

1.0 Pre-Screening - Settlement Wide Adaptation Pathways (Short Term)				Home Island - Settlement Inundation - Present Day High to Extreme Vulnerability of Assets Erosion - Present Day High to Extreme Vulnerability of Assets	
Adaptation Type	Description	Diagram	Scenario	Feasibility- Reduce erosion and inundation risks to Settlement?	Advance to specific options assessment
Avoid	Locating assets in areas that will not be vulnerable to coastal hazards.		Short Term	Not feasible at present or into future as existing assets currently at High risk of erosion and inundation.	Rejected
Planned/Managed Retreat	Planned or managed retreat for existing development involves relocating or sacrificing infrastructure, both public assets and private property. This pathway also includes prevention of further development in risk areas		Short Term	Not feasible for whole of Settlement, as insufficient high ground outside Settlement. Potentially feasible for individual assets within Settlement but not whole of Settlement.	Rejected
Accommodate	The accommodate risk treatment option aims to utilise design and management strategies which render the risks as tolerable/acceptable. Design and management strategies may include a mix of structural or non-structural approaches, including modifications to buildings, enhancing the natural environment and policy updates		Short Term	Partially effective Structural options can be used to reduce inundation risk and will be partially effective against erosion.  Non-structural options, such as enhancing the natural environment, can help to reduce erosion risk	Shortlist pathway for specific options assessment
Protect	Protect risk treatment options aim to protect assets from damage resulting from erosion and recession and storm surge inundation. Common hard protection structures include seawalls; groynes; offshore breakwaters and artificial headlands; and soft protection measures such as beach nourishment.		Short Term	Different protect options effective at managing erosion and inundation risk	Shortlist pathway for specific options assessment
No Regrets	The no regrets risk treatment options cover the period while a range of assessments and works are required to determine a preferred risk treatment option, prior to implementing specific asset risk management measures.		Short Term	Partially effective Won't stop erosion and inundation risk to existing assets but can be used while preferred risk treatment options are implemented	Shortlist pathway for specific options assessment
Do Nothing	Assumes all levels of risk are accepted, and assumes that there is no change in existing planning controls, and no actions are implemented (i.e. no controls are implemented to treat known coastal risks).		Short Term	Not feasible for whole of Settlement, including properties and airport	Rejected

2.0 Pre-Screening - Adaptation Options (Inundation)					Home Island - Settlement Inundation - Present Day High to Extreme Vulnerability of Assets				
Adaptation Type	ID	Method	Description	Benefits	Adverse Impacts	Effectiveness - Reduce inundation risks to property and people?	Environmental Fatal Flaw	Social Fatal Flaw	Advance to MCA
Accommodate	AC1	Structural - Design assets to withstand hazards	Where avoiding or relocating an asset is not an option, design of assets to withstand the impact of erosion and inundation.  This would involve constructing properties on stilts to accommodate inundation.			Effective against inundation	Nil	Nil	Proceed to short-term MCA
	AC2	Maintain and enhance beach system	Beach scraping or back passing to move sand from accreting areas to eroding areas. Preserves or enhances the beach's ability to absorb the impacts of storm events and/or assists in post storm recovery. Aims to increase the resilience of the natural beach system			Not effective at countering inundation		-	Rejected
	AC3	Maintain and enhance dune system	Dune management, including management of access tracks, control of dune blowouts, revegetation, sand fencing. Preserves and enhances the dune's ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the natural beach and dune system.			Not effective at countering inundation		-	Rejected
	AC4	Maintain and enhance reef system	Reef management including reef restoration, no-anchorage areas and marine parks  Preserves and enhances the reefs ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the reef system			Not effective at countering inundation		-	Rejected
Protect	P1	Beach Nourishment - Massive Campaign	Placement of large volumes of sand on the beach, dunes or nearshore. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.	Maintains beaches	Smothering of corals Impact at source site	Not effective at countering inundation  High dune systems are not a natural feature of atolls, so a naturally stable dune system could not be formed. Storm surge would overtop nourishment causing inundation.		-	Rejected
	P2	Beach Nourishment - Ongoing campaigns	Placement of smaller volumes of sand on the beach, dunes or nearshore at more frequent intervals. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.			Not effective at countering inundation  High dune systems are not a natural feature of atolls, so a naturally stable dune system could not be formed. Storm surge would overtop nourishment causing inundation.		-	Rejected
	P3	Offshore structures - Artificial reefs/shoals	Larger submerged structures, placed further off-shore, which aim to dampen wave energy similar to natural reefs and reduce the impacts of storm events. Typical construction materials are rock, concrete, or geotextile sand filled tubes. May have a negative impact on the adjoining shoreline.	Improve benthic habitat		Not effective at countering inundation.		-	Rejected
	P4	Offshore structures - Detached breakwaters/headlands	Large structures, visible above the waterline placed some distance off-shore. Typical construction materials are rock or geotextile sand filled tubes. In comparison to option P2, typically require significantly more construction materials. Aims to stop/redirect incoming waves to capture/retain sand at the beach and improve the capacity of the beach system to absorb the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering inundation.		-	Rejected
	P5	Groynes	Shore perpendicular structures which extend into the water. Range of construction materials (incl. rock, concrete, steel sheet pile, timber, geotextile sand filled tubes/bags). Aim to trap sand moving along the coast and retain a natural buffer to assist in absorbing the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering inundation.		-	Rejected
	P6	Geotextile Sand Container (GSC) seawalls	Involves construction of a GSC seawall usually along an entire section of shoreline. Seawalls stop both cross-shore and longshore erosion.		Loss of beach in front of seawall Downdrift / end scour erosion	Not effective at countering inundation. Must be used in conjunction with suitable Protect option		-	Rejected
	P7	SeaBee concrete seawalls	Involves construction of a Seabee concrete unit seawall usually along an entire section of shoreline. Seawalls stop both cross-shore and longshore erosion.		Loss of beach in front of seawall Downdrift / end scour erosion	Not effective at countering inundation. Must be used in conjunction with suitable Protect option		-	Rejected
	P8	Storm surge barrier	Artificial barrier designed to be closed during a storm event to prevent high ocean water levels entering an estuary or inlet. May have a negative visual impact.			Not suitable for this location, as open coastline		-	Rejected
	P9	Levees	Involves construction of a levee usually along an entire section of shoreline. Levees can prevent coastal inundation of low-lying areas			Effective at countering inundation	Nil	Nil	Proceed to short-term MCA
	P10	Land raising and/or reclamation	Involves raising or reclaiming low-lying land to prevent inundation. This option is usually completed in conjunction with levees and/or seawalls.			Effective at countering inundation	Nil	Significant disruption to local communities in short term. Should be considered as a longer term option to manage groundwater shoaling and inundation risk	Rejected
No Regrets	NR1	Monitoring	This option involves long term baseline monitoring and event based monitoring following storm erosion events			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to monitor risk over time	Nil	Nil	Shortlist option for Quick Wins
	NR2	Protection Structure Audit	This option involves undertaking an audit of existing protection structures to determine their current condition, effectiveness and future protection potential			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to help clarify risk	Nil	Nil	Shortlist option for Quick Wins
	NR3	Notification on Title	Indicates to current and future land owners that an asset is likely to be affected by coastal erosion and/or inundation over the planning timeframe. Helps current and future owners make informed decision about level of risk they are/will be willing to accept, and that risk management is likely to be required at some stage within the planning timeframe			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to manage owner understanding of risk	Nil	Nil	Shortlist option for Quick Wins
	NR4	Emergency Evacuation Plans	Where existing assets may be affected by inundation and are not already identified in an existing emergency evacuation management plan. Such plans are important in managing the safety of community and stakeholders.			Partially effective Won't stop erosion and inundation risk to existing assets but can be used to help protect lives	Nil	Nil	Shortlist option for Quick Wins

