SAJ-2004-12518 (SP-JCM)
St. John Marina

Exhibit 5, Attachment A

Alternative Analysis

With the removal of the two parcels and their related structures there was an overall reduction in parking requirements and overall 6 parking spaces and 2 loading zones are no longer required. In order to meet the required parking for the project 10 spaces were added to Parcel 13 Remainder, 7 spaces and an ADA space were added to Parcel 10-41 Remainder and 3 loading spaces were removed, and 2 parking spaces were added to Parcel 10-19.

The new upland plans are found in Appendix A.

Additional information regarding ESA listed species and the Magnuson-Stevens Act (MSA) has been provided in Appendix C in the responses to National Marine Fisheries, Protected Resources and Habitat Conservation.

The revised plans including details on the number and mix of vessels expected and information regarding the grated decking is provided in Appendix B.

Project Location - Alternatives analysis

Below we have provided a more detailed alternative analysis of locations on St. John, where a marina could physically be located. On the island of St. John we identified 10 potential sites where marina could be developed. We evaluated the sites for compatibility with existing land uses and landscape; potential effects to existing business and local economy; compatibility with and potential effects to existing infrastructure; potential conflicts and adverse effects related with navigation; quantification of potential impacts to benthic habitats; and potential effects to protected or sensitive resources within or in the vicinity as a result of construction or vessels, and what avoidance and minimization measures could be undertaken at these alternate locations to obtain the same goals as the proposed project.

As with the previous alternative analysis which was presented in the Environmental Assessment Report, Enighed Pond was one of the sites which merit a closer inspection. We have not ruled out locations within the National Park since the park does on occasion enter into agreements with private parties for operation of facilities within the park.

The sites considered are the proposed project site, Enighed Pond, Cruz Bay, Caneel Bay, Haul Over, Hansen Bay, Johnston Bay, Lameshur Bay, Rendezvous Bay, and Northern Coral Bay.

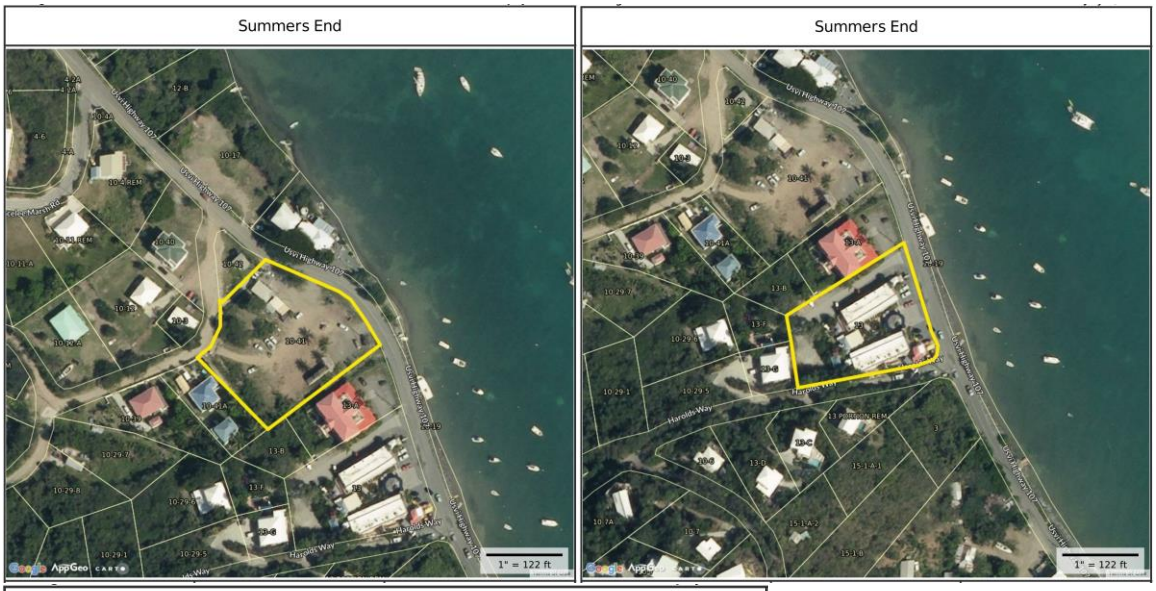
The evaluation is being done as a tiered approach first looking at the feasibility of developing the site into a marina. The following criteria are used to determine *first tier feasibility*;

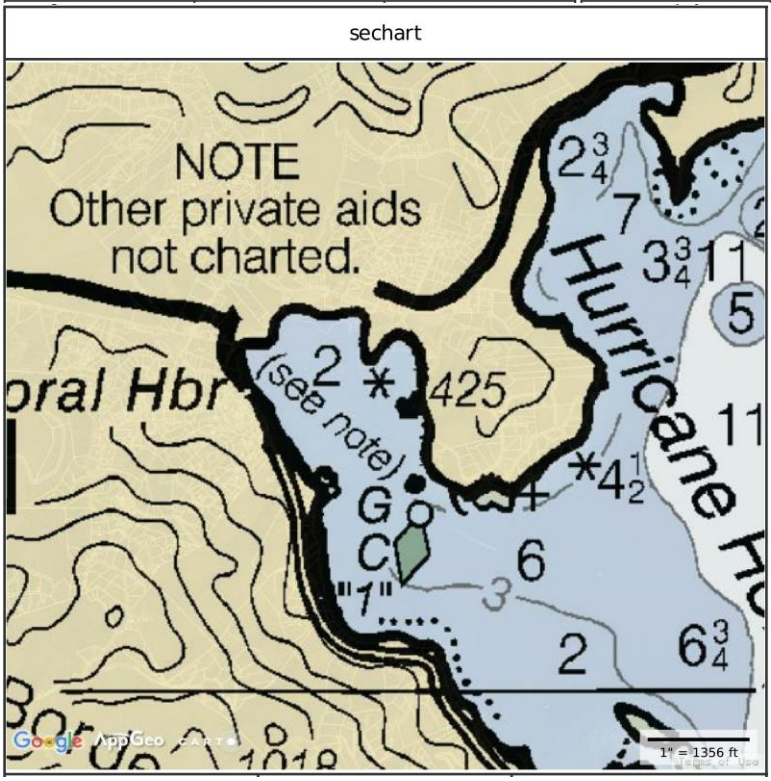
1. Accessibility and Infrastructure– Level of Infrastructure needed to provide adequate infrastructure to the site.
2. Navigation – Can the site be developed into a marina without significant dredging or alteration to obtain safe access?
3. Is there adequate upland area to develop the necessary support facilities for the marina?
4. Is it a safe harbor?
5. Would the project be compatible with existing land uses and landscape?

FIRST TIER: FEASIBILITY EVALUATION

SITE EVALUATED: CORAL HARBOR (PROJECT SITE), ST. JOHN

The project site is on the southwestern side of inner Coral Harbor and consists of several plots along the waterfront. The project has been modified since the original submission and several parcels have been removed from the upland portion of the development.





Accessibility and Infrastructure:

This is the proposed site; the site has existing road access. The access road is one of the main roads on St. John and the site is easily accessible. Electricity is available on site and the VI WAPA and Power Authority has provided documentation (See also A§6, supra and Appendix

E). The site does not have public water or sewer, but most sites in the Virgin Islands do not. Residents and businesses must rely on roof catchment, reverse osmosis, wells, and the purchase of water from private commercial haulers. The project is relying on roof catchment and has sufficient storage capacity to support projected occupancy. As a public drinking water supplier, water will be tested monthly to ensure compliance with US Safe Drinking Water Act requirements. If water runs low, the project can purchase water from a private hauler. The public water supply from V.I. Water and Power Authority (VIWAPA) has a stand pipe on St. John used by private haulers to obtain water. Water trucks are frequently seen on the roads on the east end of St. John during drier periods of the year. The project is utilizing batch WWTP and will dispose of greywater effluent on site. There is adequate area to irrigate with the effluent to prevent discharge into the bay. Discharge will be permitted through the TPDES program, which will also require regular water quality testing.

Navigation:

Coral Harbor is a Virgin Islands Department of Planning and Resources ("DPNR") designated mooring field and has existing navigational markers into the Harbor from the channel in Coral Bay. Access to the site is through Coral Bay, and no dredging would be required to achieve access to the site. The marina can also be built without dredging by positioning the dock structures further offshore in deeper water.

Availability of Upland Development Area:

There is an existing shopping area, restaurants and apartments and an undeveloped area which was previously used as a staging area for construction of the mixed income development Calabash Boom. These areas will be developed as the upland support and amenities for the marina. Over the course of permitting, the applicant has lost control of one of the parcels that was previously under contract and a part of the development plan. The amenities planned to be located on that parcel have been redesigned to be accommodated on the controlled parcels. The parcel that has been removed from the project contained the drainage way which was going to be altered and bridged. As the parcel has been removed from the application, no dredging/or filling is being done as a part of this project.

Safe Harbor:

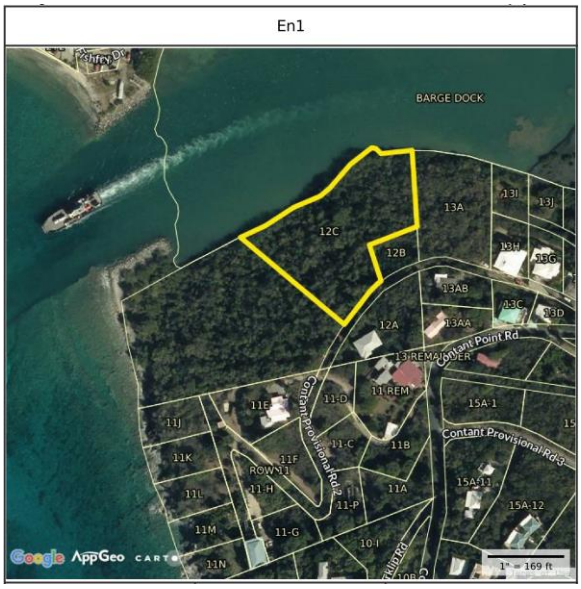
Coral Harbor is a safe harbor and has been designated by DPNR as a hurricane hole. The project site is used by numerous boats as a mooring and anchoring site. A detailed wind wave study was conducted and shows that the site is suitable for development of marina structures. The wind wave study is further discussed in Section A§3 and is attached in Appendix D.

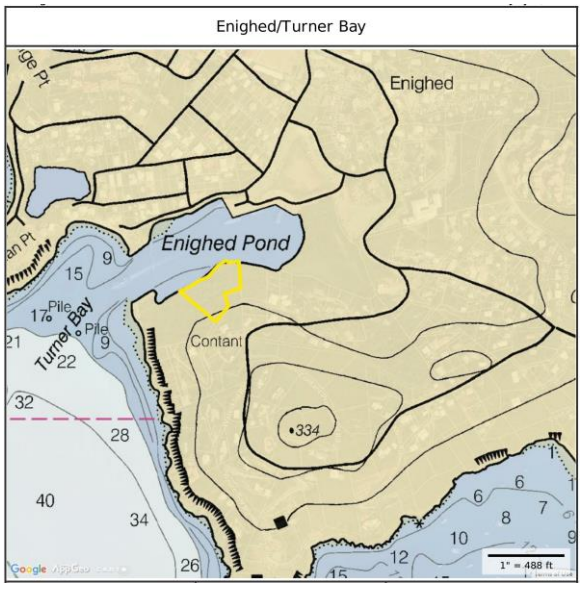
Compatibility:

The area is already in commercial use and the area is a heavily used harbor so it is a compatible use. The marina would be more organized and would provide services not currently available in the harbor such as fuel, pump out service, potable water and garbage disposal.

