

The reef platform retains only a shallow depth of water at low tide. The micro-topography is complex, consisting of broad, slightly raised areas of mostly consolidated limestone and slightly depressed areas of sand-filled holes and channels, or areas of mixed sand and rubble. Various species of algae are abundant to moderately abundant everywhere, covering nearly all hard surfaces. Most are microscopic encrusting or turf-forming species that are difficult to identify and even more difficult to quantify in a reconnaissance survey. These species have been largely ignored here, but are important and ubiquitous in the reef environment. Macrothallic algal species were recorded in analysis of the photoquadrats and included in the observational notes. Macroinvertebrates other than corals were only rarely encountered in the photoquadrats, but noted in the observational notes as present in different areas, although in reality only large, non-cryptic species were observed.

Corals

Considering each transect as a whole, coral coverage calculated from the photoquadrats ranges from 14.2% (Transect 1) to 41.3% (Transect B). No east-west or alongshore gradient patterns are apparent in these results. Coral growth is generally sparse within the nearshore zone extending out at least 100 m (300 ft), except at Transect B, where landfill for the airport runway and coastal road extends well out onto the natural reef. The high average coral cover in Transect B reflects the fact that the nearshore zone of little or no coral growth is buried under this fill. Both abundance and diversity of coral species increases gradually out across the reef flat to an outer reef zone where coral cover is generally substantial (approaching 100% in some areas). The greatest diversity of coral species occurs along the reef margin and down the frontal slope. Differences in coral coverage between the inner and outer reef zones are clearly evident in the coral cover values presented in Table 2 above. It is interesting that for all three impact area transects[4], the first quadrat of the outer series was at 130 m (that is, high coral cover started between 126 and 130 m from the vegetation line).

Transect 3 is unusual in that average coverage by all major categories are much the same along both the inner and outer parts of the line. This may in part be due to high coral cover along the margins of a borrow pit located between the 30 and 79 m marks on the transect. Low coral cover on the outside reef of this transect is not so easily explained. However, along the margin, corals appear to be overwhelmed by the growth of the alga, *Dictyota* (Fig. 10), and on the frontal slope there is an abundance of areas bare of live coral and algae.

Overall, a total of 34 hermatypic corals and two additional cnidarian taxa were identified throughout the study area. The most coral species (25) were observed on Transect A, followed by 17 species on Transect 1. Generally, in the project area, there seems to be a decrease in coral species numbers from west to east (Table 3). Corals found in the nearshore or inner reef flat area are mostly limited to just a few species (*Psammocora contigua, Montipora digitata* and scattered occurrences of

[4] As well as Transect A, on which photoquadrat 130 m was unusable, making quadrat 132 m the first high coral density quadrat. For transect B, the starting point was at the shoreline of fill that extended well out onto the reef (see Fig. 2).

Pocillopora damicornis and *Porites* spp.), species somewhat tolerant of exposure at extreme low tides, elevated water temperatures, and salinity swings that occur whenever heavy rains occur coincident with low tide.

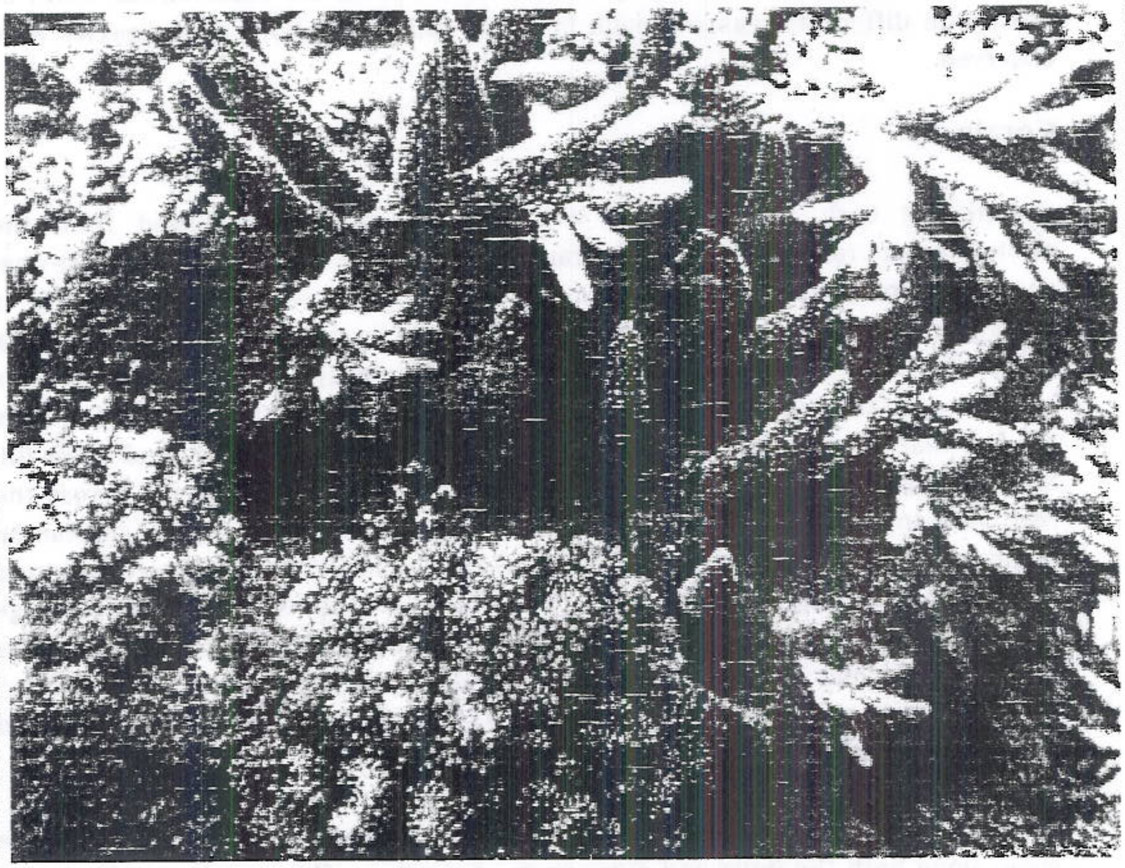

Figure 10. Frontal slope near Transect 2 showing corals crowded by growth of the alga, *Dictyota*.

Table 3. Listing of scleractinian coral species and other cnidaria observed in the project area along or in the vicinity of each transect.

		Transect				
Family	Species	A	1	2	3	B
Acroporidae	*Acropora abrotanoides* (Lamarck, 1816)	x	x		x	
	Acropora cythera (Dana, 1846)	x			x	x
	Acropora digitifera (Dana, 1846)	x	x	x	x	x
	Acropora elseyi (Brook, 1892)	x				
	Acropora florida (Dana, 1846)	x	x			
	Acropora gemmifera (Brook, 1892)		x	x	x	
	Acropora globiceps (Dana, 1846)		x	x		
	Acropora hyacinthus (Dana, 1846)		x	x	x	x

Table 3 (continued).

Family	Species	Transect A	1	2	3	B
	Acropora cf. *latistella* (Brook, 1892)		x			
	Acropora millepora (Ehrenberg, 1834)			x		x
	Acropora nasuta (Dana, 1846)	x	x	x	x	
	Acropora nobilis (Dana, 1846)			x		
	Acropora sarmentosa (Brook, 1892)	x			x	
	Acropora secale (Studer, 1878)				x	
	Acropora sp.	x	x	x	x	x
	Astreopora myriophthalma (Lamarck, 1816)	x				
	Montipora cf. aequituberculata Bernard, 1897			x		
	Montipora cf. *calicata* (Dana, 1846)		x			
	Montipora digitata (Dana, 1846)	x	x		x	
Pocilloporidae	*Pocillopora damicornis* (Linnaeus, 1758)	x	x	x	x	x
	Pocillopora meandrina Dana, 1846		x			x
	Pocillopora verrucosa (Ellis & Solander, 1786)	x	x	x		x
	Seriatopora hystrix Dana, 1846	x				
Pavonidae	*Pavona decussata* (Forskal, 1775)			x	x	
	Pavona varians Verrill, 1864	x				
Poritidae	*Porites cylindrica* Dana, 1846	x	x	x	x	x
	Porites lutea Edwards & Haime, 1860	x	x		x	x
	Porites rus (Forskal, 1775)	x	x	x	x	x
Fungiidae	*Fungia fungites* (Linnaeus, 1758)	x				
Siderastreidae	*Psammocora contigua* (Esper, 1797)	x				
	Psammocora cf. *superficialis* (Gardiner, 1898)	x				
	Psammocora sp.				x	
Faviidae	*Symphyllia* cf. *agaricia* Edwards & Haime, 1849	x				
	Symphyllia radians Edwards & Haime, 1849	x				
	Symphyllia sp	x				
Other cnidaria						
	Millepora sp. (branching)	x				
	Sinularia sp.	x				
Total Coral and other Cnidarian Taxa		**25**	**17**	**14**	**16**	**11**

Evidence of coral bleaching[5] was not observed during this survey, although most *Acropora* heads and a few other species on the lagoon reef flat near the airport hanger to the east showed evidence of bleaching in 2006 (Chen & Dashiell,. 2006) and bleaching of Majuro lagoon corals was noted in an informal report by Jacobson (2006).