2.0 Pre-Screening - Adaptation Options (Erosion)					Home Island - Settlement				
					Erosion - Present Day High to Extreme Vulnerability of Assets				
Adaptation Type	ID	Method	Description	Benefits	Adverse Impacts	Effectiveness - Reduce erosion risks to property and people?	Environmental Fatal Flaw	Social Fatal Flaw	Advance to MCA
Accommodate	AC1	Structural - Design assets to withstand hazards	Where avoiding or relocating an asset is not an option, design of assets to withstand the impact of erosion and inundation. This would involve constructing properties on stilts to accommodate minor erosion			Partially effective Constructing houses on stilts can accommodate some minor erosion but piles will be undercut by erosion and access roads will be cut-off	Nil	Nil	Proceed to short-term MCA
	AC2	Maintain and enhance beach system	Beach scraping or back passing to move sand from accreting areas to eroding areas. Preserves or enhances the beach's ability to absorb the impacts of storm events and/or assists in post storm recovery. Aims to increase the resilience of the natural beach system			Partially effective Won't stop erosion risk to existing assets but can be used to maintain beach widths in key locations (such as a public beach area) and reduce erosion risk in conjunction with seawalls.	Nil	Nil	Shortlist option for Quick Wins
	AC3	Maintain and enhance dune system	Dune management, including management of access tracks, control of dune blowouts, revegetation, sand fencing. Preserves and enhances the dune's ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the natural beach and dune system.			Partially effective Won't stop erosion risk to existing assets but can be used to maintain beach widths in key locations (such as a public beach area) and reduce erosion risk in conjunction with seawalls.	Nil	Nil	Shortlist option for Quick Wins
	AC4	Maintain and enhance reef system	Reef management including reef restoration, no-anchorage areas and marine parks. Preserves and enhances the reefs ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the reef system			Partially effective Won't stop erosion risk to existing assets but can be used to maintain beach widths in key locations (such as a public beach area) and reduce erosion risk in conjunction with seawalls.	Nil	Nil	Shortlist option for Quick Wins
Protect	P1	Beach Nourishment - Massive Campaign	Placement of large volumes of sand on the beach, dunes or nearshore. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.	Maintains beaches	Smothering of corals Impact at source site	Effective at countering erosion	Smothering of nearshore coral reef flats of significant concern with large nourishment volumes.	-	Rejected
	P2	Beach Nourishment - On-going campaigns	Placement of smaller volumes of sand on the beach, dunes or nearshore at more frequent intervals. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.			Effective at countering erosion	Nil	Nil	Proceed to short-term MCA Combine with levee (Protect option)
	P3	Offshore structures - Artificial reefs/shoals	Larger submerged structures, placed further off-shore, which aim to dampen wave energy similar to natural reefs and reduce the impacts of storm events. Typical construction materials are rock, concrete, or geotextile sand filled tubes. May have a negative impact on the adjoining shoreline.	Improved benthic habitat		Not effective at countering cross-shore erosion. Will cause erosion downdrift settlement (MU1B)		-	Rejected
	P4	Offshore structures - Detached breakwaters/headlands	Large structures, visible above the waterline placed some distance off-shore. Typical construction materials are rock or geotextile sand filled tubes. In comparison to option P2, typically require significantly more construction materials. Aims to stop/redirect incoming waves to capture/retain sand at the beach and improve the capacity of the beach system to absorb the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering cross-shore erosion. Will cause erosion downdrift settlement (MU1B)		-	Rejected
	P5	Groynes	Shore perpendicular structures which extend into the water. Range of construction materials (incl. rock, concrete, steel sheet pile, timber, geotextile sand filled tubes/bags). Aim to trap sand moving along the coast and retain a natural buffer to assist in absorbing the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering cross-shore erosion. Will cause erosion downdrift settlement (MU1B)		-	Rejected
	P6	Geotextile Sand Container (GSC) seawalls	Involves construction of a seawall usually along an entire section of shoreline. Areas setback from erosion risk can be protected from inundation with a levee		Loss of beach in front of seawall	Effective at countering cross-shore and longshore erosion	Nil	Nil	Proceed to short-term MCA Combine with levee (Protect option)
	P7	SeaBee concrete seawalls	Involves construction of a seawall usually along an entire section of shoreline. Areas setback from erosion risk can be protected from inundation with a levee		Loss of beach in front of seawall	Effective at countering cross-shore and longshore erosion	Nil	Nil	Proceed to short-term MCA Combine with levee (Protect option)
	P8	Storm surge barrier	Artificial barrier designed to be closed during a storm event to prevent high ocean water levels entering an estuary or inlet. May have a negative visual impact.			Not effective at countering erosion		-	Rejected
	P9	Levees	Involves construction of a levee usually along an entire section of shoreline. Levees can prevent coastal inundation of low-lying areas			Not effective at countering erosion		-	Rejected
	P10	Land reclamation	Involves raising or reclaiming low-lying land to prevent inundation. This option is usually completed in conjunction with levees and/or seawalls.			Not effective at countering erosion		-	Rejected
No Regrets	NR1	Monitoring	This option involves long term baseline monitoring and event based monitoring following storm erosion events			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to monitor risk over time	Nil	Nil	Shortlist option for Quick Wins
	NR2	Protection Structure Audit	This option involves undertaking an audit of existing protection structures to determine their current condition, effectiveness and future protection potential			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to help clarify risk	Nil	Nil	Shortlist option for Quick Wins
	NR3	Notification on Title	Indicates to current and future land owners that an asset is likely to be affected by coastal erosion and/or inundation over the planning timeframe. Helps current and future owners make informed decision about level of risk they are/may be willing to accept, and that risk management is likely to be required at some stage within the planning timeframe			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to manage owner understanding of risk	Nil	Nil	Shortlist option for Quick Wins
	NR4	Emergency Evacuation Plans	Where existing assets may be affected by inundation and are not already identified in an existing emergency evacuation management plan. Such plans are important in managing the safety of community and stakeholders.			Partially effective Won't stop erosion and inundation risk to existing assets but can be used to help protect lives	Nil	Nil	Shortlist option for Quick Wins