SITE EVALUATED: ENIGHED POND:

Enighed Pond was dredged in 1990 and the site was developed into the barge landing for the island of St. John. A marina was previously considered in the eastern portion of the pond. That area instead became the mitigation for impacting the mangroves and the pond ecosystem. The eastern area is now a fully developed mangrove forest. There is open land along the southern shoreline which could be purchased and a marina could be developed linearly along the southern portion of the pond.





Accessibility and Infrastructure:

There is road access to the site. This is a secondary road off the main road but access is available. The roadway would need some improvements and with other commercial operations already located along the road, this should be permittable. Power from VIWAPA is available, and the site could either use roof catchment with cistern storage and a batch WWTP and irrigate on site or could access public water and sewer, which are available in the area and could be brought to the location if the marina developer paid the costs of extending the service lines to the project area.

Navigation:

The location is on Enighed Pond which was dredged to create the marine ferry terminal. There is a wide open dredged channel into the site. The site will have to be designed to minimize conflict with ferries and cargo vessels, but several large ferries have been moored along the mangroves on the south side of the pond and there has been little impact on navigation.

Availability of Upland Development Area:

The area is undeveloped and lands are privately held so it is possible that they could be purchased. With 2.3 acres available and the possibility of a third plot to west sufficient land exists for the development of upland support and amenities.

Safe Harbor:

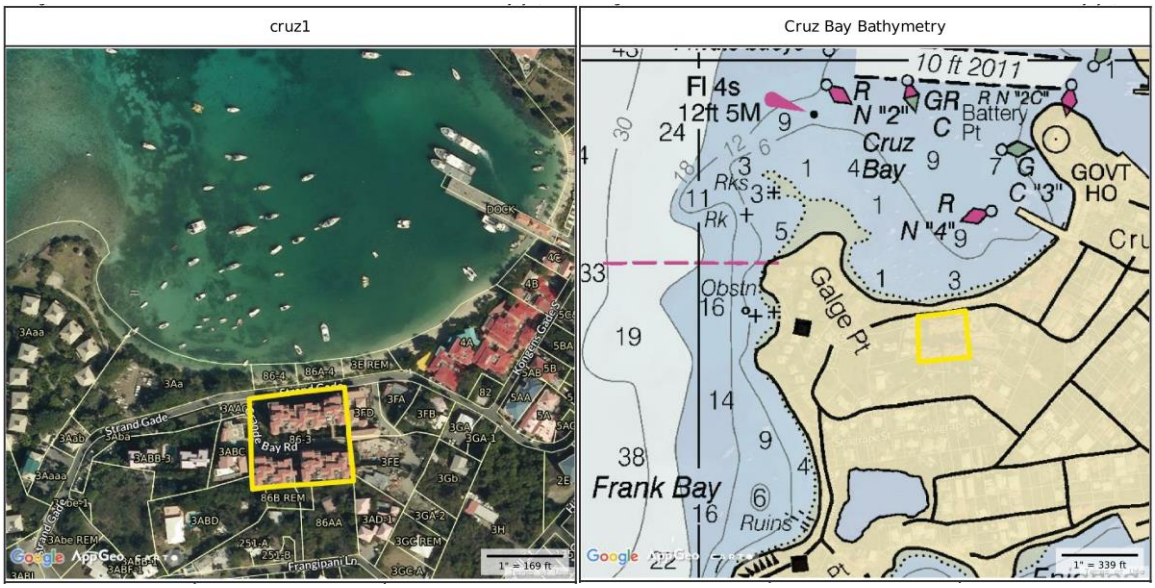
The site is extremely safe, located in the inland harbor and is not subject to impact by storm seas except under the most extreme conditions.

Compatibility:

Enighed Pond is a marine terminal so it is a compatible use. While there are residential properties to the south, many of the residences have been converted to business to the east, including the ferry operating business which frequently ties their barges to the southern side of the embayment to work on them.

SITE EVALUATED: CRUZ BAY: Shoreline Northeast of Grande Bay, Cruz Bay Town

There is a narrow strip of land to the southwest of town in front of Grande Bay Condominiums and the grave yard which would provide water access into Cruz Bay and has direct access to an area of adequate depth for a marina.



Accessibility and Infrastructure:

The site is on a main road and is easily accessible from town. The site has both public water and sewer available.

Navigation:

The site is located in the Cruz Bay mooring area and there is good access into the area. A marina could be constructed without dredging.

Availability of Upland Development Area:

The land area between the road and the sea is only a narrow strip and no development could be done between the road and the sea which is inundated during storm tides. There is no upland area available for development. A developer might be able to negotiate with surrounding business to sublet parking or maybe even some store space however this would severely impact development. This site is not a suitable site for development of a marina and no other water front in Cruz Bay is physically suitable for marina development.

Safe Harbor:

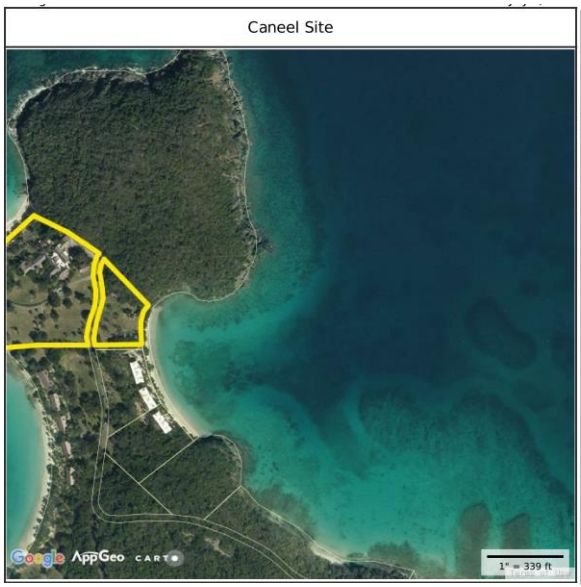
As with Coral Harbor this is a designated mooring area. This is a more open anchorage, but is fairly well protected under most seas conditions being open to the west.

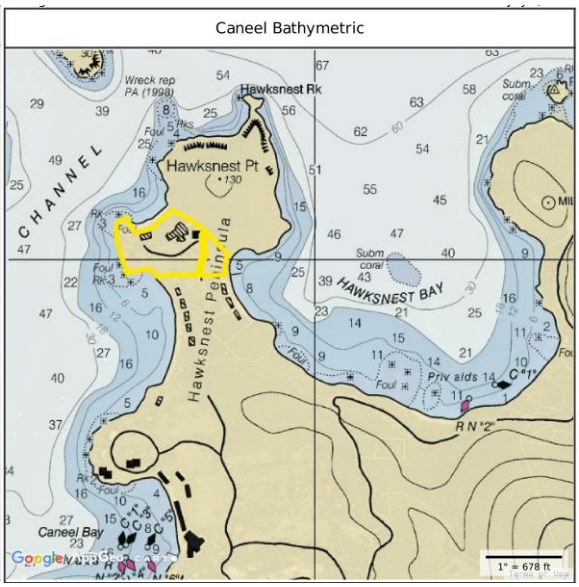
Compatibility:

The area is an active commercial town and the harbor is heavily used for anchoring and mooring. This would be a compatible site for a marina if upland space were available for services.

SITE EVALUATED: HAWKSNEST BAY: Within the Caneel Bay Resort

This property is within the Caneel Bay Resort and the applicant would have to work out an agreement to lease or purchase property from the resort.





Accessibility and Infrastructure:

Access would be through Caneel Bay Resorts private roadways which come off the main roadway. There is available VIWAPA power to the site. Water could be purchased from Caneel Bay and an agreement could probably be reached to have the waste water treated at the existing plant as well.

Navigation:

A marina could be lain out with sufficient water depth to provide slip access without dredging and there is clear navigational access into the site.

Availability of Upland Development Area:

There is available land area to develop, if the resort would choose to allow such an operation within the resort.

Safe Harbor:

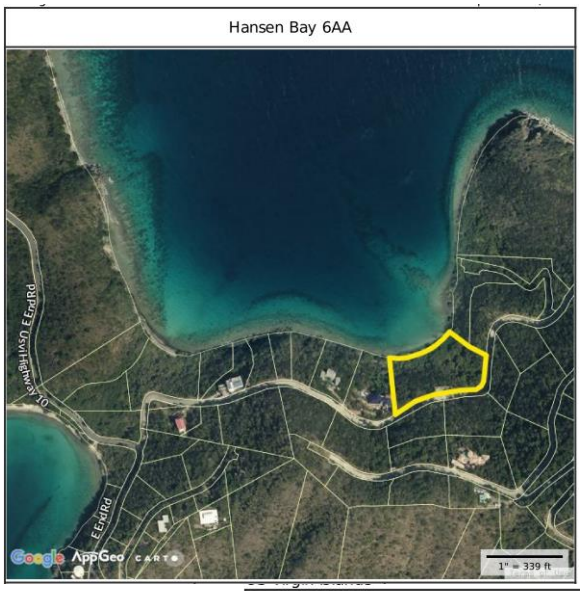
The site is open directly to the north which will present an issue during the winter when prevailing waves approach from the north. This would make marketing difficult because winter is high season for the largest vessels. A floating break water could be installed which could help alleviate this issue, but a breakwater would have environmental impacts and would add to the cost of development.

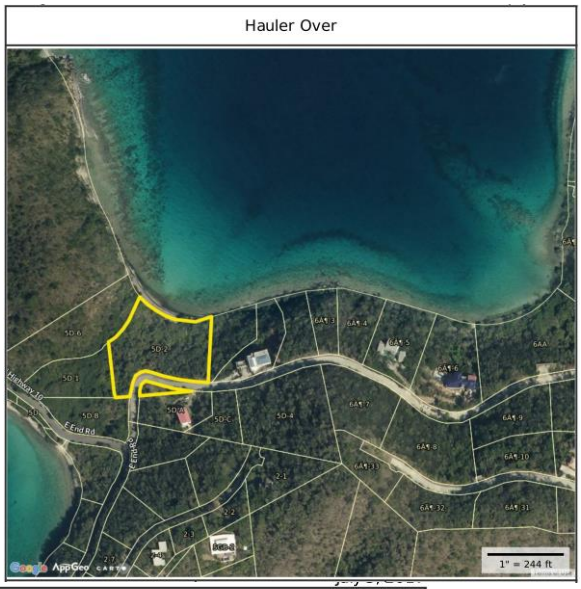
Compatibility:

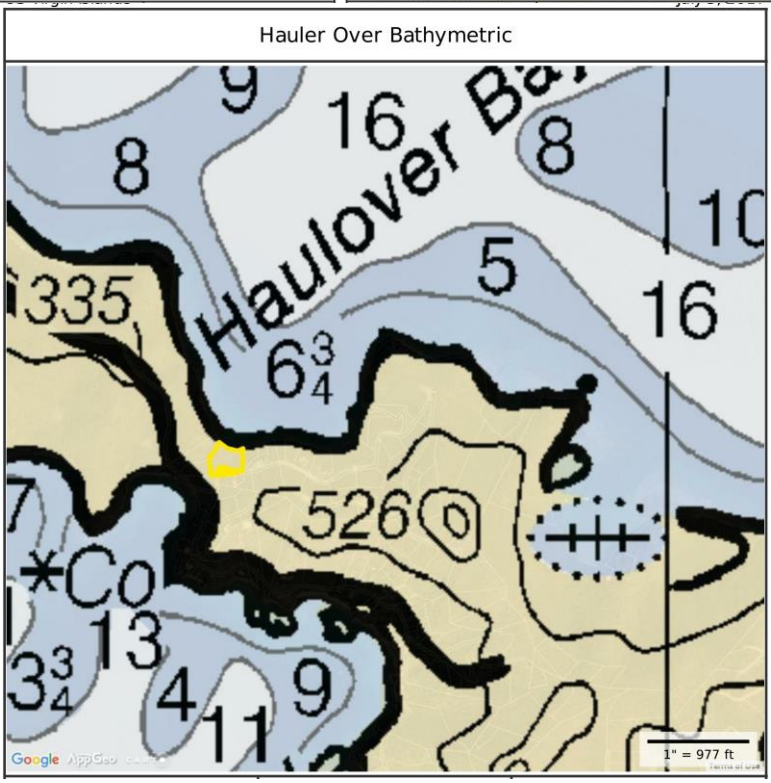
The site is not suitable for a marina based on the other uses in the area. The embayment is the site of a very popular beach "Hawksbill" which is frequented by visitors and residents of St. John. The beach is used by the Caneel Bay guests and there are rental units on the beach. Marina use, which would interrupt beach use would not be compatible with the existing uses by the Caneel Bay resort, residents of St. John and visitors to St. John.