[5] Live corals, responding to stress, appear white due to loss of zooxanthellae, a commensal alga that grows in the coral tissue and is physiologically necessary for the coral to maintain healthy growth.

Algae

Not unexpectedly, macrothallic algae showed on average a pattern opposite to that of the corals, being most abundant on the inner reef portion of each transect (Table 2). However, on Transect 3, macroalgal coverage was slightly greater outside than inside. Considering all areas surveyed, macrothallic algae in coral dominated areas on this reef seemed high in the biologists' experience with reef environments elsewhere. Indeed, in addition to lush *Dictyota* growth among live corals at the reef margin in particular, the growth of *Acanthophora spicifera* a species not reported in the literature as occurring in the Marshall Islands, was conspicuous everywhere on the reef flat, and clearly invasive in some areas. The category "encrusting calcareous" algae included *Porolithon onkodes*, *Hydrolithon* sp., *Ralfsia* sp., and other encrusting forms.

Table 4 presents a breakdown by species of alga for the transect segments (inner and outer zones as defined for the corals). Areas of highest concentrations are greyed in the table. Although clearly many more species are present on this reef (note high coverage percentage for "other, unidentified" species), the common to abundant species are differentiated and quantified in terms of cover values. Of greatest concern are the two species appearing most aggressive towards the coral growth: *Acanthophora spicifera* and *Dictyota* sp. The latter is fairly ubiquitous along the reef margin on all transects and on the inner zone of the eastern transects (Transects 2, 3, and B). *Acanthophora*, also ubiquitous on the reef flat, appears most aggressive in the middle of the reef on the western transects (Transects A, 1, and 2).

Macroinvertebrates

The only macro-invertebrate common in the inner zone is the sea cucumber, *Holothuria atra*. One crown-of-thorns starfish (*Acanthaster planci*) was seen near the outer end of Transect 2 and the smaller starfish, *Linckia* sp. is present on the reef margin. The giant turbin or top shell (*Tectus neloticus*) occurs on limestone blocks at the reef margin near Transect 3. A large, burrowing anemone (*Achtinodendron*) is common in the sand bottom of the borrow pit crossed by Transect 3. Also present in the sand are sand-dwelling mollusks: *Lambis* sp. and *Natica* sp.

Table 4. Fleshy macroalgae (percent cover) identified from the photoqudrats by transect segment.

TRANSECT	A(i)	1(i)	2(i)	3(i)	B(i)	A(o)	1(o)	2(o)	3(o)	B(o)
CHLOROPHYTA										
Avrainvillea sp.	---	---	---	---	---	p	---	---	---	---
Caulerpa racemosa	---	p	---	1	p	---	---	---	---	---
Caulerpa sertularoides	1	p	1	3	6	---	---	---	---	---
Halimeda sp.	1	---	---	---	1	1	p	< 1	---	---
Valonia aegagropila	P	---	---	---	p	---	---	---	---	---
Valonia ventricosa	---	---	---	---	---	---	---	---	---	p
RHODOPHYTA										
Acanthophora spicifera	11	19	25	5	---	---	---	---	---	---
Calcareous encrusting spp.	1	13	3	3	13	5	3	2	7	8
Dichotomaria sp.	---	---	---	---	---	p	---	---	---	---
Galaxaura sp.	---	---	---	---	---	1	---	---	---	---
Liagora sp.	1	---	---	---	---	---	---	---	---	---
CYANOPHYTA	---	---	p	p						
PHAEOPHYTA										
Dictyota sp.	4	2	15	17	32	9	10	33	24	12
Padina sp.	3	6	1	2	1	< 1	p	---	---	---
Misc. turf algae	1	13	6	1	1	1	10	2	6	---
Other, unidentified	5	4	8	5	6	3	3	5	1	4

P = species not showing up in quadrat point counts but observed in field or in photoquadrats.

Fishes

A majority of the fishes observed were closely associated with areas of high coral cover and, expectedly, deeper water on the outer margin and frontal slope of the reef. A listing of the species observed is provided as Table 5. The inner reef flat supports mostly juveniles of species abundant on the outer part of the reef. And a general movement of fishes inward occurs as the tide floods, increasing the depth of water on the reef.

Table 5. Partial list of fishes by family observed associated with the lagoon reef at the western end of the Majuro airport.

Family - Species	Common name	Where generally observed
ACANTHURIDAE (Surgeonfishes)		
Acanthurus achilles		reef face
Acanthurus nigricans	Goldrim surgeonfish	reef face
Acanthurus nigroris	Bluelined surgeonfish	reef margin, reef face
Achanthurus xanthopteris		reef face
Ctenochaetus striatus	Striped bristletooth	reef margin & face
Or *binotatus*		
Naso ?annulatus		reef margin
Zebrasoma scopas	Brown tang	reef face
Zebrasoma veliferum	Sailfin tang	reef face, reef margin
BALISTIDAE (Triggerfishes)		
Rhinecanthus aculeatus	Lagoon triggerfish	reef margin
CHAETODONTIDAE (Butterflyfishes)		
Chaetodon auriga	Threadfin butterflyfish	reef margin
Chaetodon baronessa	Eastern triangular butterflyf.	reef margin
Chaetodon citrinellus	Speckled butterflyfish	reef margin
Chaetodon ephipium	Saddled butterflyfish	reef face
Chaetodon trifascialis	Chevroned butterflyfish	reef face
Chaetodon cf. *ulietensis*		reef face
Chaetodon vagabundus	Vagabond butterflyfish	reef margin
EPHIPPIDAE (Batfishes)		
Platax sp.	Spadefish	borrow
HOLOCENTRIDAE		
	Squirrelfish	reef face & margin
LABRIDAE (Wrasses)		
Anampses sp.		reef margin
Coris cf. *aygula*		reef margin
Coris ?variagata		reef margin
Chelinus fasciatus		reef margin
Cheilio inermis	Cigar wrasse	reef margin
Gomphosus varius	Bird wrasse	reef face & margin
Halichoeres hortulanus		reef face
Halichoeres marginatus		reef face
Halichoeres trimaculatus		reef face
Labroides dimidiatus	Cleaner wrasse	reef margin & face
MULLIDAE (Goatfishes)		
Mulloides flavolineatus	Yellowstripe goatfish	reef face, borrow

Parupeneus barberinus	Dash-n-dot goatfish	reef face, borrow
Parupeneus multifasciatus	Multibarred goastfish	reef face
LETHRINIDAE (Emperors)		
Lethrinus harak	Thumbprint emperor	reef face
Monotaxis grandoculus	Bigeye emperor	reef face
NEMIPTERIDAE (Coral breams)		
Scolopsis bilineatus	Twoline spinecheek	reef front
Scolopus lineatus	Black-and-white spinecheek	reef front
POMOCENTRIDAE (damselfishes)		
Abudefduf viagiensis	Sergeant-major	reef face & margin
Amblyglyphidodon curacao	Staghorn damsel	reef face
Amphiprion melanops	Dusky anemonefish	reef face
Chromis viridis	Blue-green chromis	reef face
Chrysiptera biocellata	Two-spot damoiselle	inner reef flat
Chrysiptera cf. *unimaculata*	One-spot demoiselle	reef face
Dischistodus chrysopoecilus	White-spot damsel	mid-reef flat*
Plectroglyphidodon johnstonianus	Johnston damsel	reef face
Pomacentrus grammorhynchus	Blue-spot damsel	reef face*
Pomacentrus vaiuli	Princess damsel	reef face
SCARIDAE (Parrotfishes)		
Scarus ?dimidiatus	Turquoise-capped parrotfish	reef face
Scarus frenatus (juv.)	Vermiculate parrotfish	reef face
Scarus sordidus	Bullethead parrotfish	reef face
SERRANIDAE (Groupers)		
Epinephalus merra	Dwarf-spotted grouper	reef flat & reef face
TETRAODONTIDAE (Puffers)		
Arothron nigropunctatus	Black-spotted puffer	reef face
ZANCLIDAE		
Zanclus cornutus	Moorish idol	reef face