### 3.0 - Multi Criteria Assessment - Key Criteria & Scoring

Category	Implementation	Environmental Impact	Social Impact - Property	Social Impact - Way of Life	Economic Impact - Businesses	Flexibility	Effectiveness	Financial	
Description	How easy is the option to implement on a small island (i.e. can it be made on the island using readily available, local resources)?	How significant are the environmental impacts?	How significant are the impacts on properties?	How significant are the impacts on daily life?	How significant are the impacts on businesses and the local economy?	Is the option reversible / adaptable in the future?	How effective is the solution at mitigating erosion and inundation risks?	How much does the option cost?	
Goals	<ul style="list-style-type: none"> <li>- Implementation timeframe</li> <li>- Local use of products</li> <li>- Logistics and delays to import material</li> <li>- Maintenance of option into future</li> <li>- Carbon miles</li> <li>- Re-use of existing material</li> </ul>	<ul style="list-style-type: none"> <li>- Amenity and public health (noise, dust, noise, odours) impacts</li> <li>- distance to sensitive receptors</li> <li>- Scale of disturbance to marine habitat, water quality vulnerable/protected species</li> <li>- Scale of disruption to commercial fisheries</li> </ul>	<ul style="list-style-type: none"> <li>- Residential property losses</li> <li>- Property access</li> </ul>	<ul style="list-style-type: none"> <li>- Impact on community values</li> <li>- Impact on access to important social and cultural areas (i.e. beach access, boat launching, views etc)</li> <li>- Scale and duration of disturbance to community areas/ activities</li> </ul>	<ul style="list-style-type: none"> <li>- Impact on existing businesses</li> </ul>	<ul style="list-style-type: none"> <li>- Reversibility of option</li> <li>- Adaptable to unforeseen changes in climate conditions</li> <li>- Alignment with potential long term adaptation pathways, including reclamation with seawalls</li> </ul>	<ul style="list-style-type: none"> <li>- Effectiveness against erosion</li> <li>- Effectiveness against inundation</li> </ul>	<ul style="list-style-type: none"> <li>- Combined capital and maintenance costs</li> <li>- Potential for external funding sources</li> </ul>	
5 Insignificant impacts OR Very low risk	Abundant and sustainable source of material on island	Preserves and repairs	0 houses lost Does not affect property access	Does not affect any community values and/or improves access	No loss of existing businesses	Easily reversible or adaptable	Effective, long term mitigation	<\$5 million	Excellent performance - no impacts on criterion
4 Minor impacts OR Low risk	A significant portion of material available on island	Maintains status quo	1-10 houses lost	Minor impact to community values and/or access		Reversible or adaptable	Effective, mid-term mitigation	\$5 to \$15 million	Good performance - minor short term impacts on criterion
3 Moderate impacts OR Medium Risk	Some material available on island	May result in impact and damage	11-19 houses lost Minor impact to property access	Loss of access to some community assets that doesn't effect overall intrinsic community value	Protects or maintains as long as possible	Reversible or adaptable but with some cost	Effective, short term mitigation	\$15 - \$30 million	Sound performance - manageable short-term adverse impacts on criterion
2 Major impacts OR High risk	Only a small portion of material available on island, majority of material needs to be imported	Likely to result in impact and damage	20-40 houses lost	Loss of access to certain assets		Difficult to reverse or adapt	Limited effectiveness	\$30-\$50 million	Poor performance - short-term adverse impacts on criterion, not easily managed
1 Severe impacts OR Very high risk	No material on island, all materials need to be imported	Will result in impact and damage	>40 houses lost Major impact to property access	Will definitely affect key values of area	Loss of existing businesses	Irreversible or unadaptable	Ineffective and/or suitable only for minor events	>\$50 million	Very Poor Performance - long term adverse major impacts on criterion, not easily managed