SITE EVALUATED: HAUL OVER:

Haul Over is located on the north side of St. John and there are two areas that are undeveloped and both have good access to open water in locations where there is sufficient room to build a marina.







Accessibility and Infrastructure:

The site(s) are accessible off the main road so adequate access exists. VIWAPA is available along the main roadway. The service may have to be upgraded since only residential properties are presently located in the area, but this should not be a significant impediment. The applicant would be responsible for potable water which could be met by roof catchment, well, reverse

osmosis or purchase from private haulers and the applicant would also be responsible for waste water disposal which could be met by installing a WWTP.

Navigation:

A marina could be located with access to sufficient water depth to allow slip access without dredging and there is clear navigational access into the site.

Availability of Upland Development Area:

There is available land area to develop, as noted by the two separate parcels.

Safe Harbor:

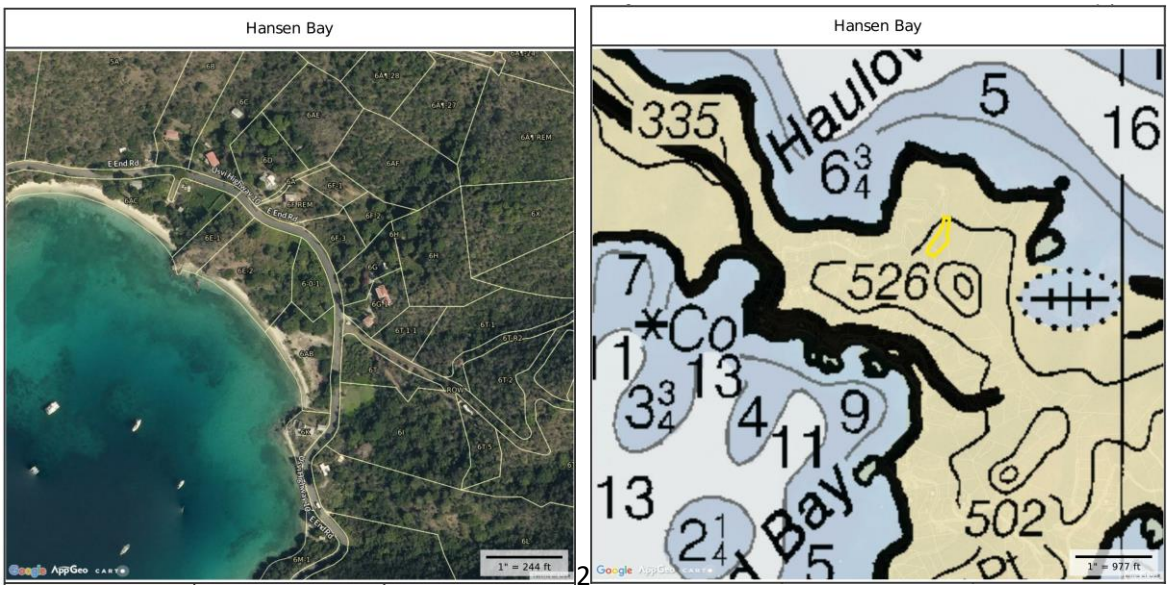
The sites are both open directly to the north however they are protected by Tortola and the limited fetch between the islands. The site would be subject to some rolling seas and waves from within the inner passage between the islands and it would probably be advisable to install a floating break water to offset this effect.

Compatibility:

The area is residential and is zoned as such. The properties could potentially be re-zoned but there are no commercial uses in the area, which might make rezoning challenging. Development of a commercial venture in this area would change the landscape significantly and impact the surrounding residential uses by introducing traffic and noise. Developing this area into a marina would not be a compatible use.

SITE EVALUATED: HANSEN BAY: HANSEN BAY EAST END QTR

The Hansen Bay parcels are in greater Coral Bay in Hansen Bay.



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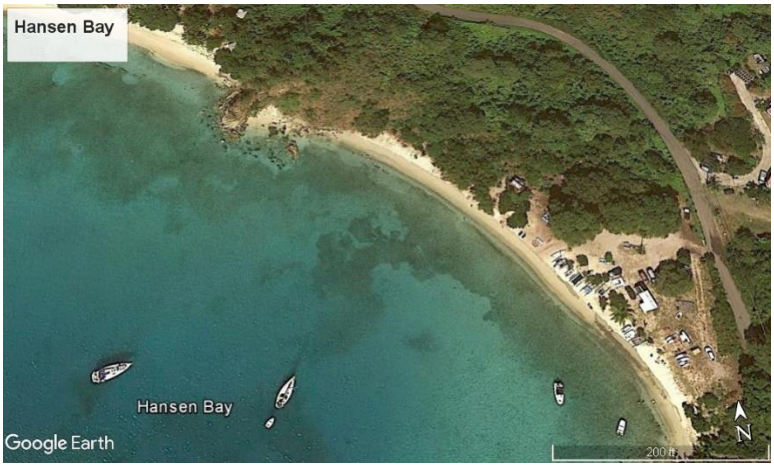
Accessibility and Infrastructure:

The site would be accessible off the main road so adequate access to the site exists to support a marina. VIWAPA is available along the main roadway. The service may have to be upgraded since only residential properties are found within the area, but this should not be a significant impediment. The applicant would be responsible for potable water which could be met by roof catchment, well, reverse osmosis or purchase and for waste water disposal which could be met by installing a WWTP.

Navigation:

The approach to the site is open, although there are shallow reefs in the vicinity which must be avoided, and a few boats are currently moored within the bay. A small marina could be designed which would minimize impact to natural resources There is already marine use on the eastern end of site which has catamarans and boats pulled up all along a portion of the beach.



Availability of Upland Development Area:

There is undeveloped land adjacent to the land to the east which is currently being used for marine use.

Safe Harbor:

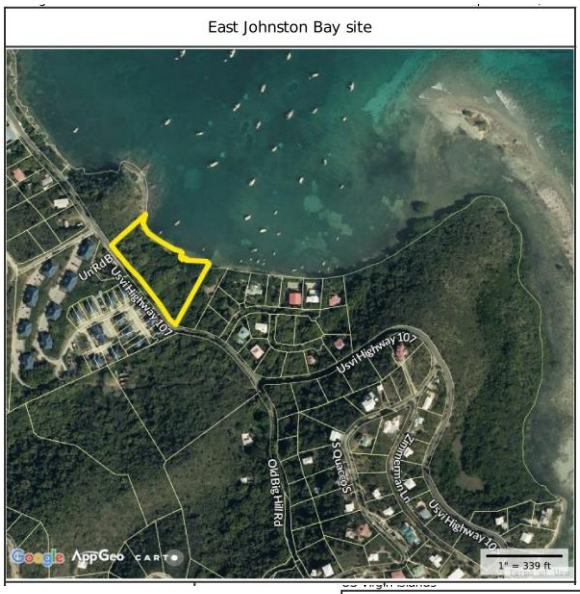
The site is partially protected due to its location with Coral Bay; it will be subject to seas approaching from the south, but this could be abated by a floating wave attenuator.

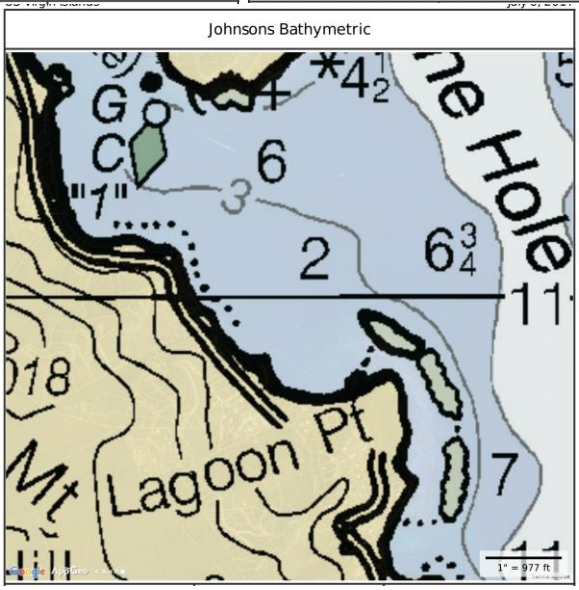
Compatibility:

The area is residential and is zoned as such. The property could potentially be re-zoned, but there are no commercial uses in the area and Coral Bay Community Council actively opposes development in Coral Bay and would likely oppose this rezoning application as well. There is the limited marine use to the east but no structures have been placed in the water. Development of a large commercial venture in this area would change the landscape significantly and impact residential uses located nearby by increasing traffic and noise. Developing this site into a marina would not be a compatible use with the surrounding residential community but is not totally out of character due to the existing marine uses and existing mooring in the bay.

SITE EVALUATED: JOHNSTON BAY (WEST AND EAST)

Johnston Bay is located along the southern shore of Coral Bay and is a site with numerous moored boats.





Accessibility and Infrastructure:

The site is accessible off the main road so adequate access exists. VIWAPA is available along the main roadway; the applicant would be responsible for costs associated with bringing lines onto private property. The applicant would be responsible for potable water which could be met by roof catchment, well, reverse osmosis or purchase and for waste water disposal which could be met by installing a WWTP.

Navigation:

There is adequate depth so that a marina could be lain out with to access sufficient water depth without dredging and there is clear navigational access into the site.

Availability of Upland Development Area:

There is available land area to develop if several parcels are combined.

Safe Harbor:

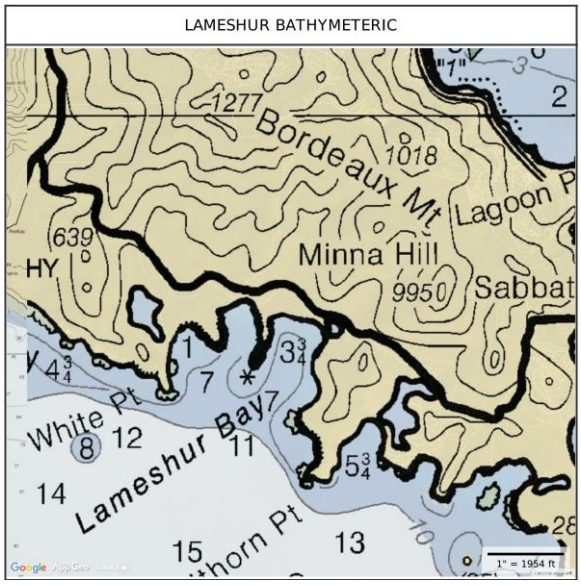
The site is well protected due to its location in Coral Bay and behind Johnson's Reef, as evidenced by the large number of boats on moorings and on anchor in the bay.

Compatibility:

The area is primarily residential but there are commercial properties along the roadway and western parcels are zoned Water Front Pleasure which is the appropriate zoning for a marina. The development of a marina in this area will not be an incompatible use. However, Coral Bay Community Council may oppose the project due to its location in Coral Bay.

SITE EVALUATED: LAMESHUR BAY: LAMESHUR ESTATE REEF BAY QTR.

Lameshur Bay is within the National Park and is zoned P, however the physical location could be suitable for a marina and vessels currently moor and anchor there. Summers End would have to develop a concession agreement with the Park to use such a location.