Ocean Reef

Fill "Area B" is proposed for an area that is technically part of the seaward reef of the atoll. However, this area is presently a shallow channel containing water only at high tide (see Fig. 3, above) and was once part of the islet of Lo-kōjbar that appears to have been scraped off during development of the mid-islet borrow. The ocean reef in this area incorporates a sea level reef flat and an older somewhat elevated platform perhaps representing an earlier stand of the sea or material consolidated beneath an old islet and similar in origin to the beachrock on the lagoon shore. The sloping seaward face of this platform appears as a dark zone running the full length of the back reef shown in Fig. 2. In the aerial photo, the wave break marks the approximate front of the reef flat. In Fig. 9, the platform occupies most of the image, with the seaward reef flat the yellowish brown flat seen on the right side. A few shallow tide pools are present on the platform seaward of the proposed fill area, which is consolidated limestone rock with a scattering of rubble and sand deposits carried in with the tidal flow. Very few organisms inhabit this area, which completely dries out at every low tide.

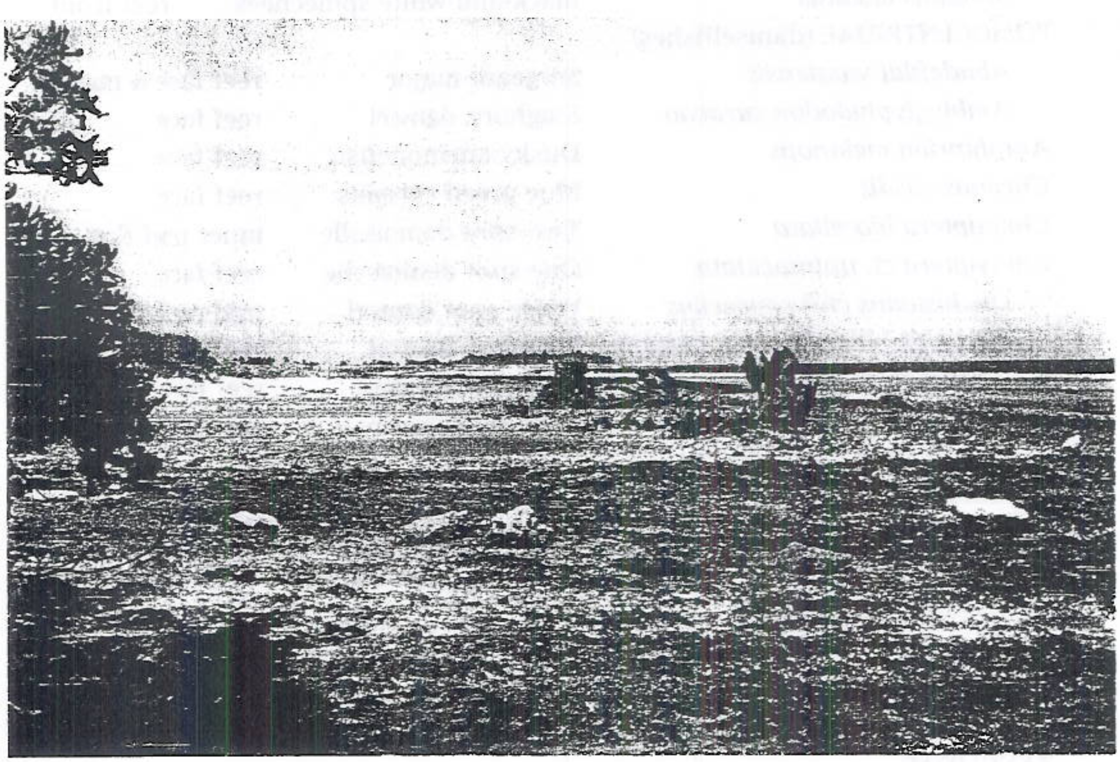

Figure 9. Seaward reef platform between Lo-kōjbar and the airport (left background). Rusting metal equipment is probably remains from the quarry operation that created the borrow pit, fed by tidal flow across the channel just out of frame to the left and shown in Fig. 3.

Impacts Assessment

The lagoon reef provides habitats for a large number of organisms, and can encompass over a relatively small area one of the most diverse and complex ecosystems on the planet. In general, the diversity of life increases steadily from the shore, reaching a peak at the reef margin and for a short distance down the frontal slope, then decreases rapidly into deeper water of the lagoon floor. By this consideration, direct adverse impacts to a reef environment can be assessed to increase in magnitude as a function of the extent offshore of a proposed activity involving the reef. Impacts at the shoreline and for a short distance offshore, even impacts of adding fill or building a revetment with fill behind, can be minimal despite the permanent loss of reef area, simply because the shoreline habitat can be successfully recreated at the new location and loss of the inner reef flat may not represent a significant loss to the reef ecosystems (there are exceptions). Obviously such losses represent tradeoffs between conserving reef resources and gaining developable land in a land-limited environment such as that of an atoll.

The proposed road realignment will directly impact X Ha on area A and Y Ha on area B (calculate from Fig. 2). The barren reef flat at Area B is at an elevation that completely dries out between high tides, so the biological impact of the fill would be minimal. The negative result of Area B fill will be its effect on a recreational feature utilized by local residents. The proposed fill would not actually impact directly on this favored swimming area because extension of the runway runoff safety zone stops just short of the edge of the borrow, leaving intact the sand-filled east end of the borrow that constitutes the popular swimming beach. The fill would, however, stop the high tide exchange of sea water between the ocean and the borrow at this end of the latter. A similar opening is present at the west end of the borrow and it would not be impacted. Unknown at this time are several considerations: Will flushing of the borrow be altered by having only the one exchange point? Will the sand deposit dynamics (i/e., the recreational beach) be altered? Will the new security fence include or exclude the east end of the borrow for public use?

The lagoon reef surveyed in the project area is one showing environmental stress due to one or more of several factors having a negative impact on the lagoon at Majuro Atoll. Although fishes and corals are abundant on the outer part of the reef, the project area appears to be characterized by an excess of fleshy algae, particularly *Acanthophora* and *Dictyota*. *Acanthophora* is a recent introduction to Majuro. This species is the most widely spread introduced marine alga in the main Hawaiian Islands (Smith et al., 2002), where its impact on corals is thought to be minimal yet it is clearly displacing native algal species . At Majuro, however, both *Acanthophora* and *Dictyota* are clearly overgrowing and killing corals on the reef flat and reef margin. Several possible explanations can be hypothesized, but are not easily evaluated. Typically, an excess of fleshy algae indicates an increase in dissolved nutrients in the water (a by-product of increasing human density on the islets, for example), or a decrease in fishes that feed on algae (from over-fishing, for example), or long-term changes in water temperature (increasing) or in water circulation (decreasing).

One factor that could be over-arching in its impact as contributory to other adverse factors were the physiographic alterations that occurred along this section of the south reef of the atoll when it was converted from a string of small islets separated by shallow channels into a continuous landfill or causeway with no provisions made to accommodate water exchange between the lagoon and the ocean. The Rairōk and Ajeltake Subdistricts were most impacted by this activity that involved construction of the airport runway and a roadway joining all of the southern Districts of the atoll. Prior to these projects, Ānen-elip (Majuro Airport), Lo-kōjbar (project area), and Lojemwā (quarry west of the project area) islets were separated by fairly broad channels through which tidal water exchanged between the lagoon and the ocean and wave-driven flows contributed low nutrient ocean water during periods of large south swells. The coral community is one adapted to low-nutrient water; whereas fleshy algae take advantage of an increase in dissolved nutrients to outgrow corals in competition for space on the reef.

Conditions we observed on the reef in the project area appear to reflect a chronic decline in the health of the reef's coral community. Unfortunately, it is unlikely that data exist to assess, as causative factors, changes in nutrient concentrations or water temperatures over a period of time stretching back several decades. Although declines in populations of certain fishes can possibly be documented, the relationships between various fish species and community dynamics on the coral reef are potentially too complex to readily understand. However, removal of all sea water exchange between the ocean and the lagoon in the project vicinity in the late 1970s is documented. Restoring some of this exchange is the most achievable mitigation likely to reverse the destructive processes now well underway.