3.2 - Multi Criteria Assessment - Short Term

Adaptation Type	ID	Name	Description	Implementation	Environmental Impact	Social Impact - Property	Social Impact - Way of Life	Economic Impact - Businesses	Flexibility	Effectiveness	Implementation	Environmental Impact	Social Impact - Property	Social Impact - Way of Life	Economic Impact - Businesses	Flexibility	Effectiveness	Financial	Unweighted Score
Accommodate	PMR2	Structural - Design assets to withstand hazards	This option would involve constructing properties on stilts to accommodate inundation.	Difficult implementation, as each house and structure has to be replaced. Significant import of material to the island.	Maintains status quo. Impact is restricted to property footprint. Allows shoreline to continue to erode.	High impact - potential loss of multiple properties (approximately 30) due to erosion. Daily impact to residents accessing properties, as stairs are required for stilted housing.		High impact - potential loss of Cocos Island Beach Resort with on-going erosion.	Difficult to reverse or adapt, as houses built on stilts can't be easily raised.	Partially effective in medium term. Raising houses on stilts is effective at countering inundation in medium term but not effective at countering erosion. Option would have to be combined with a protect pathway (nourishment or seawall option) to increase erosion effectiveness.	1	4	4	5	1	2	4	1	22
Protect	P9 + P2	Levees with on-going nourishment	This option would involve construction of a levee to protect against inundation and on-going nourishment to counter erosion.	Moderate implementation difficulty, with on-going resources required to implement. Nourishment uses locally available sand. Levee requires import of clay core material or Geotextile Clay Layer.	Will impact on environment at nourishment source site and placement site. Maintains some beach width.	Insignificant impacts	Loss of access to some community values, as levee separates community from Settlement beaches and views. Nourishment maintains beach widths.	Low impact - no businesses lost.	Nourishment is reversible or flexible, allowing different pathways to be implemented as required.	Effective short term adaptation option. Requires on-going nourishment and sand sources are finite. Not effective in long term given potential groundwater shoaling behind levees.	2	2	5	3	5	5	3	2	27
	P9 + P6	Levees with GSC Seawalls	This option would involve construction of a combined levee and GSC seawall structure to counter inundation and erosion.	Relatively straightforward implementation, using previously implemented GSC seawalls. Containers need to be imported but uses locally available sand. Levee requires import of clay core material or Geotextile Clay Layer.	Likely to impact beaches in front and adjacent to seawall.	Insignificant impacts	Will definitely affect key values of area, as levee separates community from Settlement beaches and views. Seawalls cause erosion of Settlement beaches.	Low impact - no businesses lost.	Seawalls are reversible or adaptable but with some cost. This could include raised crests or additional bag layers.	Effective short term adaptation option. GSC seawalls are considered less robust than concrete Seabee seawalls. Not effective in long term given potential groundwater shoaling behind levees.	5	3	5	1	5	3	3	5	30
	P9 + P7	Levees with Concrete Seabee Seawalls	This option would involve construction of a combined levee and concrete Seabee seawall structure to counter inundation and erosion.	Moderate implementation difficulty, using Seabee seawall units that need to be imported. Levee requires import of clay core material or Geotextile Clay Layer.	Likely to impact beaches in front and adjacent to seawall.	Insignificant impacts	Will definitely affect key values of area, as levee separates community from Settlement beaches and views. Seawalls cause erosion of Settlement beaches.	Low impact - no businesses lost.	Seabee seawalls are difficult to reverse or adapt. The crest could be raised but additional concrete layers could not be added.	Effective medium term adaptation option. Not effective in long term given potential groundwater shoaling behind levees.	4	3	5	1	5	2	4	4	28



1.0 Pre-Screening - Settlement Wide Adaptation Pathways				West Island - Settlement Inundation - Present Day High Vulnerability of Assets Erosion - Present Day High Vulnerability of Assets	
Adaptation Type	Description	Diagram	Scenario	Feasibility- Reduce erosion and inundation risks to Settlement?	Advance to specific options assessment
Avoid	Locating assets in areas that will not be vulnerable to coastal hazards.		Short Term	Not feasible at present or into future as existing assets currently at High risk of erosion and inundation.	Rejected
Planned/Managed Retreat	Planned or managed retreat for existing development involves relocating or sacrificing infrastructure, both public assets and private property. This pathway also includes prevention of further development in risk areas		Short Term	Not feasible for whole of Settlement, including airport, as insufficient high ground outside Settlement. Potentially feasible for individual assets within Settlement but not whole of Settlement.	Rejected
Accommodate	The accommodate risk treatment option aims to utilise design and management strategies which render the risks as tolerable/acceptable. Design and management strategies may include a mix of structural or non-structural approaches, including modifications to buildings, enhancing the natural environment and policy updates		Short Term	Partially effective Structural options can be used to reduce inundation risk and will be partially effective against erosion. Non-structural options, such as enhancing the natural environment, can help to reduce erosion risk	Shortlist pathway for specific options assessment
Protect	Protect risk treatment options aim to protect assets from damage resulting from erosion and recession and storm surge inundation. Common hard protection structures include seawalls; groynes; offshore breakwaters and artificial headlands; and soft protection measures such as beach nourishment.		Short Term	Different protect options effective at managing erosion and inundation risk	Shortlist pathway for specific options assessment
No Regrets	The no regrets risk treatment options cover the period while a range of assessments and works are required to determine a preferred risk treatment option, prior to implementing specific asset risk management measures.		Short Term	Partially effective Won't stop erosion and inundation risk to existing assets but can be used while preferred risk treatment options are implemented	Shortlist pathway for specific options assessment
Do Nothing	Assumes all levels of risk are accepted, and assumes that there is no change in existing planning controls, and no actions are implemented (i.e. no controls are implemented to treat known coastal risks).		Short Term	Not feasible for whole of Settlement, including properties and airport	Rejected