Accessibility and Infrastructure:

No serviceable public roads serve the area and access would have to be created. There is also limited electrical service available and service would have to be brought in. The remote location of the site and the difficulty to get site access over land makes it an unattractive site to consider.

Navigation:

There is adequate depth so that a marina could be lain out with to access sufficient water depth without dredging and there is clear navigational access into the site.

Availability of Upland Development Area:

There is available land area to develop if the Park Service would consider allow a concession over an area.

Safe Harbor:

The site is open to the south and as such is affected by sea conditions during periods of southerly swells. A wave attenuator could be installed to address this issue.

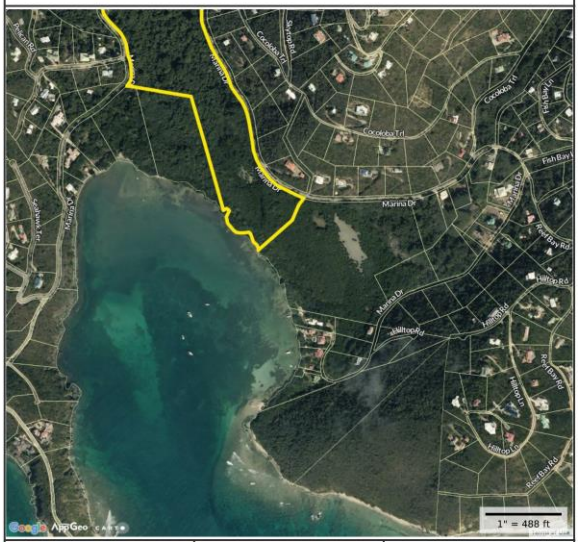
Compatibility:

The site is within the National Park and the surrounding area is undeveloped. The development of a marina in this area will not be a compatible use because there is no supporting infrastructure .

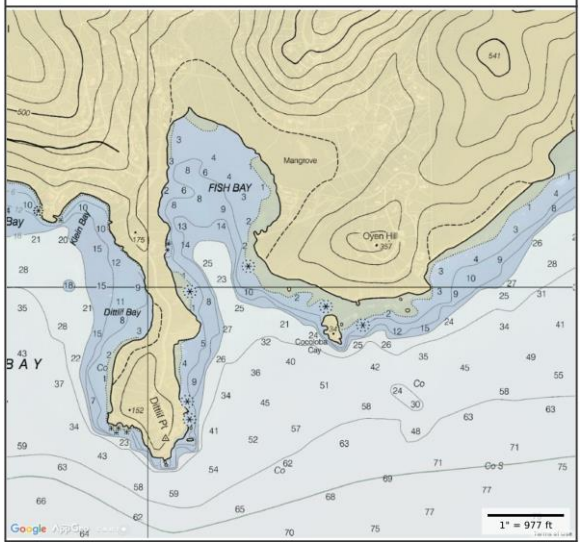
SITE EVALUATED: FISH BAY:

Fish Bay lies on the south side of St. John and is a protected embayment where there are currently some vessels mooring in the bay.

Fish Bay site



Fish Bay Bathymetric



Accessibility and Infrastructure:

The site is accessible off a main road way and VIWAPA power is developed near the site. Like most sites on St. John, the marina would have to be responsible for its own water through roof catchment and cisterns, wells, a reverse osmosis plant or through purchase or a combination of sources. The marina could also use a small WWTP to satisfy wastewater disposal needs.

Navigation:

There is adequate depth to access the site, however the marina would have to be designed with a long walkway out to reach a location with sufficient depth to prevent the need for dredging.

Availability of Upland Development Area:

There is available land area to develop if the current owners would consider selling. However, the owner is conservation minded group and probably will not be interested in selling the area since a large amount of the land is jurisdictional wetland.

Safe Harbor:

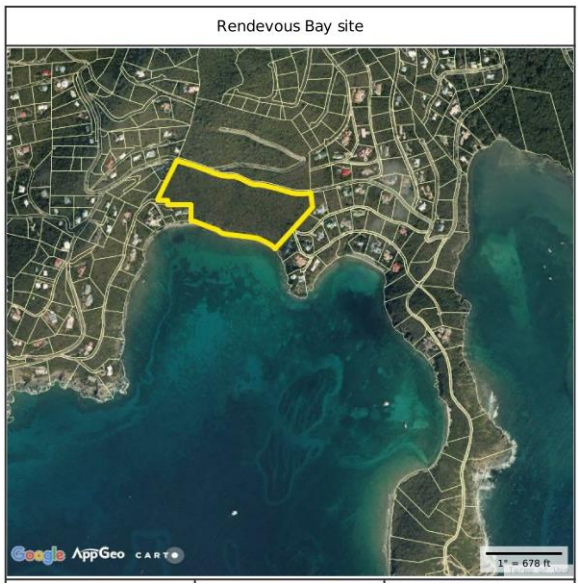
The site is open to the south and as such is affected by sea conditions during periods of southerly swells. A wave attenuator could be installed to address this issue.

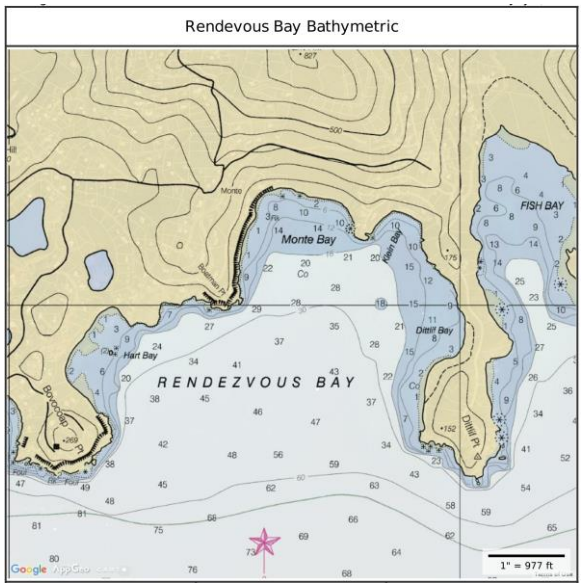
Compatibility:

The area is residential in nature and the shoreline area has large wetland areas. Development of this area into a marina would not be a compatible use with existing residential nature of the area There are no commercial uses within the vicinity and a marina would increase noise and traffic in a residential area. Further the wetland resources would limit development options or require impacts to natural resources.

SITE EVALUATED: RENDEZVOUS BAY:

There is a large area of open land within Rendezvous Bay in the Monte Bay embayment.





Accessibility and Infrastructure:

The site is accessible off a main road way and VIWAPA power is developed to the site. Like most sites on St. John, the marina would be responsible for its own water through roof catchment and cisterns, wells, a reverse osmosis plant or through purchase or a combination of sources. The marina could use a small WWTP to address wastewater disposal requirements.

Navigation:

There is adequate depth to access the site and sufficient water depth to create a marina without dredging.

Availability of Upland Development Area:

There is available land area to develop. There is a large parcel which is privately held.

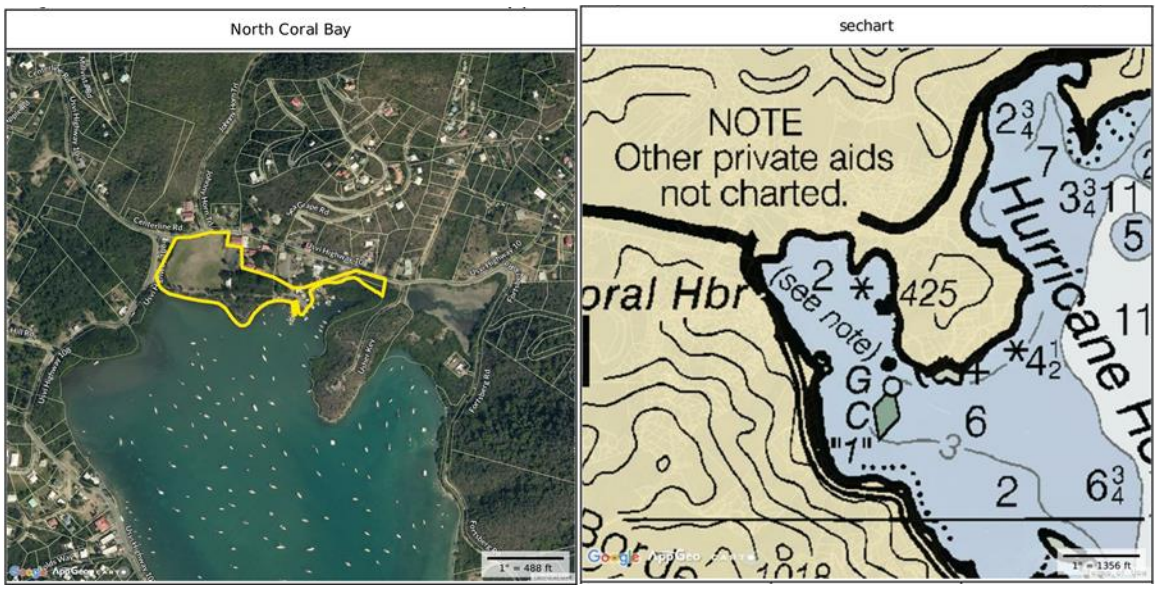
Safe Harbor:

The site is open to the south and as such is affected by sea conditions during periods of southerly swells. A wave attenuator could be installed to address this issue.

Compatibility:

The area is residential in nature and development of this area into a marina would not be a compatible use with existing residential uses. There are no commercial uses within the vicinity and therefore a marina would impact the area by increasing noise and traffic.

SITE EVALUATED: NORTHERN CORAL HARBOR



Accessibility and Infrastructure:

The site is accessible off a main road way and VIWAPA power is developed to the site. Like most sites on St. John, the marina would be responsible for its own water through roof catchment and cisterns, wells, a reverse osmosis plant or through purchase or a combination of sources. The marina could also use a small WWTP to manage its wastewater disposal needs. The site has the exact same access and infrastructure as the proposed site.

Navigation:

There is adequate depth to access the site and sufficient water depth to create a marina without dredging if the slips were placed well out into the bay similarly to the way the proposed marina is laid out. There is currently a marina proposed for the area which involves dredging of the site, which based on the environment impact of dredging in the enclosed embayment, has significant impact (see response to NPS and site alternatives).

Availability of Upland Development Area:

There is available land area to develop and there is currently a marina proposal on this property which has been submitted to CZM and the USACOE.

Safe Harbor:

The site like the proposed marina is well protected in Coral Harbor which his designated by DPNR as a mooring area and is designated as a hurricane hole.

Compatibility:

The area is already in commercial use and the area is a heavily used harbor so it is a compatible use. The Coral Bay Community Council would likely oppose approval of a marina in Coral Harbor.

Conclusions : First Tier of Analysis

Based on the analysis of accessibility and infrastructure, navigation, available land mass to develop, harbor safety, and compatibility, there are 5 sites including the proposed project site where marinas could be considered: the project site, Enighed Pond, Hansen Bay, Johnson Bay and Northern Coral Harbor.