The shallow reef and submerged borrow area that would be affected in area A have already received substantial environmental stresses resulting in a "phase shift" to an algal-dominated reef flat with a high abundance of an invasive introduced species, *Acanthophora spicifera.* The cost of the irretrievable loss of this area may thus be considered a tolerable tradeoff for the benefit of the project, given the low coral coverage, minimal three dimensional habitat and relatively low fish abundance and diversity that now occur at distances up to 120-130 m from the shoreline. However, the project could have significant negative indirect impacts on the deeper reef zones along the outside of the fill area from mechanical disturbances and increased turbidity and sedimentation during construction. All feasible steps should be taken to minimize these direct construction impacts by use of sediment curtains and other techniques to isolate the offshore reef from construction impact.

Of longer-term concern are chronic stresses related to sediments, nutrients and hydrocarbons from road runoff more directly impacting the more pristine offshore reef area after the project is complete. These potential negative influences are potentially significant given the situation that the lagoon reef is located in a relatively stagnant part of the lagoon, the result of connecting former islets into the continuous landfill that is the present airport runway and coastal road.

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APPENDIX 1 – Lagoon Reef Transect Notes

Abbreviations used

bldr	-	boulder
cbl	-	cobble; stones larger than gravel, smaller than boulders
lmstn	-	limestone (reef rock comprised of mostly calcium carbonate)
pltfm	-	reef platform; the mostly level surface of the lagoon reef
rbl	-	rubble; a mix of gravel to cobble sized fragments
WL	-	water line or water level

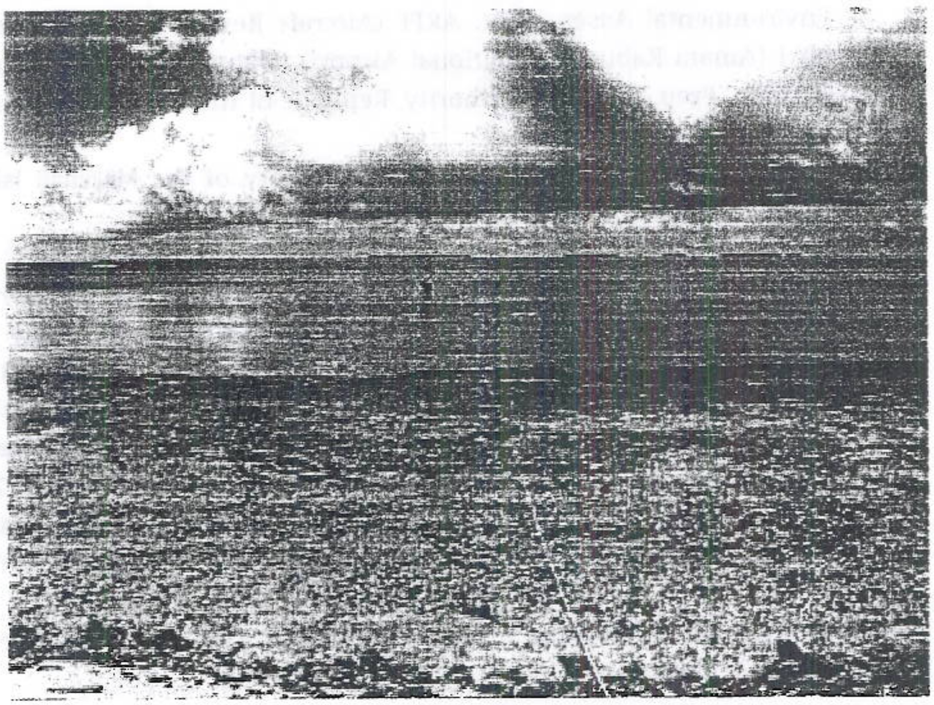

Figure A1. Setting Transect A across beachrock and shallow reef flat in direction of Kōlal-en islet.

Transect A:

5/19/06 ~ 7° 3.663'N - 171° 15.412' E bearing 330° mag. N for 160 m

Notes: "*kamani* tree at road curve on west end"

Vegetation: sand/rubble berm

Trees: *Calophyllum inophyllum*

Shrubs: *Scaevola sericea*

Grasses and sedges: *Lepturus repens*, *Fimbristylis cymosa*, *Dactyloctenium aegyptium*, indet. grass

Herbs: *Vigna marina*, *Ipomoea pes-caprae*

Transect A (continued).

south ^ ~ north V	(approx. transect direction)
0	Eroding roots at upper end of beach deposit
0 to 5.7	Sand beach with cobbles
5 m	First photoquadrat (above WL) shows sand and cobble
5.7 to 25.1	Low beachrock formation (WL at survey start at 25.5 → 25.1)
25.1 to 46	Thin layer of sand and rbl over lmstn pltfm First live coral, *Porites* off to side at 36.4 m (30 m quadrat?); algae: *Padina, Acanthophora, Caulerpa racemosa,*
46 to 106	Mostly sand veneer (~ 1 cm) on platform, slightly greater depth; *Acanthophora* larger, *Hydrolithon, Porites* wheel.
106 to 130	Greater microtopography; *Dictyota* and *Padina,* scattered corals.
132 m	Start photoquadrats at 2 m intervals (high coral density)
130 to 160	Frontal slope, depth increasing to 2-3 m; corals and *Dictyota, Halimeda, Avrainvillea.*
160 m	Last photoquadrat

Low tide depth profile (cm) across reef platform:

Meters	Depth	Meters	Depth	Meters	Depth
5.7	+57	51.5	-6	130	-23
	*	60	-3	134	-143
25.1	+12	70	+1		
25.5	0	80	-3		
30	-10	90	-10		
40	-28	100	-18		
41.8	-8	110	-22		
50	-31	120	-14		

* High point on beachrock a little greater than +57 cm

Note: Depths are relative to this transect only and have been corrected for tidal changes during period of measurements only.

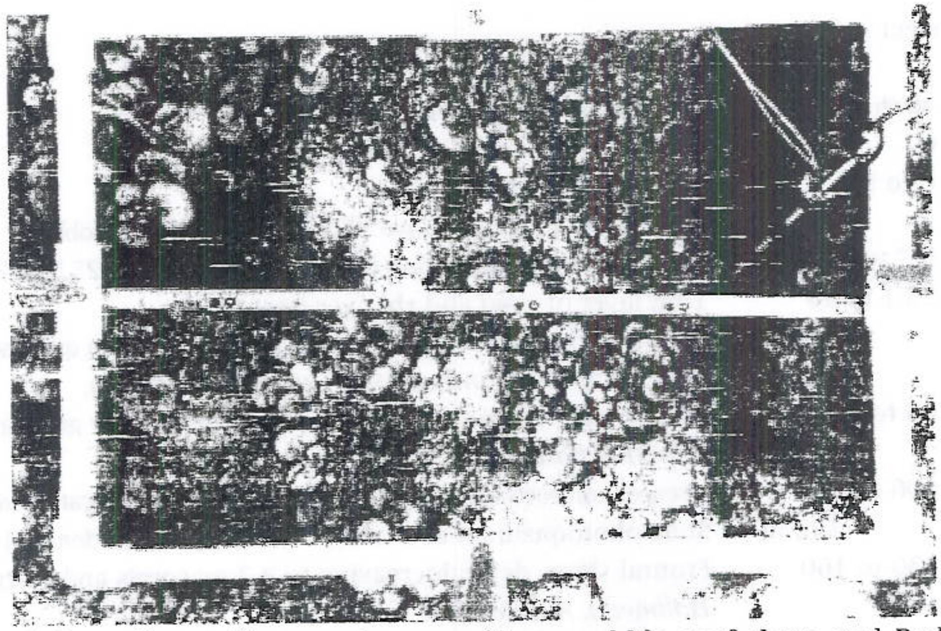

Figure A2. Raw photo of bottom in area of loose rubble, turf algae, and *Padina* along Transect 1 showing quadrat frame, transect line (at second 50 m), and pin (surveyor's arrow) used to attach line end points.