2.0 Pre-Screening - Adaptation Options (Inundation)					West Island - Settlement				
					Inundation - Present Day High Vulnerability of Assets				
Adaptation Type	ID	Method	Description	Benefits	Adverse Impacts	Effectiveness - Reduce inundation risks to property and people?	Environmental Fatal Flaw	Social Fatal Flaw	Advance to MCA
Accommodate	AC1	Structural - Design assets to withstand hazards	Where avoiding or relocating an asset is not an option, design of assets to withstand the impact of erosion and inundation. This would involve constructing properties on stilts to accommodate inundation.			Effective against inundation	Nil	Nil	Proceed to short-term MCA
	AC2	Maintain and enhance beach system	Beach scraping or back passing to move sand from accreting areas to eroding areas. Preserves or enhances the beach's ability to absorb the impacts of storm events and/or assists in post storm recovery. Aims to increase the resilience of the natural beach system.			Not effective at countering inundation		-	Rejected
	AC3	Maintain and enhance dune system	Dune management, including management of access tracks, control of dune blowouts, revegetation, sand fencing. Preserves and enhances the dune's ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the natural beach and dune system.			Not effective at countering inundation		-	Rejected
	AC4	Maintain and enhance reef system	Reef management including reef restoration, no-anchorage areas and marine parks. Preserves and enhances the reefs ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the reef system.			Not effective at countering inundation		-	Rejected
Protect	P1	Beach Nourishment - Massive Campaign	Placement of large volumes of sand on the beach, dunes or nearshore. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.	Maintains beaches	Smothering of corals Impact at source site	Not effective at countering inundation  High dune systems are not a natural feature of atolls, so a naturally stable dune system could not be formed. Storm surge would overtop nourishment causing inundation.		-	Rejected
	P2	Beach Nourishment - On-going campaigns	Placement of smaller volumes of sand on the beach, dunes or nearshore at more frequent intervals. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.			Not effective at countering inundation  High dune systems are not a natural feature of atolls, so a naturally stable dune system could not be formed. Storm surge would overtop nourishment causing inundation.		-	Rejected
	P3	Offshore structures - Artificial reefs/shoals	Larger submerged structures, placed further off-shore, which aim to dampen wave energy similar to natural reefs and reduce the impacts of storm events. Typical construction materials are rock, concrete, or geotextile sand filled tubes. May have a negative impact on the adjoining shoreline.	Improve benthic habitat		Not effective at countering inundation.		-	Rejected
	P4	Offshore structures - Detached breakwaters/headlands	Large structures, visible above the waterline placed some distance off-shore. Typical construction materials are rock or geotextile sand filled tubes. In comparison to option P2, typically require significantly more construction materials. Aims to stop/redirect incoming waves to capture/retain sand at the beach and improve the capacity of the beach system to absorb the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering inundation.		-	Rejected
	P5	Groynes	Shore perpendicular structures which extend into the water. Range of construction materials (incl. rock, concrete, steel sheet pile, timber, geotextile sand filled tubes/bags). Aim to trap sand moving along the coast and retain a natural buffer to assist in absorbing the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering inundation.		-	Rejected
	P6	Geotextile Sand Container (GSC) seawalls	Involves construction of a GSC seawall usually along an entire section of shoreline. Seawalls stop both cross-shore and longshore erosion.		Loss of beach in front of seawall Downdrift / end scour erosion	Not effective at countering inundation. Must be used in conjunction with suitable Protect option		-	Rejected
	P7	SeaBee concrete seawalls	Involves construction of a Seabee concrete unit seawall usually along an entire section of shoreline. Seawalls stop both cross-shore and longshore erosion.		Loss of beach in front of seawall Downdrift / end scour erosion	Not effective at countering inundation. Must be used in conjunction with suitable Protect option		-	Rejected
	P8	Storm surge barrier	Artificial barrier designed to be closed during a storm event to prevent high ocean water levels entering an estuary or inlet. May have a negative visual impact.			Not suitable for this location, as open coastline		-	Rejected
	P9	Levees	Involves construction of a levee usually along an entire section of shoreline. Levees can prevent coastal inundation of low-lying areas			Effective at countering inundation	Nil	Nil	Proceed to short-term MCA
	P10	Land raising and/or reclamation	Involves raising or reclaiming low-lying land to prevent inundation. This option is usually completed in conjunction with levees and/or seawalls.			Effective at countering inundation	Nil	Significant disruption to local communities in short term. Should be considered as a longer term option to manage groundwater shoaling and inundation risk	Rejected
No Regrets	NR1	Monitoring	This option involves long term baseline monitoring and event based monitoring following storm erosion events			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to monitor risk over time			Shortlist option for Quick Wins
	NR2	Protection Structure Audit	This option involves undertaking an audit of existing protection structures to determine their current condition, effectiveness and future protection potential			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to help clarify risk			Shortlist option for Quick Wins
	NR3	Notification on Title	Indicates to current and future land owners that an asset is likely to be affected by coastal erosion and/or inundation over the planning timeframe. Helps current and future owners make informed decision about level of risk they are/will be willing to accept, and that risk management is likely to be required at some stage within the planning timeframe			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to manage owner understanding of risk			Shortlist option for Quick Wins
	NR4	Emergency Evacuation Plans	Where existing assets may be affected by inundation and are not already identified in an existing emergency evacuation management plan. Such plans are important in managing the safety of community and stakeholders.			Partially effective Won't stop erosion and inundation risk to existing assets but can be used to help protect lives			Shortlist option for Quick Wins

2.0 Pre-Screening - Adaptation Options (Erosion)					West Island - Settlement				
					Erosion - Present Day High Vulnerability of Assets				
Adaptation Type	ID	Method	Description	Benefits	Adverse Impacts	Effectiveness - Reduce erosion risks to property and people?	Environmental Fatal Flaw	Social Fatal Flaw	Advance to MCA
Accommodate	AC1	Structural - Design assets to withstand hazards	Where avoiding or relocating an asset is not an option, design of assets to withstand the impact of erosion and inundation.  This would involve constructing properties on stilts to accommodate minor erosion			Partially effective Constructing houses on stilts can accommodate some minor erosion but piles will be undercut by erosion and access roads will be cut-off	Nil	Nil	Proceed to short-term MCA
	AC2	Maintain and enhance beach system	Beach scraping or back passing to move sand from accreting areas to eroding areas. Preserves or enhances the beach's ability to absorb the impacts of storm events and/or assists in post storm recovery. Aims to increase the resilience of the natural beach system			Partially effective Won't stop erosion risk to existing assets but can be used to maintain beach widths in key locations (such as a public beach area) and reduce erosion risk in conjunction with seawalls.	Nil	Nil	Shortlist option for Quick Wins
	AC3	Maintain and enhance dune system	Dune management, including management of access tracks, control of dune blowouts, revegetation, sand fencing. Preserves and enhances the dune's ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the natural beach and dune system.			Partially effective Won't stop erosion risk to existing assets but can be used to maintain beach widths in key locations (such as a public beach area) and reduce erosion risk in conjunction with seawalls.	Nil	Nil	Shortlist option for Quick Wins
	AC4	Maintain and enhance reef system	Reef management including reef restoration, no-anchorage areas and marine parks  Preserves and enhances the reefs ability to absorb the impacts of storm events and provide a source of sand for beach recovery. Aims to increase the resilience of the reef system			Partially effective Won't stop erosion risk to existing assets but can be used to maintain beach widths in key locations (such as a public beach area) and reduce erosion risk in conjunction with seawalls.	Nil	Nil	Shortlist option for Quick Wins
Protect	P1	Beach Nourishment - Massive Campaign	Placement of large volumes of sand on the beach, dunes or nearshore. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.	Maintains beaches	Smothering of corals Impact at source site	Effective at countering erosion	Smothering of nearshore coral reef flats of significant concern with large nourishment volumes.	-	Rejected
	P2	Beach Nourishment - On-going campaigns	Placement of smaller volumes of sand on the beach, dunes or nearshore at more frequent intervals. May be undertaken pre/post storm event. Requires available sources of compatible sand. Aims to restore or enhance the beach profile to provide a natural buffer to absorb the impacts of storm events.			Effective at countering erosion	Nil	Nil	Proceed to short-term MCA Combine with levee (Protect option)
	P3	Offshore structures - Artificial reefs/shoals	Larger submerged structures, placed further off-shore, which aim to dampen wave energy similar to natural reefs and reduce the impacts of storm events. Typical construction materials are rock, concrete, or geotextile sand filled tubes. May have a negative impact on the adjoining shoreline.	Improved benthic habitat		Not effective at countering cross-shore erosion. Will cause erosion downdrift settlement (MU1B)		-	Rejected
	P4	Offshore structures - Detached breakwaters/headlands	Large structures, visible above the waterline placed some distance off-shore. Typical construction materials are rock or geotextile sand filled tubes. In comparison to option P2, typically require significantly more construction materials. Aims to stop/redirect incoming waves to capture/retain sand at the beach and improve the capacity of the beach system to absorb the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering cross-shore erosion. Will cause erosion downdrift settlement (MU1B)		-	Rejected
	P5	Groynes	Shore perpendicular structures which extend into the water. Range of construction materials (incl. rock, concrete, steel sheet pile, timber, geotextile sand filled tubes/bags). Aim to trap sand moving along the coast and retain a natural buffer to assist in absorbing the impacts of storm events. May have a negative impact on the adjoining shoreline.			Not effective at countering cross-shore erosion. Will cause erosion downdrift settlement (MU1B)		-	Rejected
	P6	Geotextile Sand Container (GSC) seawalls	Involves construction of a seawall usually along an entire section of shoreline. Areas setback from erosion risk can be protected from inundation with a levee		Loss of beach in front of seawall	Effective at countering cross-shore and longshore erosion			Proceed to short-term MCA Combine with levee (Protect option)
	P7	SeaBee concrete seawalls	Involves construction of a seawall usually along an entire section of shoreline. Areas setback from erosion risk can be protected from inundation with a levee		Loss of beach in front of seawall	Effective at countering cross-shore and longshore erosion			Proceed to short-term MCA Combine with levee (Protect option)
	P8	Storm surge barrier	Artificial barrier designed to be closed during a storm event to prevent high ocean water levels entering an estuary or inlet. May have a negative visual impact.			Not effective at countering erosion			Rejected
	P9	Levees	Involves construction of a levee usually along an entire section of shoreline. Levees can prevent coastal inundation of low-lying areas			Not effective at countering erosion		-	Rejected
	P10	Land reclamation	Involves raising or reclaiming low-lying land to prevent inundation. This option is usually completed in conjunction with levees and/or seawalls.			Not effective at countering erosion		-	Rejected
No Regrets	NR1	Monitoring	This option involves long term baseline monitoring and event based monitoring following storm erosion events			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to monitor risk over time			Shortlist option for Quick Wins
	NR2	Protection Structure Audit	This option involves undertaking an audit of existing protection structures to determine their current condition, effectiveness and future protection potential			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to help clarify risk			Shortlist option for Quick Wins
	NR3	Notification on Title	Indicates to current and future land owners that an asset is likely to be affected by coastal erosion and/or inundation over the planning timeframe. Helps current and future owners make informed decision about level of risk they are/will be willing to accept, and that risk management is likely to be required at some stage within the planning timeframe			Partially effective Won't stop erosion and inundation risk to existing assets but can be used as a policy measure to manage owner understanding of risk			Shortlist option for Quick Wins
	NR4	Emergency Evacuation Plans	Where existing assets may be affected by inundation and are not already identified in an existing emergency evacuation management plan. Such plans are important in managing the safety of community and stakeholders.			Partially effective Won't stop erosion and inundation risk to existing assets but can be used to help protect lives			Shortlist option for Quick Wins