CRITERIA	LOCATIONS CONSIDERED - FIRST TIER ANALYSIS										
	PROJECT SITE	ENIGHED POND	CRUZ BAY	CANEEL BAY	HAULOVER	HANSEN BAY	JOHNSON BAY	LAMESHUR BAY	FISH BAY	RENDEZVOUS BAY	NORTHERN CORAL HARBOR
Accessibility and Infrastructure	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Navigation	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Availability of Upland	YES	YES	NO	MAYBE	YES	YES	YES	MAYBE	MAYBE	YES	YES
Safe Harbor	YES	YES	YES	W/ATTENUATOR	W/ATTENUATOR	YES	YES	W/ATTENUATOR	W/ATTENUATOR	W/ATTENUATOR	YES
Compatibility	YES	YES	YES	NO	NO	MAYBE	YES	NO	NO	NO	YES
Move on to Tier 2	YES	YES	NO	NO	NO	YES	YES	NO	NO	NO	YES

Second Tier Analysis

The second tier of the analysis considers whether sufficient upland and harborage exists within the area to create the type of facility proposed in the application. This doesn't have to be the exact number of slips proposed by the Applicant, but rather considers does sufficient area exist to create an economically viable marina to meet the proposed market. This tier will also consider quantification of potential impacts to benthic habitats; and potential effects to protected or sensitive resources within or in the vicinity of a site that, as a result of construction or vessels, could impact those resources. If potential impacts are identified, the analysis also considers what avoidance and minimization measures could be undertaken at this location and still develop a comparable marina to the proposed project.

SITE: CORAL HARBOR SOUTH (SELECTED ALTERNATIVE)

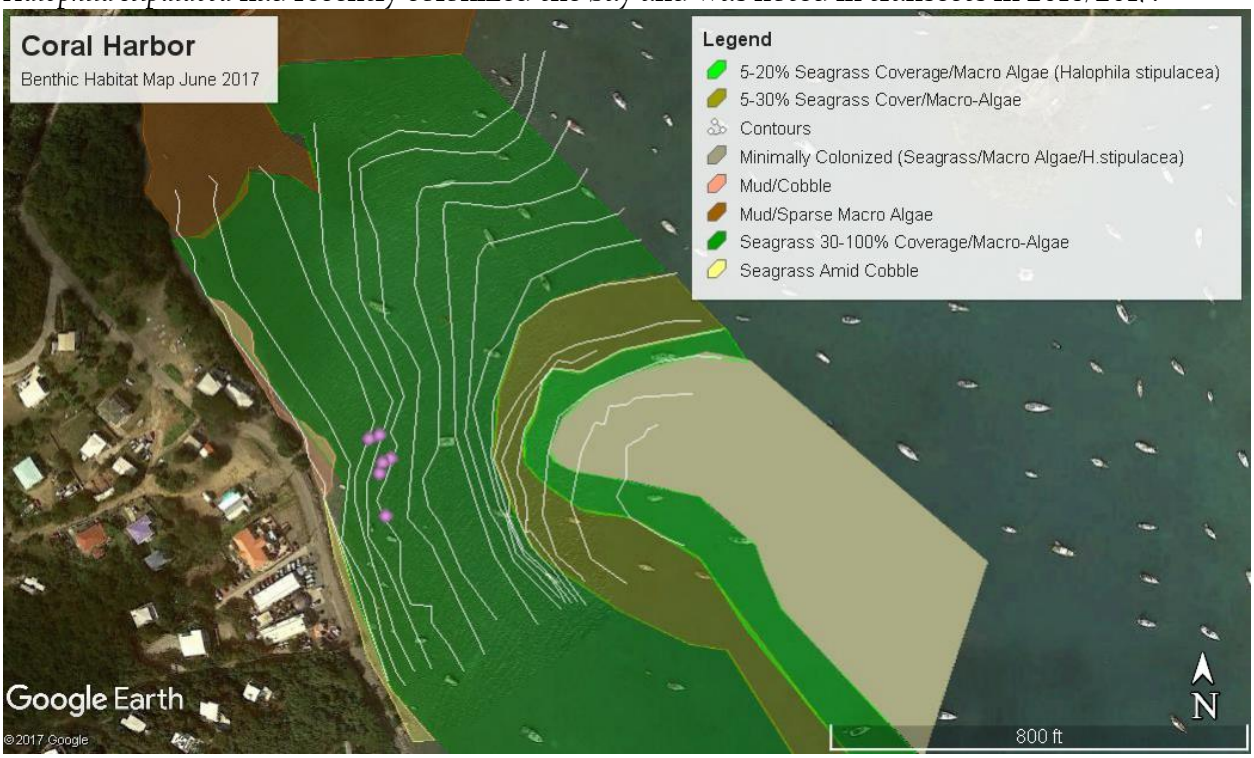
Available Area for Marina Development:

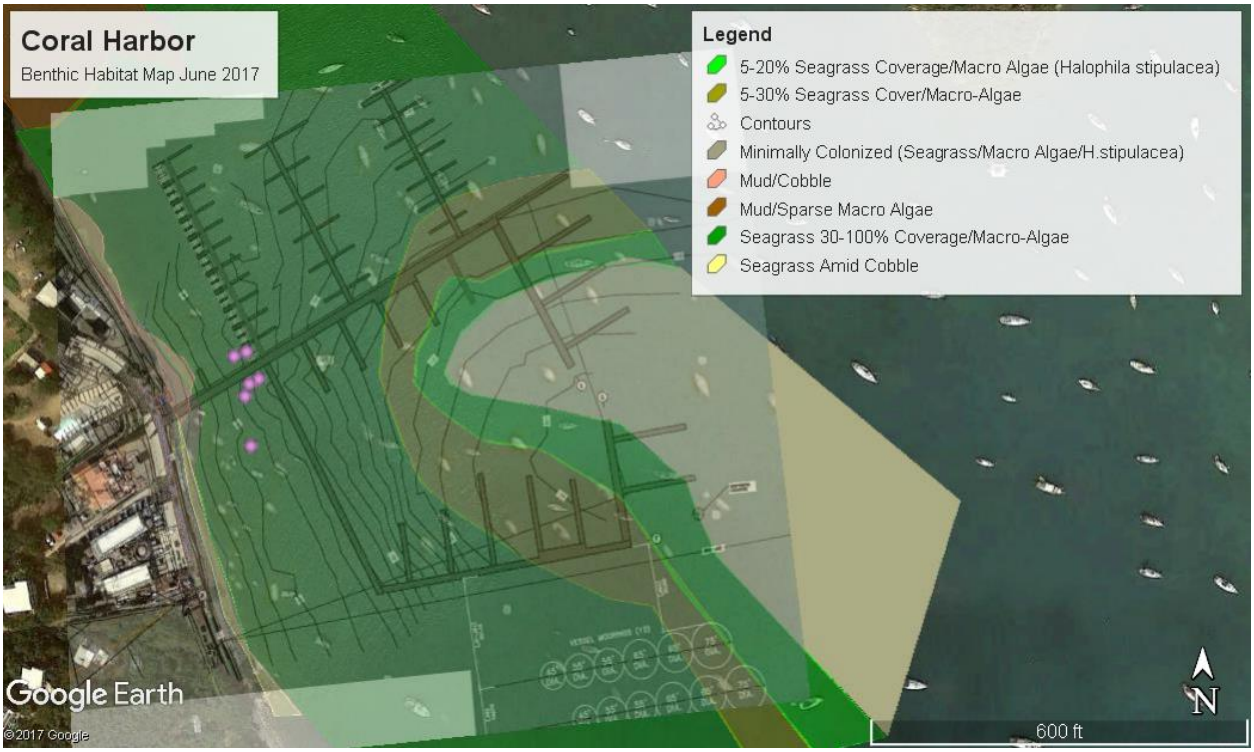
There is sufficient area offshore of the selected parcels without going beyond the extended property boundary lines and beyond the existing channel to construct the docks.

Environmental Resources:

There are dense grass beds offshore with a shoreline that is a mixture of muddy/cobble to the north and is riprapped to the south. There is a narrow band of muddy sand between the cobbly shore seagrass beds to the north and a mixture of seagrass and cobble to the south. There are a few large coral heads offshore of the culvert discharge in the middle of the property. Dense

seagrass, primarily *Thalassia testudinum*, are found in the offshore environment at a depth of between 1 ft. and 11 ft., at which point they begin to diminish and algal species become more prevalent. *Syringodium filiforme* also becomes more prevalent with depth. The exotic sea vine, *Halophila stipulacea* had recently colonized the bay and was noted in transects in 2016/2017.





Type	Habitat	Number	Acres	Sq. ft.
Moorings	30-100% Coverage Seagrass	9 (8 +0.5,0.5)		
Moorings	5-30% Coverage Seagrass	3 (1.5 + 1.5)		
	Total	12		
Docks			1.69	73,591.10
	Riprap (above MHW)		0.01	235.00
	Docks Less Above MHW		1.68	73,356.10
	Mud/Cobble		0.02	762.20
	30-100% Coverage Seagrass		0.90	39,258.18
	5-30% Coverage Seagrass		0.48	20,927.41
	5-20% Coverage Seagrass Macro-Algae		0.13	5,836.21
	Minimally Colonized		0.15	6,572.10
	Total		1.68	73,356.10

A total of 39,258.18sf of docks are over areas with SAV, the majority of which has densities between 20 and 100%. Based on a 46% survival due to shading since the Applicant is using grated decking, 21,199.42sf (0.487ac) of seagrass may be lost. At the maximum capacity and at the maximum size boat in each slip there will be 5.65 acres of shading due to vessels. It can be

assumed that 50% of this will be lost due to vessels being in placed more than 2 weeks at a time. There will be some survival due to angle of the sun and vessel types and some available light. There will be impacts due to spudding impact during construction which will probably account for between a 900-1020sf of impact (6sf per spudding event and between 150 and 170 relocations. The operation of the marina will have an impact due to prop wash scour and you can assume another 10% loss. In total, approximately 3.75 acres of seagrass will probably be lost as a result of the project.

The application is using grated decking to reduce shading impacts, and will be transplanting seagrass within the piling foot prints to reduce impacts. As compensatory mitigation, a harbor cleanup plan is proposed, and maintenance of sediment control measures in the watershed to improve water quality. The applicant will also be conducting long-term monitoring of water quality and of the closes ESA listed coral species.

The project will be using impact pile driving during the placement of 960 piles which will create acoustic impacts within Coral Harbor. A vibratory hammer will be used where possible to reduce this impact. Bubble curtains will be used to help abate esonification, and turtle and marine mammal monitoring will be conducted during all impact pile driving.

Vicinity:

There is an open approach and vessels should be able to access the site without groundings. The number of boats through the area will increase, and thus the potential for groundings, unauthorized groundings and turtle strikes could occur.