Transect 1:

5/20/06 ~ 7° 3.685'N - 171° 15.471' E bearing 330° mag. N for 165 m

Notes: "fixed at about vegetation line"

Vegetation:

Trees: *Calophyllum inophyllum, Tournefortia argentea*

Shrubs: *Scaevola sericea*

Grasses and sedges: *Lepturus repens, Eleusine indica, Cenchrus echinatus, Sporobolus virginicus*

Herbs: *Bidens alba, Vigna marina, Ipomoea pes-caprae, Chamaesyce hirta, Phyllanthus amarus*

south ^ ~ north V	(approx. transect direction)
0 to 2.8	Coarse sand beach with cobble. Littoral snails: *Nerita plicata*, *Nerita* sp., *Melampus* sp. higher up; *Metopograpsus* crab.
2.8 to 5.3	Cobble deposit with some sand
5.3 to ~19.7	Beachrock; tide pools with blennies on land side, merges smoothly into reef platform.
12.7	High point on beachrock
19.7 to 28	Lmstn platform with sand veneer.
28 to 59.3	Lmstn pltfm with sand and boulders, much *Acanthophora*, *Padina*, *Caulerpa*, *Holothuria atra*
30 m	First photoquadrat

Transect 1 (continued).

59.3 to 84.5	*Porites rus*, rubble bottom with sparse coral growth, becoming smooth lmstn with fleshy algae (mostly *Acanthophora* and *Padiona*), algal turf. *Porolithon*, then rubble again.
84.5 to 99.5	*Acanthophora* declines; mostly *Padina* and *Caulerpa*.
99.5 to 127.5	Slab debris pile from borrow operation nearby to west; *Padina*, *Dictyota*, encrusting algae, incl. *Porolithon*.
127.5 to 165	2+ m deep shelf beyond debris pile; coral, *Linckia*, *Holothuria atra*, *Dictyota*.
130 m	Start photoquadrats at 2 m intervals (high coral density)
154 m	Last photoquadrat
165	Reef front at depth of about 4 m

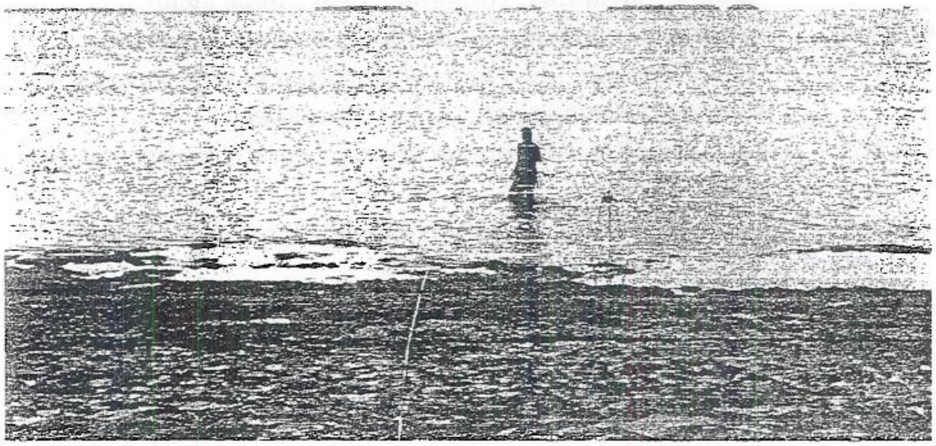

Figure A3. Walking Transect 2 line out, across exposed beachrock at the shore towards small islet of Āne-kōtkōt on north reef.

Transect 2:

5/20/06 ~ 7° 3.700'N - 171° 15.528' E bearing 340° mag. N for 162 m

Notes: "fixed at about vegetation line"

Vegetation:

Trees: *Calophyllum inophyllum, Pandanus tectorius*

Shrubs: *Scaevola sericea*, kou (*juv.*)

Grasses and sedges: *Lepturus repens, Eleusine indica, Fimbristylis cymosa, Paspalum* sp.

Herbs: *Bidens alba, Vigna marina*

0 to 3.5	Beach, mixed sand and gravel
3.5 to 28.9	Beachrock formation; algal zonation
3.85	High point on beachrock
6.3	Second high point on beachrock
28.9 to 37.5	reef platform of mixed sand and scattered rubble/boulder *Pavona, Acanthophora, Padina, Caulerpa*
30 m	First photoquadrat; live coral present
37.5 to 50	Slight rise onto "algal platform" with dense *Acanthophora* growth, some *Caulerpa* spp.
50 to 62.7	Mixed bottom; dense *Acanthophora* clumps after 54 m
62.7 to 82	Smooth lmstn platform with sand veneer
82 to 90	Much *Pavona*, many heads dead
90 to 95	*Dictyota* and *Acanthophora* forming thick clumps
95 to 113.5	Bottom of jumbled, dead coral heads; *Dictyota* and *Padina*

Transect 2 (continued).

113.5 to 114	Zone of dense live coral drops into channel at 114 m; coral diversity increasing.
114 to 130.5	Channel, live coral on steep margins, sand bottom; ultimate depth reaching about 4 m
130.5 to 148	Dense coral bottom
130 m	Start photoquadrats at 2 m intervals (high coral density)
148 to 159	Bottom at reef edge sloping down
159 to 162	Reef front, increasing rapidly in depth to 5 or 6 m
162 m	Last photoquadrat

Mid-tide depth profile (cm) across reef platform at Transect 2:

Meters	Depth	Meters	Depth	Meters	Depth
0	+126	35	-67	62.7	-67
12	+52	40	-46	70	-52
17	+27	45	-56	80	-65
23	+2	50	-66	100	-89
25	-8	50	-66	114	-140
28.9	-26	55	-75	131	~-90
30	-53	60	-63		

Note: Depths are relative to this transect only and have been corrected for tidal changes during period of measurements only.

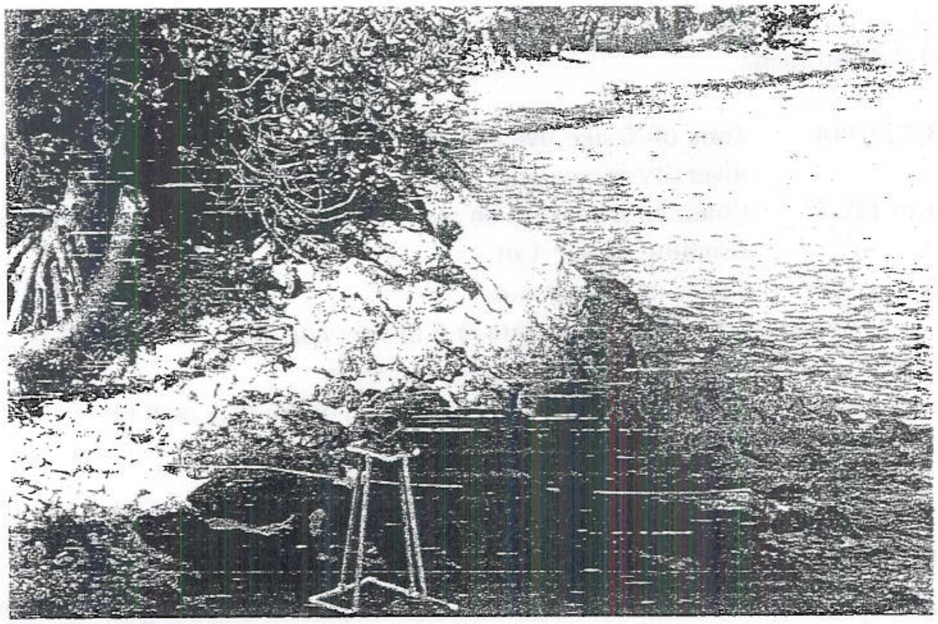

Figure A4. Start of Transect 3; camera-on-frame at the ready.