### 3.0 - Multi Criteria Assessment - Key Criteria & Scoring

Category	Implementation	Environmental Impact	Social Impact - Property	Social Impact - Way of Life	Economic Impact - Businesses	Flexibility	Effectiveness	Financial	
Description	How easy is the option to implement on a small island (i.e. can it be made on the island using readily available, local resources)?	How significant are the environmental impacts?	How significant are the impacts on properties?	How significant are the impacts on daily life?	How significant are the impacts on businesses and the local economy?	Is the option reversible / adaptable in the future?	How effective is the solution at mitigating erosion and inundation risks?	How much does the option cost?	
<b>Goals</b>	<ul style="list-style-type: none"> <li>- Implementation timeframe</li> <li>- Local use of products</li> <li>- Logistics and delays to import material</li> <li>- Maintenance of option into future</li> <li>- Carbon miles</li> <li>- Re-use of existing material</li> </ul>	<ul style="list-style-type: none"> <li>- Amenity and public health (noise, dust, noise, odours) impacts - distance to sensitive receptors</li> <li>- Scale of disturbance to marine habitat, water quality vulnerable/ protected species</li> <li>- Scale of disruption to commercial fisheries</li> </ul>	<ul style="list-style-type: none"> <li>- Residential property losses</li> <li>- Property access</li> </ul>	<ul style="list-style-type: none"> <li>- Impact on community values</li> <li>- Impact on access to important social and cultural areas (i.e. beach access, boat launching, views etc)</li> <li>- Scale and duration of disturbance to community areas/ activities</li> </ul>	<ul style="list-style-type: none"> <li>- Impact on existing businesses</li> </ul>	<ul style="list-style-type: none"> <li>- Reversibility of option</li> <li>- Adaptable to unforeseen changes in climate conditions</li> <li>- Alignment with potential long term adaptation pathways, including reclamation with seawalls</li> </ul>	<ul style="list-style-type: none"> <li>- Effectiveness against erosion</li> <li>- Effectiveness against inundation</li> </ul>	<ul style="list-style-type: none"> <li>- Combined capital and maintenance costs</li> <li>- Potential for external funding sources</li> </ul>	
<b>5</b> Insignificant impacts OR Very low risk	Abundant and sustainable source of material on island	Preserves and repairs	0 houses lost Does not affect property access	Does not affect any community values and/or improves access	No loss of existing businesses	Easily reversible or adaptable	Effective, long term mitigation	<\$5 million	Excellent performance - no impacts on criterion
<b>4</b> Minor impacts OR Low risk	A significant portion of material available on island	Maintains status quo	1-10 houses lost	Minor impact to community values and/or access		Reversible or adaptable	Effective, mid-term mitigation	\$5 to \$15 million	Good performance - minor short term impacts on criterion
<b>3</b> Moderate impacts OR Medium Risk	Some material available on island	May result in impact and damage	11-19 houses lost Minor impact to property access	Loss of access to some community assets that doesn't effect overall intrinsic community value	Protects or maintains as long as possible	Reversible or adaptable but with some cost	Effective, short term mitigation	\$15 - \$30 million	Sound performance - manageable short-term adverse impacts on criterion
<b>2</b> Major impacts OR High risk	Only a small portion of material available on island, majority of material needs to be imported	Likely to result in impact and damage	20-40 houses lost	Loss of access to certain assets		Difficult to reverse or adapt	Limited effectiveness	\$30-\$50 million	Poor performance - short-term adverse impacts on criterion, not easily managed
<b>1</b> Severe impacts OR Very high risk	No material on island, all materials need to be imported	Will result in impact and damage	>40 houses lost Major impact to property access	Will definitely affect key values of area	Loss of existing businesses	Irreversible or unadaptable	Ineffective and/or suitable only for minor events	>\$50 million	Very Poor Performance - long term adverse major impacts on criterion, not easily managed