SITE: ENIGHED POND

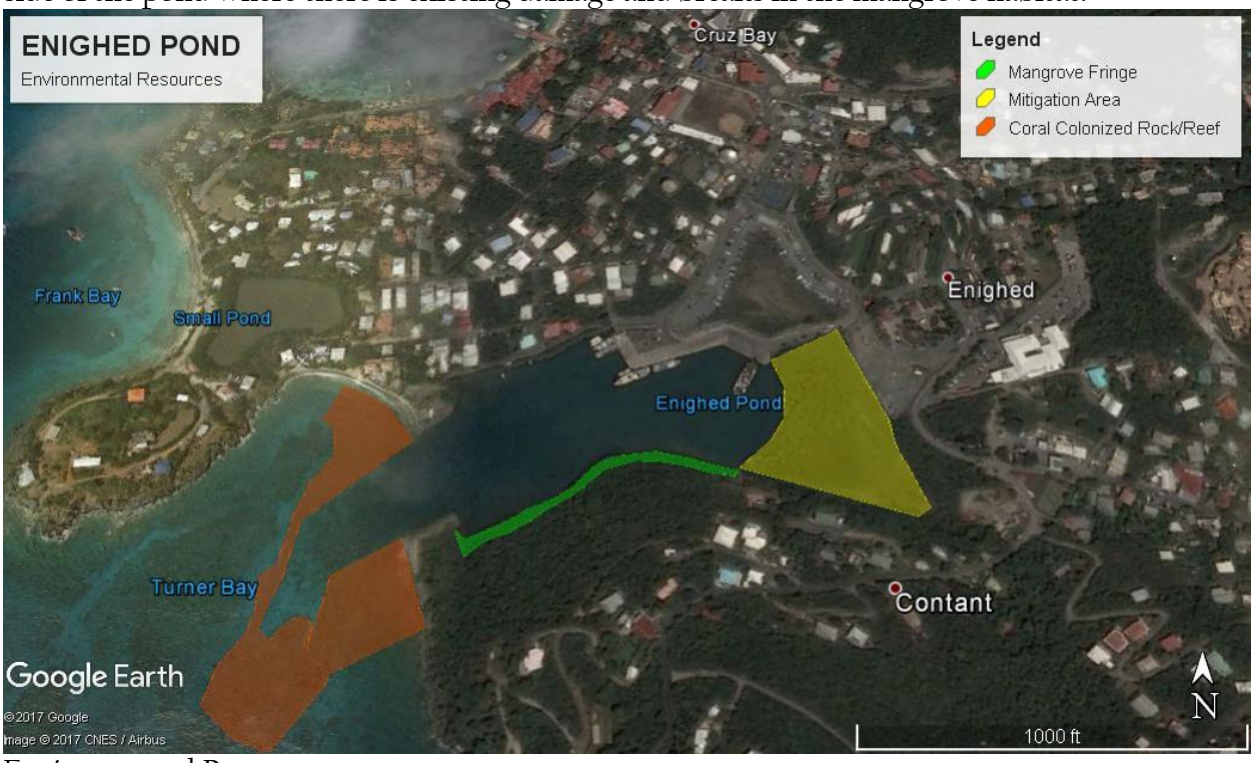
Available Area for Marina Development:

The geography of this site will limit the type and number of vessels which could be docked in a marina constructed at this location. In order to provide room for navigation, vessels longer than 50ft could not be docked without extending into the navigation area. Vessels could be docked parallel to the dock but this would limit the maximum number of vessels that could be serviced. While there is room for a marina, it would be limited to serving smaller vessels than the proposed marina at Coral Harbor and could not service the same market.

Environmental Resources:

Enighed Pond has been dredged but a dense mangrove fringe still exists along the perimeter. A marina could be built with a linear dock along the outside of the mangroves in the pond with only a couple of breaks through the mangroves to allow for access. It would be possible to provide adequate access with around 500 sq.ft. of mangrove/wetland impact. The amenities could then be built on the uplands behind the mangroves. The area is relatively steep but with proper sedimentation and erosion control and with development built in tiers on the slope, the project could be developed with limited environmental impact. Impacts would be limited

primarily to the mangrove fringe. Due to the prior dredging of the pond, there is no seagrass and coral within the pond and thus impacts to marine resources at the marina location could be avoided. Acoustic impacts would be minimal due to partial enclosure of the marine basin and soft nature of the sediment. Mangrove restoration could then be completed along the northern side of the pond where there is existing damage and breaks in the mangrove habitat.



Environmental Resources

Topography of the upland area

Potential Dock lay out

Vicinity Impacts:

The area is well traveled and there are existing aids to navigation to and from the site. The development and use of this area would not have significant impacts on the environment due to its previously altered state, nor on neighboring properties due to the heavy commercial usage in the area. Vessel traffic would be competing with large ferries and thus this might deter certain boaters from utilizing the marina.

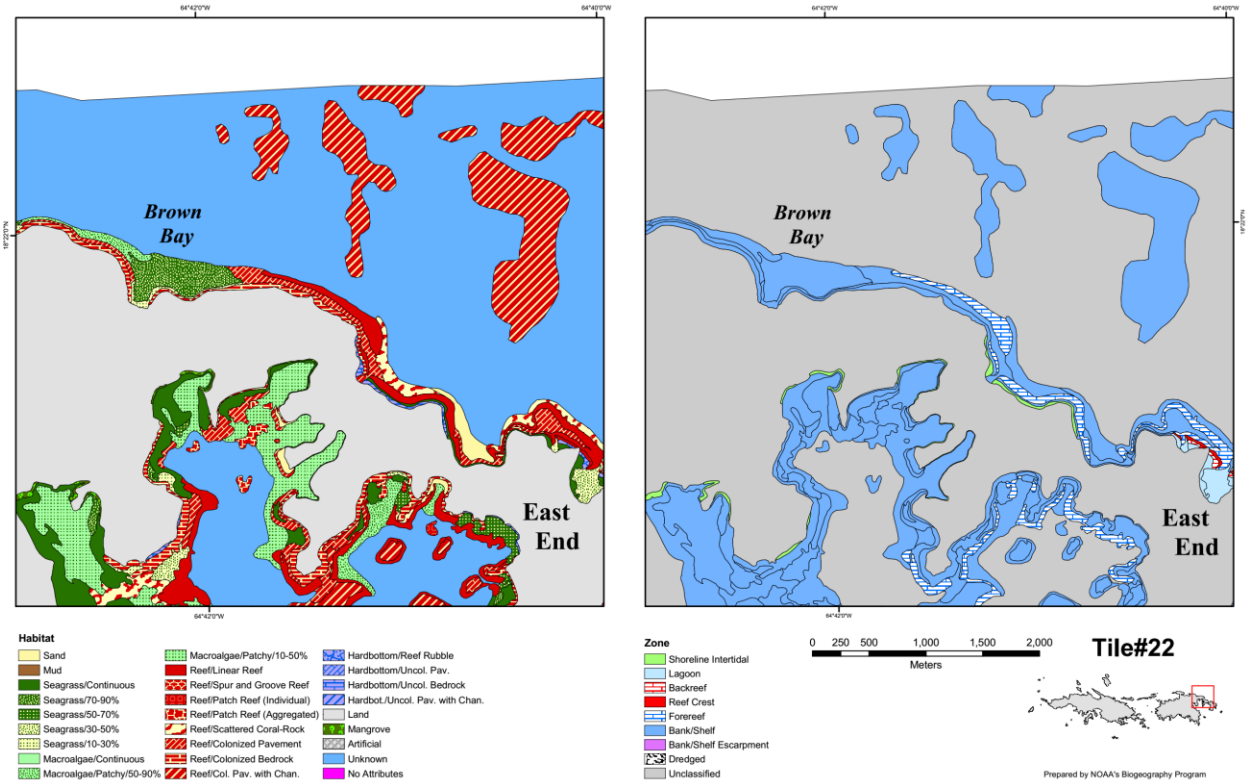
SITE: HANSEN BAY

Available Area for Marina Development:

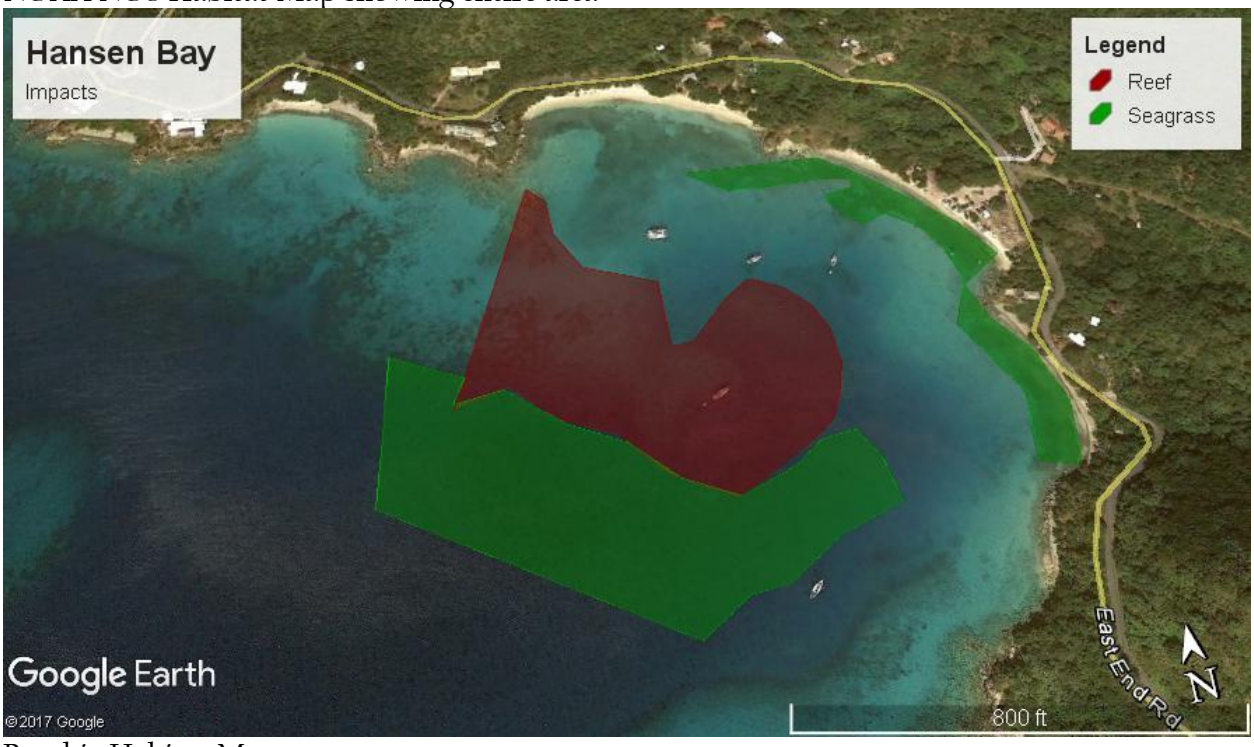
Between the bathymetry and the presence of the reef which extends offshore, there are only about 2 acres of water available for marina development. While a small marina or dock could be built in this area it would not be able to service the same type of vessels for which the project marina is being designed without destroying or severely impacting the reef.

Environmental Impacts:

There are corals on the reef and some of the corals are ESA listed Orbicella species. The marina could be designed to avoid this area and could be designed to minimize shallow resources by transplanting seagrass and moving corals from impacted areas. A small dock or extremely small marina could be constructed in this area with only minimal impacts, if mitigation were undertaken.



NOAA NOS Habitat Map showing entire area



Benthic Habitat Map

Areas a smaller marina/dock could be constructed with minimal impact.

Proposed Dock layout within Hansen Bay as a reference.

If a similarly sized marina were to be constructed in Hansen Bay it would result in more 3.75 acres of impact of reef area which has ESA listed corals as well as impacts to 1.2 acres shoreline and offshore seagrass.

Vicinity Impacts:

This site is adjacent to park waters and will have the same navigational issues as noted for the proposed marina. This site has a number of shallow coral reefs on the approach to the marina site, most of which have ESA listed corals species and would pose a grounding hazard. Informational buoys could be installed to minimize this impact.