Transect 3

5/21/06 ~ 7° 3.717'N - 171° 15.596' E bearing 326° mag. N for 170 m

Notes: "fixed on *Pandanus* root at vegetation line"

Vegetation:

Trees: *Calophyllum inophyllum, Pandanus tectorius*

Shrubs: *Scaevola sericea, Premna serratifolia*

Grasses and sedges: *Bothriochloa bladhii, Dactyloctenium aegypticum, Fimbristylis cymosa,* indet. grass, others

Herbs: *Bidens alba, Vigna marina, Ipomoea pes-caprae, Phyllanthus amarus*

0 to 1.8	Cobble beach with some sand
1.8 to 11.5	Boulders of destroyed revetment wall (WL), mixed with sand
10 m	First photoquadrat
11.5 to 25	Sand with boulders and cobble. *Caulerpa* spp. *Halimeda. Padina, Acanthophora, Holothuria atra*
15.2	*Psammocora*
25 to 30	Large *Montipora*, 80-90% cover, then drop into borrow pit with steep coral-covered slope.
38 to 68	Sand deposit at bottom of borrow; odd anemone in burrows and *Caulerpa racemosa*, Naticidae and Lambidae present. Note line turns ~ 5 degrees left at 50 m; depth ~4 m.
68 to 82	Rubble covered slope at far side of borrow, near vertical at 79 m.
82 to 94	Cobble and rubble area with turf algae

To Concerned Parties:

The RMI Port Authority (RMIPA) is preparing a Draft Environmental Impact Assessment (EIA) for the Road Realignment Project at Amata Kabua International Airport. Attached is a letter describing the project that was sent out to previously to some agencies, also attached is the EPA approved scoping report. The Port Authority ask that you review these documents and provide comment and/or questions concerning the proposed project.

Consultation with stakeholders is an important part of the EIA process, it allows for information to be shared to ensure that a complete and thorough report can be created. We ask that you send your comments by December 10th 2007 to NJDeeley@leoadaly.com. If you have no comments at this time an email stating so would be appreciated. For those who do not have any comments at this time, there will be another opportunity to do so when the EPA/RMIPA hold a public meeting concerning the design and environmental issues facing the Airport Road Realignment Project in the upcoming months. You will be notified of the time and the date once the meeting has been set

Thank you for taking part in this important process.

Nicholas Deeley

Nicholas J. Deeley

LEO A DALY

www.leoadaly.com NJDeeley@leoadaly.com

the approved draft EIA is submitted and also at the public meeting that will be held in the up coming month(s).

Thanks again for taking part in this important process.

Nick

From: Deeley, Nicholas J.
Sent: Tuesday, December 04, 2007 9:34 AM
To: 'agoffice@ntamar.net'; 'presoff@ntamar.net'; 'tourism@ntamar.net'; 'eparmi@ntamar.net'; 'mimra@ntamar.net'; 'mipamohe@ntamar.net'; 'rndesec@ntamar.net'; 'planning@ntamar.com'; 'rmihpo@ntamar.net'; 'nitijela@ntamar.net'; 'midaoff@ntamar.net'; 'jusmohe@ntamar.net'; 'commerce@ntamar.net'; 'commerce@ntamar.net'; 'yumiko.crisostomo@gmail.com'; 'cnemra@ntamar.net'; 'henrycapelle@hotmail.com'; 'gjoseph@mimra.com'; 'albon@mimra.com'; 'jojeba@hotmail.com'; 'atolldino@yahoo.com'; 'cmihess@gmail.com'; 'Steve Why'; 'Roger Cooper'; 'dolores@visitmarshallislands.com'; 'rimimia@ntamar.net'
Cc: 'Andrew Finlay'; 'Jack Chung-Gum'; Pskowski, Edward Z.; 'Pat Campanella'
Subject: RE: Airport Road Realignment Project

To Concerned Parties:

This is just a reminder that the deadline for comments on the pre-draft environmental impact assessment (EIA) for the Airport Road Realignment Project is December 10th. Thank you to those of you who have already commented. Your comments help to develop and identify issues that the project might face. Even if you do not have any concerns or comments a email stating so would greatly be appreciated.

Thank you,

Nick

From: Deeley, Nicholas J.
Sent: Monday, November 26, 2007 9:10 AM
To: 'presoff@ntamar.net'; 'tourism@ntamar.net'; 'eparmi@ntamar.net'; 'mimra@ntamar.net'; 'mipamohe@ntamar.net'; 'rndesec@ntamar.net'; 'planning@ntamar.com'; 'rmihpo@ntamar.net'; 'nitijela@ntamar.net'; 'midaoff@ntamar.net'; 'jusmohe@ntamar.net'; 'commerce@ntamar.net'; 'commerce@ntamar.net'; 'yumiko.crisostomo@gmail.com'; 'cnemra@ntamar.net'; 'henrycapelle@hotmail.com'; 'gjoseph@mimra.com'; 'albon@mimra.com'; 'jojeba@hotmail.com'; 'atolldino@yahoo.com'; 'cmihess@gmail.com'; Steve Why; 'Roger Cooper'; 'dolores@visitmarshallislands.com'
Cc: 'Andrew Finlay'; Jack Chung-Gum; Pskowski, Edward Z.; 'Pat Campanella'
Subject: Airport Road Realignment Project

Deeley, Nicholas J.

From: Roger Cooper [majurowaste@msn.com]

Sent: Sunday, December 09, 2007 10:08 AM

To: Deeley, Nicholas J.; agoffice@ntamar.net; presoff@ntamar.net; tourism@ntamar.net; eparmi@ntamar.net; mimra@ntamar.net; mipamohe@ntamar.net; rndesec@ntamar.net; planning@ntamar.com; rmihpo@ntamar.net; nitijela@ntamar.net; midaoff@ntamar.net; jusmohe@ntamar.net; commerce@ntamar.net; yumiko.crisostomo@gmail.com; cnemra@ntamar.net; henrycapelle@hotmail.com; gjoseph@mimra.com; albon@mimra.com; jojeba@hotmail.com; atolldino@yahoo.com; cmihess@gmail.com; Steve Why; dolores@visitmarshallislands.com; rimimia@ntamar.net

Cc: Andrew Finlay; Jack Chung-Gum; Pskowski, Edward Z.; Pat Campanella; afinlay@ntamar.net

Subject: RE: Airport Road Realignment Project

Hello Nick,
Just a quick note on MAWC. The Gov't is working hard at finding funding for a Suction Sand dredge. We have a mandate from RMIEPA
to cease all shoreline dredging activity by October 2008. I think within the next year, a suction dredge will be a reality for the RMI
Gov't, quite possibly operated by MAWC.
Roger
MAWC.

From: njdeeley@leoadaly.com
To: agoffice@ntamar.net; presoff@ntamar.net; tourism@ntamar.net; eparmi@ntamar.net; mimra@ntamar.net; mipamohe@ntamar.net; rndesec@ntamar.net; planning@ntamar.com; rmihpo@ntamar.net; nitijela@ntamar.net; midaoff@ntamar.net; jusmohe@ntamar.net; commerce@ntamar.net; commerce@ntamar.net; yumiko.crisostomo@gmail.com; cnemra@ntamar.net; henrycapelle@hotmail.com; gjoseph@mimra.com; albon@mimra.com; jojeba@hotmail.com; atolldino@yahoo.com; cmihess@gmail.com; stevewhy@coralatolls.org; majurowaste@msn.com; dolores@visitmarshallislands.com; rimimia@ntamar.net
CC: finlayrao@yahoo.co.uk; rmiports@ntamar.net; ezpskowski@leoadaly.com; Pat@lyonassociates.com; afinlay@ntamar.net
Date: Fri, 7 Dec 2007 13:19:05 -0600
Subject: RE: Airport Road Realignment Project

To Concerned Parties:

Monday the 10th is the last day to get comments in before the draft EIA is produced. If you do not comment by the ten you will have another opportunity to do so during the 30 day review period once

Deeley, Nicholas J.

From: Roger Cooper [majurowaste@msn.com]
Sent: Monday, November 19, 2007 1:04 PM
To: Deeley, Nicholas J.; Andrew Finlay
Cc: Don Hess; francis reimers; Steve Why; smith ysawa
Subject: Majuro

Mr. Deeley,

In response to your inquiry about the Majuro landfill being able to accept commercial construction debris & waste from the airport construction project, I offer the following for your perusal;

1. Construction waste (concrete, wood, metal) will be accepted at the landfill for a fee per load. Each respective type of material must be seperated and dumped in the correct area of the landfill/recycling center. Unsegregated waste will be charged a higher fee at the gate.

2. Any hazardous waste generated by your project (paints, paint thinner, solvants, oils, lubricants, acids, batteries, fiberglass, asbestos etc) will be accepted for fee provided that MSDS are provided. Any unidentified chemical/haz waste will be refused and EPA will be notified. The contractor will be liable for all costs associated with proper disposal, including shipping & handling if material needs to be exported.

3.Sand/rock will be accepted however it must be clean. Any indication of oil or chemical contamination will cause us to refuse it and EPA will be notified.