3.2 - Multi Criteria Assessment - Short Term

Adaptation Type	ID	Name	Description	Implementation	Environmental Impact	Social Impact - Property	Social Impact - Way of Life	Economic Impact - Businesses	Flexibility	Effectiveness	Implementation	Environmental Impact	Social Impact - Property	Social Impact - Way of Life	Economic Impact - Businesses	Flexibility	Effectiveness	Financial	Unweighted Score
Accommodate	AC1	Structural - Design assets to withstand hazards	This option would involve constructing properties on stilts to accommodate inundation.	Difficult implementation, as each house and structure has to be replaced. Significant import of material to the island.	Maintains status quo. Impact is restricted to property footprint. Allows shoreline to continue to erode.	High impact - potential loss of multiple properties (approximately 30) due to erosion. Daily impact to residents accessing properties, as stairs are required for stilted housing.		High impact - potential loss of Cocos Island Beach Resort with on-going erosion.	Houses built on stilts can be raised in future if built as kit houses that can be dismantled and lifted with cranes.	Partially effective in medium term. Raising houses on stilts is effective at countering inundation in medium term but not effective at countering erosion. Option would have to be combined with a protect pathway (nourishment or seawall option) to increase erosion effectiveness.	1	4	2	5	1	4	2	1	20
Protect	P9 + P2	Levees with on-going nourishment	This option would involve construction of a levee to protect against inundation and on-going nourishment to counter erosion.	Moderate implementation difficulty, with on-going resources required to implement. Nourishment uses locally available sand. Levee requires import of clay core material or Geotextile Clay Layer.	Will impact on environment at nourishment source site and placement site. Maintains some beach width.	Insignificant impacts	Loss of access to some community values, as levee separates community from Settlement beaches and views. Nourishment maintains beach widths.	Low impact - no businesses lost.	Nourishment is reversible or flexible, allowing different pathways to be implemented as required.	Effective short term adaptation option. Requires on-going nourishment and sand sources are finite. Not effective in long term given potential groundwater shoaling behind levees.	2	2	5	3	5	5	3	1	26
	P9 + P6	Levees with GSC Seawalls	This option would involve construction of a combined levee and GSC seawall structure to counter inundation and erosion.	Relatively straightforward implementation, using previously implemented GSC seawalls. Containers need to be imported but uses locally available sand. Levee requires import of clay core material or Geotextile Clay Layer.	Likely to impact beaches in front and adjacent to seawall.	Insignificant impacts	Loss of access to certain assets, as levee separates community from Settlement beaches and views. Seawalls cause erosion of Settlement beaches.	Low impact - no businesses lost.	Seawalls are reversible or adaptable but with some cost. This could include raised crests or additional bag layers.	Effective short term adaptation option. GSC seawalls are considered less robust than concrete Seabee seawalls. Not effective in long term given potential groundwater shoaling behind levees.	5	3	5	2	5	3	3	2	28
	P9 + P7	Levees with Concrete Seabee Seawalls	This option would involve construction of a combined levee and concrete Seabee seawall structure to counter inundation and erosion.	Moderate implementation difficulty, using Seabee seawall units that need to be imported. Levee requires import of clay core material or Geotextile Clay Layer.	Likely to impact beaches in front and adjacent to seawall.	Insignificant impacts	Loss of access to certain assets, as levee separates community from Settlement beaches and views. Seawalls cause erosion of Settlement beaches.	Low impact - no businesses lost.	Seabee seawalls are difficult to reverse or adapt. The crest could be raised but additional concrete layers could not be added.	Effective medium term adaptation option. Not effective in long term given potential groundwater shoaling behind levees.	4	3	5	2	5	2	4	2	27