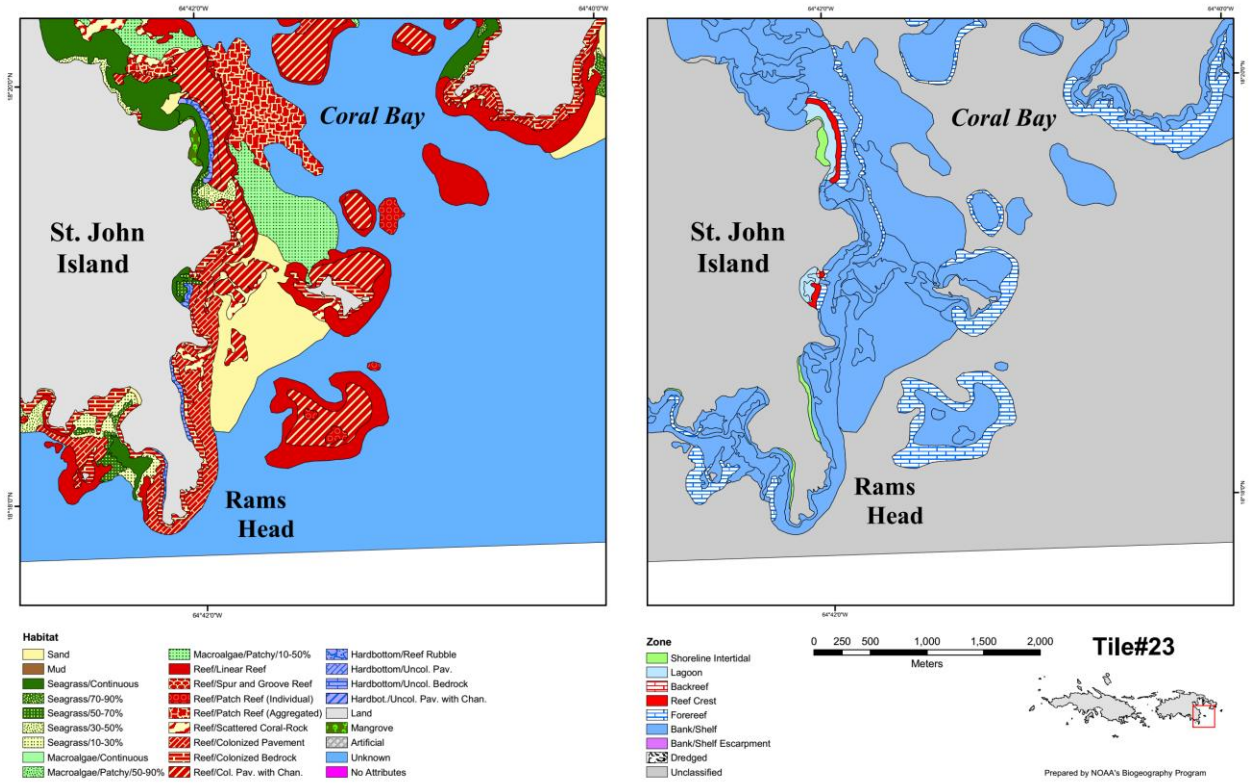
SITE: JOHNSONS BAY

Area Available for Marina Development:

The site is relative open and there is sufficient space to create a marina which could service the vessels envisioned in the proposed marina plan.

Environmental Resources:

Both embayments have very dense seagrass and there is coral colonized hard bottom between the two embayments. The seagrass is extremely dense and luxurious throughout most of both bays. The development of the marina at this site would have am much higher impact on seagrass than the proposed site and most of the 1.68 acres of dock would be over dense seagrass. The overall shading impact by vessels during high occupancy will impact an additional 3 acres of dense seagrass. Seagrass can be transplanted from the piling footprints and grate decking can be used to reduce impacts, but it will have greater impact on dense seagrass than will the proposed project.


Coral Bay
St. John Island
Rams Head
Coral Bay
St. John Island
Rams Head
Habitat
Sand
Mud
Seagrass/Continuous
Seagrass/70-90%
Seagrass/50-70%
Seagrass/30-50%
Seagrass/10-30%
Macroalgae/Continuous
Macroalgae/Patchy/50-90%
Macroalgae/Patchy/10-50%
Reef/Linear Reef
Reef/Spur and Groove Reef
Reef/Patch Reef (Individual)
Reef/Patch Reef (Aggregated)
Reef/Scattered Coral-Rock
Reef/Colonized Pavement
Reef/Colonized Bedrock
Reef/Col. Pav. with Chan.
Hardbottom/Reef Rubble
Hardbottom/Uncol. Pav.
Hardbottom/Uncol. Bedrock
Hardbot./Uncol. Pav. with Chan.
Land
Mangrove
Artificial
Unknown
No Attributes
Zone
Shoreline Intertidal
Lagoon
Backreef
Reef Crest
Forereef
Bank/Shelf
Bank/Shelf Escarpment
Dredged
Unclassified
0 250 500 1,000 1,500 2,000
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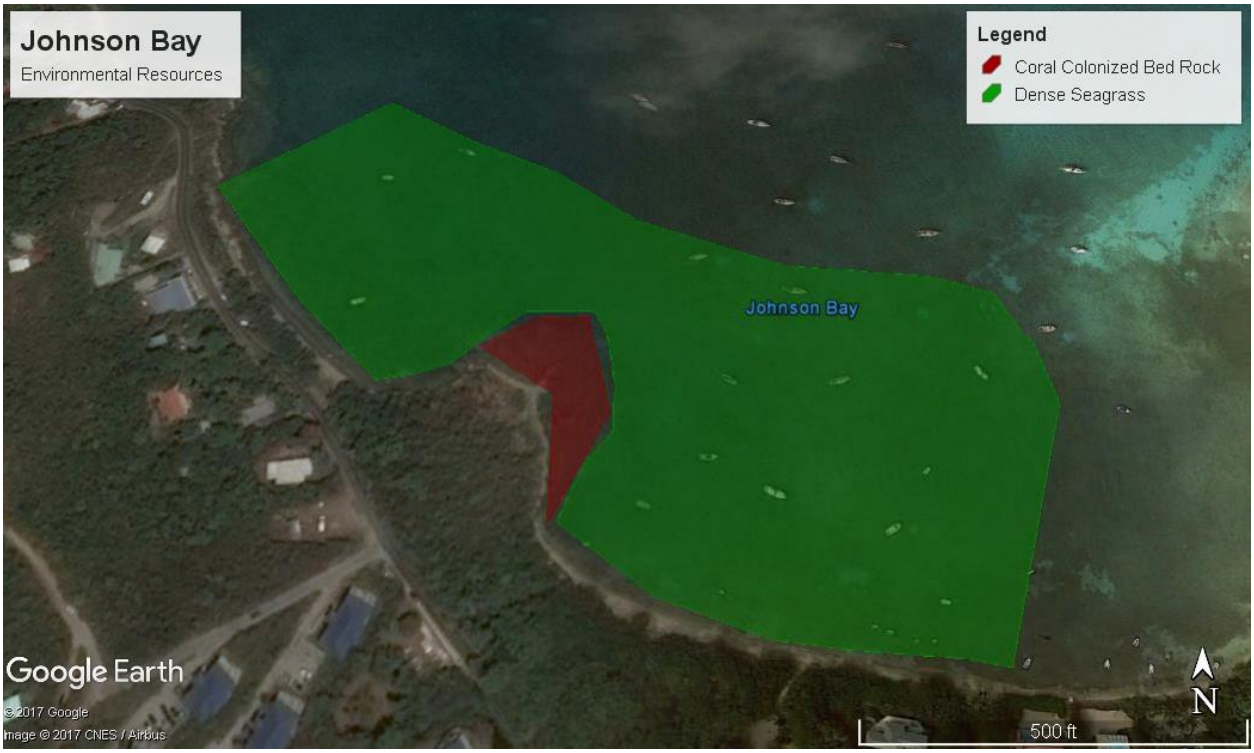
Tile#23
Prepared by NOAA's Biogeography Program


Johnson Bay
Environmental Resources
Legend
Coral Colonized Bed Rock
Dense Seagrass
Johnson Bay
Google Earth
©2017 Google
Image © 2017 CNES / Airbus
N
500 ft

Vicinity Impacts:

This site is adjacent to park waters and will have the same navigational issues as noted for the proposed site. Johnsons Reef would be on the approach to a marina at Johnsons Bay. ESA listed corals species grow on Johnson's Reef and the reef would pose a grounding hazard. Informational buoys could be installed to minimize this impact.

SITE: NORTHERN CORAL HARBOR

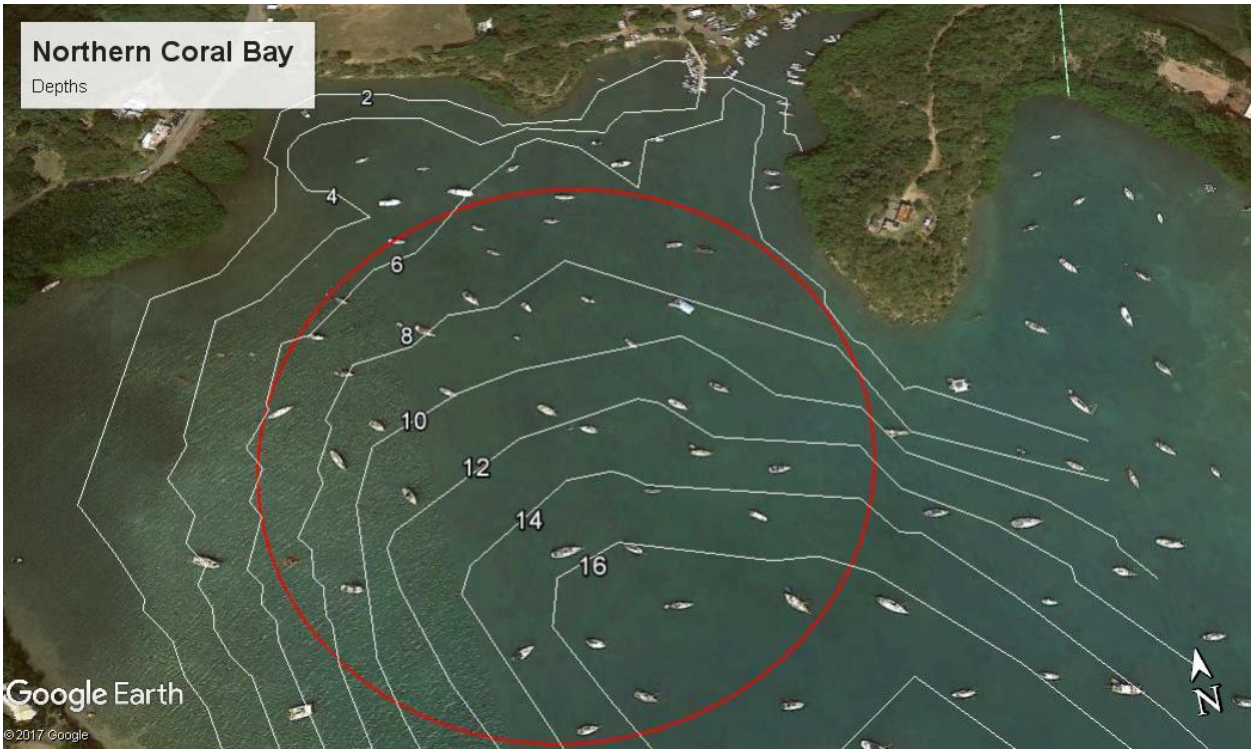
Availability:

There is sufficient area to create a marina, and there is currently another marina proposed in the area which is proposed to service 92 vessels, of which most are a smaller class of vessels. This marina also included dredging to accommodate those vessels. The proposed northern marina only extends to a depth of approximately 9ft.

Proposed northern marina

YCSE proposes to service larger vessels with deeper drafts and in order to reach sufficient depth to service the deeper draft vessels, most of the St. John marina is designed to be constructed in

over 10ft of water, a depth not available on the northern side of the bay. Due to the shape of the shoreline and the bay, the Northern Coral Harbor marina would have to extend more linearly out into the bay. To service the same market, the northern marina would extend to the center of the bay, crossing and encompassing the traditional channel between Coral Harbor and Coral Bay. This would result in the area occupied by a similarly sized marina being around 30 acres (docks, navigation area and moorings) as opposed to the approximately 25.8 acres (docks, navigation area and moorings) YCSE is proposed to occupy and would occupy45.5% of the navigable waters in the inner harbor rather than the 39.1% YCSE will occupy. The northern Coral Harbor site is better suited to service smaller vessels of than 70ft. in length. To service the same mix of vessels as proposed in the current application for that site the main area of the marina would have to be positioned as shown above. If constructed from the northern shore, a new channel into the bay would have to be developed and other boats within the embayment would be forced to anchor or moor in the areas with the densest seagrass.