4. Green waste will be accepted provided it is clean and not mixed with other material.

5. MAWC can make 2,4 or 6 yd or 20-30 yd dumpsters available for your project for fee.

Hope this helps.
Please feel free to contact me if you require further info.

Kind regards

Roger Cooper
Majuro Atoll Waste Company

Deeley, Nicholas J.

From: Don Hess [cmihess@gmail.com]

Sent: Tuesday, December 04, 2007 1:46 PM

To: Pat Campanella

Cc: Deeley, Nicholas J.; agoffice@ntamar.net; presoff@ntamar.net; tourism@ntamar.net; eparmi@ntamar.net; mimra@ntamar.net; mipamohe@ntamar.net; rndesec@ntamar.net; planning@ntamar.com; rmihpo@ntamar.net; nitijela@ntamar.net; midaoff@ntamar.net; jusmohe@ntamar.net; commerce@ntamar.net; yumiko.crisostomo@gmail.com; cnemra@ntamar.net; henrycapelle@hotmail.com; gjoseph@mimra.com; albon@mimra.com; jojeba@hotmail.com; atolldino@yahoo.com; Steve Why; Roger Cooper; dolores@visitmarshallislands.com; rimimia@ntamar.net; Andrew Finlay; Jack Chung-Gum; Pskowski, Edward Z.; Terry Kearney

Subject: Re: Airport Road Realignment Project

Nick,

The only comments that I have at this time are that I am in agreement with the EPA comments. Also in regards to MAWC and the suction dredge, I am fairly certain that this will not happen in the near future as neither MAWC or RMI government have the funding to purchase the necessary equipment. If you would like to include it in your project, MAWC would be happy to take it over after the project is complete. Thanks for the opportunity to comment on the scoping document.

Donald Hess
College of the Marshall Islands

On 12/5/07, **Pat Campanella** <Pat@lyonassociates.com> wrote:

Nick,

Part 6 Second paragraph: Suggest changing the word "will" to "may".

Pat

Deeley, Nicholas J.

From: Dolores deBrum Kattil [dolores@visitmarshallislands.com]

Sent: Monday, November 26, 2007 7:01 PM

To: Deeley, Nicholas J.

Cc: John Bungitak (E-mail) (E-mail)

Subject: Re. Airport Road Realignment Project

Mr. Deeley,

Iokwe from MIVA! I concur with the RMIEPA's comments that the RMIPA, even though they claim that they are not obligated to it, should provide an alternative site for recreational activities for the community. If it is public safety that is most considered for this project, then this rec area should be also because it allows the townsfolk to have access to a picnic area that is closer rather than having to go all the way to Laura Beach which poses an increased risk for accidents, based on past experiences.

I had recommended to Mr. Chong Gum and Mr. Bing that the area between the water catchment and the runway would be ideal as it used to be a "rest spot", if you may, for many locals before the trees were cut down and erosion took its toll.

I also agree that the proponent must follow "Best Management Practices" and fully consider our fragile environment as far as dredging, filling and the importation of materials as there obviously is a lot of damage. Replanting/coastal protection measures must be considered also.

Thank you for giving me the opportunity to comment on this project for not only do I represent tourism, but moreso as a concerned resident of Majuro. I may have more later but will await the public forum.

Kommol tata,

Dolores deBrum-Kattil
General Manager

eley, Nicholas J.

From: Andrew Finlay [finlayrao@yahoo.co.uk]
Sent: Sunday, June 17, 2007 6:55 PM
To: Nick Deeley
Subject: road EIA

Hi Nick

We received the Leo Daly letter re the road re-alignment. Good job on sending this out to obtain comments from all interested parties.

Can you send me a list of who you sent the letter to?

Can you also send letters to the Chief Secretary at the Office of the Minister in Assistance to the President - Casten Nemra (P.O.Box 15 MAJURO, MI 96960.

Also will you be asking for comments of the key local contractors? i.e. Pacific International or Anil Developments?

The only EPA comments are:

The EPA would like to see a committment of the pronponent to provide compensatory land area or space for the recreational area lost. This should be landscaped and made suitable for recreation, perhaps with swimming areas, tree planting, pic nic tables and trash bins.

The reclamation should avoid the more abundant and diverse coral areas at the edge of the reef.

[illegible]e EPA expect the fill material to be obtained from a sustainable source, ideally from overseas and not sourced locally from dragline or clam shell near shore dredging.

The EPA would like to see the rock armor sourced from overseas.

The EPA have provided templates to guide the EIA production and provided advice on the EIA process

Thats all for now

Regards

Andrew

R. Andrew O. Finlay MSc. CMarSci, IMarEST

Environmental Advisor
Environmental Protection Authority
Republic of the Marshall Islands
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Deeley, Nicholas J.

From: Deeley, Nicholas J.
Sent: Tuesday, November 27, 2007 9:26 AM
To: 'agoffice@ntamar.net'
Cc: 'Andrew Finlay'
Subject: Airport Road Realignment Project
Attachments: EIA Pre-Consultation Letter.pdf; Road Realignment Project Scoping Report (Final).doc.pdf

To Concerned Parties:

The RMI Port Authority (RMIPA) is preparing a Draft Environmental Impact Assessment (EIA) for the Road Realignment Project at Amata Kabua International Airport. Attached is a letter describing the project that was sent out to previously to some agencies, also attached is the EPA approved scoping report. The Port Authority ask that you review these documents and provide comment and/or questions concerning the proposed project.

Consultation with stakeholders is an important part of the EIA process, it allows for information to be shared to ensure that a complete and thorough report can be created. We ask that you send your comments by December 10th 2007 to NJDeeley@leoadaly.com. If you have no comments at this time an email stating so would be appreciated. For those who do not have any comments at this time, there will be another opportunity to do so when the EPA/RMIPA hold a public meeting concerning the design and environmental issues facing the Airport Road Realignment Project in the upcoming months. You will be notified of the time and the date once the meeting has been set.

Thank you for taking part in this important process.

Nicholas Deeley

Nicholas J. Deeley

LEO A DALY

T [illegible] F [illegible]

www.leoadaly.com NJDeeley@leoadaly.com

Please consider the environment before printing.

ATTACHMENT 1

Purposed Action

The purposed action will realign the existing roadway to the boundary edge of the RSA. The RSA is defined as an area 500 feet wide and 1,000 feet beyond the runway. Currently the segment of roadway that intrudes into the RSA is only 400 feet from the centerline of the runway. The RSA will be filled and graded to conform to FAA AC 150/5300-13 Section 305. This will entail embankment and construction revetment in both the lagoon and ocean. Also, a security fence will be built around the RSA to comply with FAA AC 107-1.

Realignment of Road

The proposed road segment will be designed as a two-lane rural arterial with consideration for traffic volume, speed and operational characteristics conforming to American Association of State Highway and Transportation Officials (AASHTO). The centerline of the proposed road parallels the north RSA boundary and extends 20 feet beyond the west boundary to begin the transition back into the existing roadway. The roadway is approximately 32 feet wide by 2070 feet in length along the centerline. It has two vehicle lanes, two foot paved shoulders, and two foot paved guardrail strips.

The roadway has an approximate area of 66,240 square feet. It will be constructed with materials consisting of a crushed aggregate base course overtopped with bituminous prime coat and a bituminous tack and/or seal coat finished with a plant mix bituminous pavement. The structural sub-base, which includes a 3:1 sloped revetment sub-grade, requires approximately 28,000 cubic yards of fill material.

Revetment

A revetment will be constructed along the lagoon side of the roadway directly on the slope of the newly installed fill material. The armor stone will sit upon a geotextile filter layer and a stone bedding layer composed of much smaller stones. The toe of the structures will be tied into the water bottom to provide stability to the road and structural fill behind it. The revetment will continue across the entire length of the slope to provide full coverage and protection for the new roadway and its structural fill. The approximate length of the proposed revetment is 2000 feet and will cover the entire portion of new road that is constructed over what is currently open water.

Runway Safety Area

The RSA will be filled and grade to conform to FAA Standards. The RSA needs to be 500 feet wide and 1,000 feet long from the end of the runway. To meet this standard, part of the lagoon and the ocean will need to be filled and graded. Approximately 73,400 cubic yard of fill will be required on the lagoon side, and an additional 21,000 cubic yard of fill material will be needed on the ocean side.