Adaptation Option Costings - West Island Short to Medium Term

Timeframe	Option Name	AC1 Accommodate				P9 + P2 Levees with nourishment				P9 + P6 Levees with GSC Seawalls				P9 + P7 Levees with Concrete Seabee Seawalls								
		Capital Costs		Seawall Repair Costs		Sand Volumes		Capital Costs		Seawall Repair Costs		Sand Volumes		Capital Costs		Seawall Repair Costs		Sand Volumes				
		\$	Unit	Qty	Subtotal	Seawall Length (m)	Subtotal	Qty	Subtotal	Seawall Length (m)	Subtotal	Qty	Subtotal	Seawall Length (m)	Subtotal	Qty	Subtotal	Seawall Length (m)	Subtotal			
Present Day	Mobilisation Civil/Structural	\$ 100,000	/unit	2	\$ 200,000			5	\$ 500,000			1	\$ 100,000			1	\$ 100,000					
	Mobilisation TSHD	\$ 4,500,000	/unit		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade GSC Seawall - 1 additional crest layer	\$ 2,100	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade Seabee Seawall - raise crest height 1m	\$ 3,400	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New GSC Seawall	\$ 14,000	/m		\$ -				\$ -		1130	\$ 15,820,000			17,196	\$ -						
	Protect - New Seabee Seawall	\$ 17,000	/m		\$ -				\$ -			\$ -				1130	\$ 19,210,000					
	Protect - New 1m high levee	\$ 3,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - New 1.5m high levee	\$ 5,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - Nourishment	\$ 1,404	/m per year		\$ -			900	\$ 4,500,000			6,300	\$ 4,500,000			6,300	\$ 4,500,000		6,300			
	Accommodate - Raise road 1m and asphalt	\$ 2,600	/m		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Asphalt new road	\$ 2,200	/m	470	\$ 1,034,000				\$ -			\$ -					\$ -					
	Accommodate - New stilted house	\$ 900,000	/unit	56	\$ 50,400,000				\$ -			\$ -					\$ -					
	Accommodate - Large Building (commercial or public)	\$ 2,700,000	/unit	11	\$ 29,700,000				\$ -			\$ -					\$ -					
	Accommodate - Raise stilted house 0.5m	\$ 100,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Project Management	5%	Item		\$ 4,066,700				\$ 325,093				\$ 1,021,000				\$ 1,190,500					
	Approvals and monitoring - general	5%	Item		\$ 4,066,700				\$ 325,093				\$ 1,021,000				\$ 1,190,500					
	PM and approvals - nourishment	10%	Item		\$ -				\$ 150,185				\$ -				\$ -					
	Contingency	20%	Item		\$ 16,266,800				\$ 1,300,370				\$ 4,084,000				\$ 4,742,000					
	Repairs	specific to option	Item		\$ -				\$ -				\$ -				\$ -					
		<b>Total</b>				\$ 105,794,200				\$ 8,602,593				\$ 26,546,000			1240	\$ 848,000	23,496	\$ 30,953,000	1240	\$ 421,600
2030	Mobilisation Civil/Structural	\$ 100,000	/unit		\$ -			5	\$ 500,000			1	\$ 100,000				\$ -					
	Mobilisation TSHD	\$ 4,500,000	/unit		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade GSC Seawall - 1 additional crest layer	\$ 2,100	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade Seabee Seawall - raise crest height 1m	\$ 3,400	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New GSC Seawall	\$ 14,000	/m		\$ -				\$ -		640	\$ 9,240,000			10,043	\$ -						
	Protect - New Seabee Seawall	\$ 17,000	/m		\$ -				\$ -			\$ -				640	\$ 11,220,000					
	Protect - New 1m high levee	\$ 3,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - New 1.5m high levee	\$ 5,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - Nourishment	\$ 1,597	/m per year		\$ -			1730	\$ 2,763,156			22,075	\$ -				\$ -					
	Accommodate - Raise road 1m and asphalt	\$ 2,600	/m		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Asphalt new road	\$ 2,200	/m		\$ -				\$ -			\$ -					\$ -					
	Accommodate - New stilted house	\$ 900,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Large Building (commercial or public)	\$ 2,700,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Raise stilted house 0.5m	\$ 100,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Project Management	5%	Item		\$ -				\$ 138,158				\$ 462,000				\$ 561,000					
	Approvals and monitoring - general	5%	Item		\$ -				\$ 138,158				\$ 462,000				\$ 561,000					
	PM and approvals - nourishment	10%	Item		\$ -				\$ 276,316				\$ -				\$ -					
	Contingency	20%	Item		\$ -				\$ 652,631				\$ 1,868,000				\$ 2,264,000					
	Repairs	specific to option	Item		\$ -				\$ -				\$ -				\$ -					
		<b>Total</b>				\$ -				\$ 4,468,418				\$ 12,132,000			1240	\$ 848,000	10,043	\$ 14,706,000	1240	\$ 421,600
2040	Mobilisation Civil/Structural	\$ 100,000	/unit		\$ -			5	\$ 500,000			1	\$ 100,000				\$ -					
	Mobilisation TSHD	\$ 4,500,000	/unit		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade GSC Seawall - 1 additional crest layer	\$ 2,100	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade Seabee Seawall - raise crest height 1m	\$ 3,400	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New GSC Seawall	\$ 14,000	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New Seabee Seawall	\$ 17,000	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New 1m high levee	\$ 3,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - New 1.5m high levee	\$ 5,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - Nourishment	\$ 1,597	/m per year		\$ -			1730	\$ 2,763,156			22,075	\$ -				\$ -					
	Accommodate - Raise road 1m and asphalt	\$ 2,600	/m		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Asphalt new road	\$ 2,200	/m		\$ -				\$ -			\$ -					\$ -					
	Accommodate - New stilted house	\$ 900,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Large Building (commercial or public)	\$ 2,700,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Raise stilted house 0.5m	\$ 100,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Project Management	5%	Item		\$ -				\$ 138,158				\$ 901,600				\$ -					
	Approvals and monitoring - general	5%	Item		\$ -				\$ 138,158				\$ 901,600				\$ -					
	PM and approvals - nourishment	10%	Item		\$ -				\$ 276,316				\$ -				\$ -					
	Contingency	20%	Item		\$ -				\$ 652,631				\$ 3,626,400				\$ -					
	Repairs	specific to option	Item		\$ -				\$ -				\$ -				\$ -					
		<b>Total</b>				\$ -				\$ 4,468,418				\$ 23,561,600			1240	\$ 848,000	19,522	\$ 29,999,200	1240	\$ 421,600
2050	Mobilisation Civil/Structural	\$ 100,000	/unit		\$ -			5	\$ 500,000			1	\$ 100,000				\$ -					
	Mobilisation TSHD	\$ 4,500,000	/unit		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade GSC Seawall - 1 additional crest layer	\$ 2,100	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade Seabee Seawall - raise crest height 1m	\$ 3,400	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New GSC Seawall	\$ 14,000	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New Seabee Seawall	\$ 17,000	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - New 1m high levee	\$ 3,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - New 1.5m high levee	\$ 5,000	/m		\$ -				\$ -			\$ -					\$ -					
	Protect - Nourishment	\$ 1,597	/m per year		\$ -			1730	\$ 2,763,156			22,075	\$ -				\$ -					
	Accommodate - Raise road 1m and asphalt	\$ 2,600	/m		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Asphalt new road	\$ 2,200	/m		\$ -				\$ -			\$ -					\$ -					
	Accommodate - New stilted house	\$ 900,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Large Building (commercial or public)	\$ 2,700,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Accommodate - Raise stilted house 0.5m	\$ 100,000	/unit		\$ -				\$ -			\$ -					\$ -					
	Project Management	5%	Item		\$ -				\$ 138,158				\$ 531,300				\$ 1,149,200					
	Approvals and monitoring - general	5%	Item		\$ -				\$ 138,158				\$ 531,300				\$ 1,149,200					
	PM and approvals - nourishment	10%	Item		\$ -				\$ 276,316				\$ -				\$ -					
	Contingency	20%	Item		\$ -				\$ 652,631				\$ 2,145,200				\$ 4,616,800					
	Repairs	specific to option	Item		\$ -				\$ -				\$ -				\$ -					
		<b>Total</b>				\$ -				\$ 4,468,418				\$ 13,933,800			1240	\$ 848,000	11,478	\$ 29,999,200	1240	\$ 421,600
2060	Mobilisation Civil/Structural	\$ 100,000	/unit	2	\$ 200,000			5	\$ 500,000			1	\$ 100,000				\$ -					
	Mobilisation TSHD	\$ 4,500,000	/unit		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade GSC Seawall - 1 additional crest layer	\$ 2,100	/m		\$ -				\$ -				\$ -				\$ -					
	Protect - Upgrade Seabee Seawall - raise crest height 1m	\$ 3,400	/m		\$ -				\$ -</													