Security Fence

To conform to FAA AC 107-1, the proposed security fence will encompass the new RSA. The fence will be constructed of 10 gauge, galvanized steel, chain-link fabric. This will be installed at a height of 8 feet. It will be topped with three strands barbed wire, which will be installed at a forty-five degree angle outward. The fence post will be installed at 10 foot intervals on-center. The length of the proposed security fence will be approximately 2,500 feet.

LEO A DALY

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SAN ANTONIO
WACO
WASHINGTON, DC

1 June 2007

Agency
Address

Subject: Pre-Assessment Consultation
Draft Environmental Impact Assessment for
Airport Road Realignment at the Amata Kabua
International Airport (AKIA)

To Concerned Parties,

On behalf of the Republic of Marshall Islands Port Authority, LEO A DALY is preparing a Draft Environmental Impact Assessment for the proposed road realignment at AKIA.

The only road linking the community of Laura (located west of the airport) to the communities of Delap and Rita (located to the east), traverses through airport property on the west side of the Runway 7. A segment of this road is now located within the runway safety area (RSA). The proposed action will realign the roadway out of the RSA, and bring the RSA into compliance with United States Federal Aviations Administration (FAA) standards.

We are soliciting your comments on the proposed project at AKIA. A project summary sheet is enclosed for your information. Please submit your written comments to:

LEO A DALY
1357 Kapiolani Boulevard, Suite 1230
Honolulu, HI 96814

Attention: Nick Deeley, Planner

You may also submit your comments by fax to 808.521.3757. Please send your comments by 22 June 2007.

Very truly yours,

LEO A DALY

Edward J Pskowski

Edward Pskowski
Vice President

Enclosure: Attachment 1

Majuro – List of Address for Consultation

Office of the President
PO Box 2
Majuro, Marshall Islands 96960
Tel (692) 625-3445/2233
Fax (692) 625-4021
presoff@ntamar.com

Office of the Attorney General
PO Box 2
Majuro, Marshall Islands 96960
Tel (692) 625-3244
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Majuro Atoll Local Government
PO Box 796
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Tel (692) 625-8186/8147
Fax (692) 625-5714

Ministry of Health & Environment
PO Box 16
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Tel (692) 625-3355/3399
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mipamohe@ntamar.com

Ministry of Resource & Development
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rndesec@ntamar.com

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RMI Marine Resource Authority
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College of the Marshall Islands
PO Box 1258
Majuro. Marshall Islands 96960

RMI Office of Planning & Statistic
PO Box 7
Majuro, Marshall Islands 96960
Tel (692) 625-3802/3803
Fax (692) 625-3805
planning@ntamar.com

RMI Historic Preservation Office
PO Box 1454
Majuro, Marshall Islands 96960
Tel (692) 625-4476

RMI Nitijela
PO Box 24
Majuro, Marshall Islands 96960
Tel (692) 625-8678
Fax (692) 625-3687
nitijela@ntamar.com

Appendix B

Correspondence

APPENDIX 3 – Turbidity measurements

Collecting water quality samples was not part of the scope-of-work for the biological surveys. However, so few water quality measurements exist for Majuro Lagoon, that the opportunity was taken to measure water clarity by nephelometer in the project area. All sampling was made close to the shore, and generally in relation to the biological transects, although on both sides of the coastal road. Samples from the south side of the road were therefore taken in the borrow pit or (in the case of Transect A) back reef flat on the ocean side. Units are NTU (nephelometric turbidity units) in every case

Sample Date: 5/20/07 ~ 12:30 PM (tide low and ebbing)	
Transect 2, 2m off shore	1.67
Borrow, opposite Trans. 2	2.78
Transect 3, shore	1.39
Transect A, 2 m off beachrock	1.06
Transect 1, 2 m off beachrock	1.12
West end of borrow	2.91

Sample Date: 5/21/07 ~ 08:30 AM (tide high and flooding)	
Borrow, opposite Transect 3	2.03
Transect 3 at WL	1.16
Transect 2 on beachrock shore	1.15
Borrow, opposite Transect 2	1.14
Transect B off rocks	0.91
Ocean reef flat opposite Transect A	1.46
Transect A at shore	2.04

APPENDIX 2 – Transect Summary Results

Organism	Family	Species	Transect A	1	2	3	B
Algae							
Chlorophyta	Bryopsidales	*Caulerpa racemosa* (Forssk.) J.Agardh				0.47	
	Bryopsidales	*Caulerpa sertularoides* (Gmel.) M.Howe	0.43		0.61	1.50	0.52
	Halimedaceae	*Halimeda* sp.	1.24		0.22		0.05
	Valoniaceae	*Valonia* sp.					
Phaeophyta	Dictyotaceae	*Dictyota* sp.	5.68	1.33	23.40	20.45	4.43
	Dictyotaceae	*Padina* sp.	2.16	0.73		0.82	0.05
Rhodophyta	Rhodomelaceae	*Acanthophora spicifera* (Vahl) Børgesen	6.87	2.53	13.68	2.52	
	Liagoraceae	*Liagora* sp.	0.83		0.72		
		Calcareous red algae	2.29	2.03	2.78	5.00	2.29
Other Macoralgae			4.57	0.87	6.19	2.94	1.14
Turf algae			0.83	2.67	3.66	3.65	0.05
Total Algae			24.90	10.17	51.25	37.33	8.52
Reef Corals							
Scleractinia	Acroporidae	*Acropora digitifera* Dana, 1846	4.63	0.07	3.84	4.30	0.86
		Acropora elseyi (Brook, 1892)	0.13				
		Acropora globiceps (Dana, 1846)			0.22		
		Acropora nasuta (Dana, 1846)	0.75	0.07		0.11	
		Acropora secale (Studer, 1878)				1.24	
		Acropora spp.			0.12		
		Montipora digitata (Dana, 1846)	2.78	0.53	3.15	6.48	0.05
	Pocilloporidae	*Pocillopora damicornis* (Linnaeus, 1758)		0.03	0.34	0.24	0.24
		Pocillopora meandrina Dana, 1846			0.57		0.24
		Pocillopora verrucosa Ellis & Solander, 1786)	0.39		0.84		1.24
	Poritidae	*Porites cylindrica* Dana, 1846				0.34	
		Porites lutea Edwards & Haime, 1860	0.74			0.97	0.33
		Porites rus (Forskal, 1775)		2.57	16.70	3.84	6.48
	Siderastreidae	*Psammocora contigua* (Esper, 1797)	4.11				
	Undentified Coral		7.23		0.11		0.10
Total Coral			20.76	3.27	25.89	17.53	9.52
Other Invertebrates							
Porifera		Unid. Species	0.24				0.05

Transect B (continued).

Mid- tide depth profile (cm) across reef platform:

Meters	Depth	Meters	Depth	Meters	Depth
0		35	-155		
0.8	-100	40			
10	-140	45			
15	-128	50			
20	-120	50			
25	-126	55			
30	-137	60			

Note: Depths are relative to this transect only and have been corrected for tidal changes during period of measurements only.

Figure A5. Starting Transect B (diver) off lagoon revetment wall.

Transect B:

5/19/06 ~ 7° 3.800'N - 171° 15.704' E bearing 340° mag. N for 74 m

Notes: "fixed on boulders of revetment just above water line east of speed bump by tall *Tournefortia*"

Vegetation:

Trees: *Tournefortia argentea*

Shrubs: *Scaevola sericea*

Grasses and sedges: *Fimbristylis cymosa, Lepturus repens*

Herbs: *Ipomoea pes-caprae*

0 to 0.8	Boulder revetment
0.8 to 7	Coarse sand with scattered corals; *Caulerpa racemosa, C. sertularoides,* and *C.* sp., *Padina*, *Holothuria atra.*
4.2 m	*Porites* cf. *lutea*; and *Porites rus* at 4.3 m
5 m	First photoquadrat; *Pocillopora damicornis*
7 to 13	Start lmstn platform, sand in channels;
13 to 35	Much *Padina* and *Dictyota*
24 m	Increase in bottom relief.
35 to 75	Frontal slope of reef
50 m	Start photoquadrats at 2 m intervals (high coral density)
74 m	Last photoquadrat

Transect 3 (continued).

94 to 130	Same, but increasing amounts of *Dictyota*. Also, a compact *Halimeda* and some *Padina*. Note lines turns left ~ 5degrees at 130m.
130 m	Start photoquadrars at 2 m intervals (high coral density)
130 to 149	Coral bottom descending to shelf at depth of 2-3 m.
149 to 165	Shelf, gradual descent to depth of 3+ m
170 m	Last photoquadrat