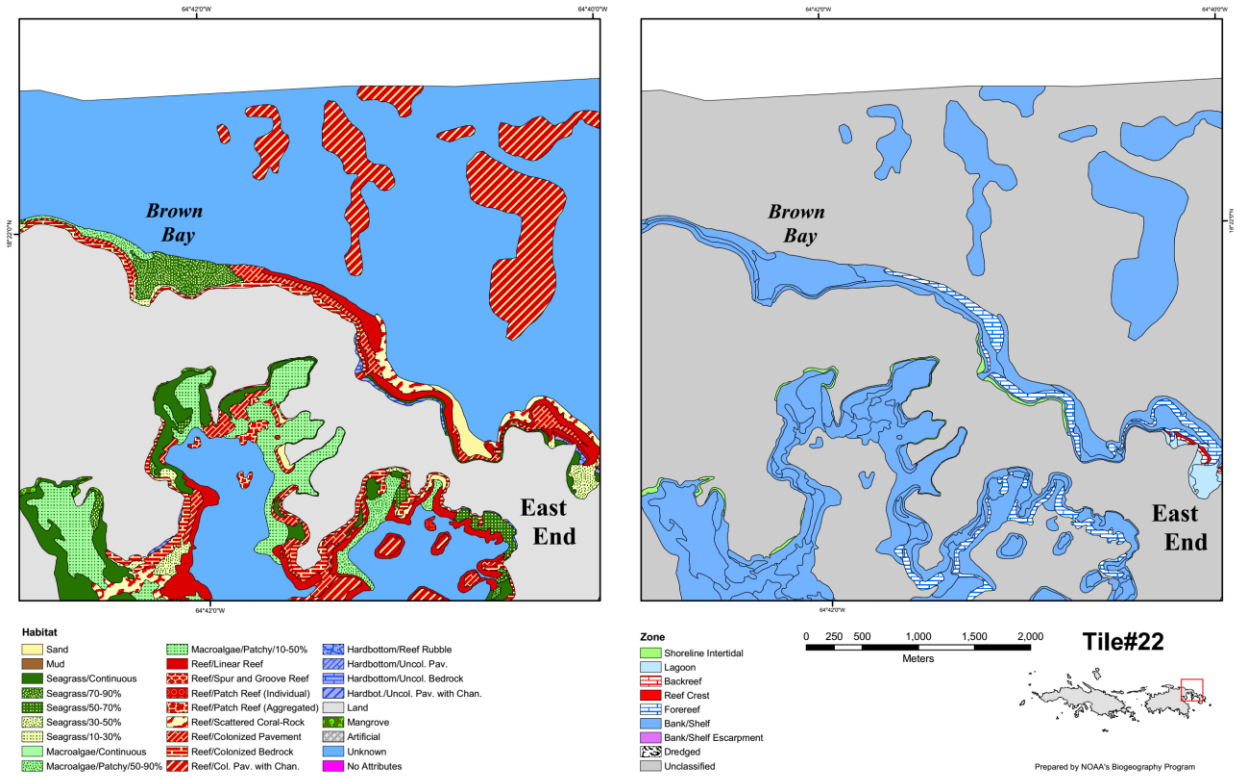
Location required to service a similar size and mix as the proposed St. John Marina.

Environmental Resources:

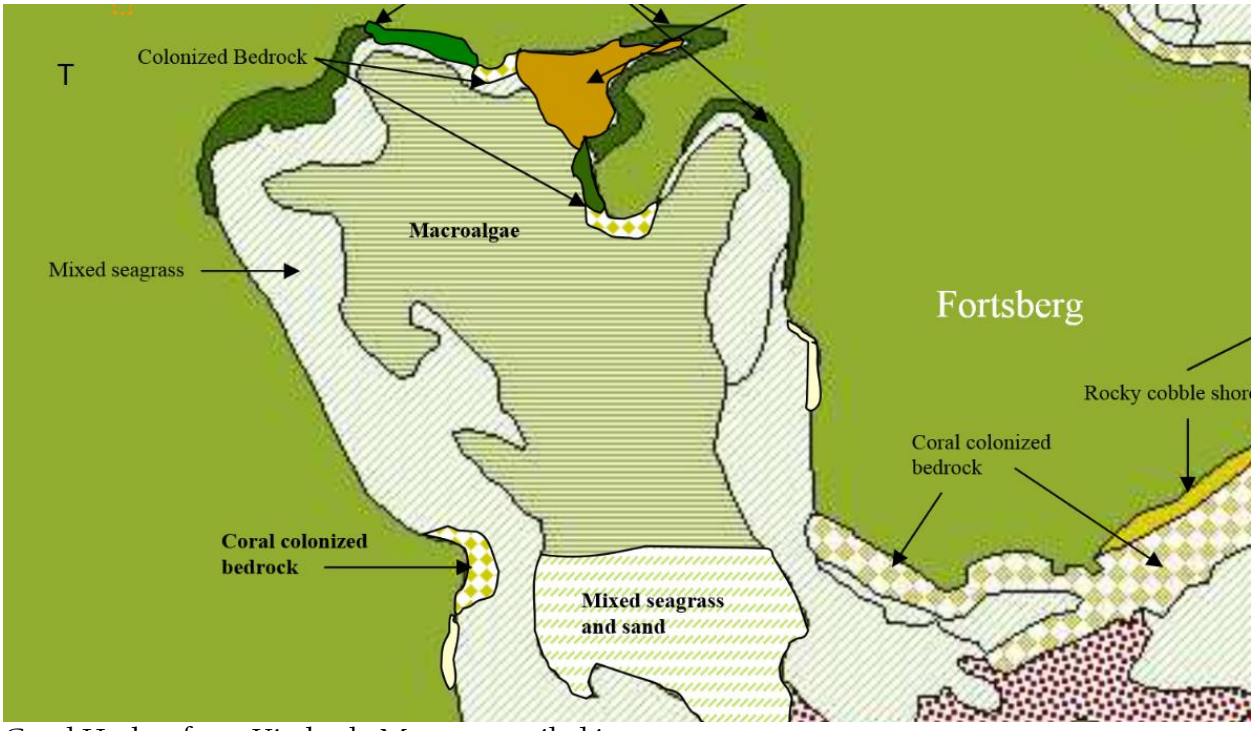
The northern portion of the inner harbor has been subject to heavy marine use. The area has also been impacted by terrestrial runoff depositing fine sediment. The NOAA Benthic habitat map shows the northern portion of the bay as primarily macro-algae with seagrass fringing the shallower areas. The Coral Bay Harbor Marine Survey compiled by Kimberly Myers in 2004 showed similar findings as does the Environmental Assessment Report done by Sirius Marina.

Surveys through the northern portions of the site in 2014 and then again in 2016 and 2017, showed a mix of marco algae, some *Halophila stipulacea* and widely scattered patches of *Syringodium filiforme* and *Thalassia testudinum* in the deeper areas and denser seagrass (primarily *Thalassia*) in shallower areas.

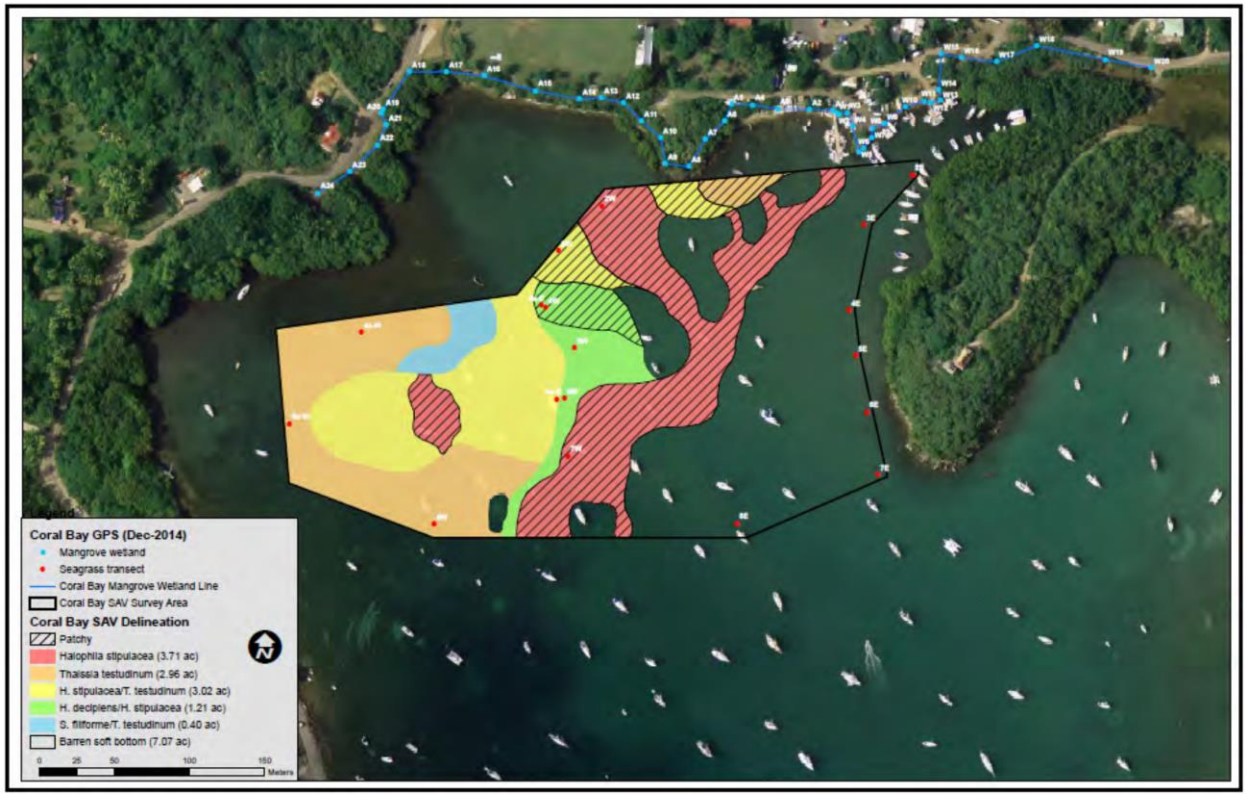
A similar size marina coming off of the northern shore would primarily be situated over areas of macro-algae with small percentage of intermixed seagrasses. Denser seagrass impacts would be limited due to its distribution in the bay. YCSE has a proposed square footage of 78,244.50 sf.. If a marina with the same square footage was constructed in the Northern Harbor the project would have fewer seagrass areas impacted through pile driving and shading , because there is less seagrass located on the northern side of the bay. Based on the Sirius Marina design, they estimated approximately a 0.5 acre loss of seagrass. To provide equivalent harborage to what is proposed by YCSE, the Northern Harbor marina would have to be close to 2.5 times the size proposed by Sirius to reach adequate water depths and service the equivalent number of vessels. This would result in approximately a one acre loss of seagrass (resources are sparser in the center of the bay). Like YCSE, grated decking and transplanting of seagrass from dock footprints could reduce overall impacts. Due to the finer sediments found in the northern part of the bay, the likelihood of resuspension of sediments would be higher during construction and operation of the marina. Thus, marina operations in the Northern Harbor would have a greater impact on water quality than the proposed YCSE marina.



NOAA Benthic Habitat Map showing Coral Harbor



Coral Harbor from Kimberly Myers compiled inventory.



Benthic Habitats as depicted in the EAR for Sirius Marina on the northern side of Coral Harbor.

Vicinity Impacts:

This is adjacent to park waters and will have the same navigational issues as noted for YCSE. Informational buoys could be installed to help abate this impact.

Conclusions: Second Tier Analysis

Of the alternatives considered, developing a marina in Enighed Pond would have the least amount of environmental impact of any of the alternatives considered. However the marina would be very limited in size and would not service the market for which YCSE has been designed, nor provide meaningful numbers of slips to answer the pent up demand for dock space in St. John.

All of the remaining alternatives will have equivalent acoustic impacts.

Hansen Bay is currently being used for some marine related activities and a small marina could probably be built in that location with moderate environmental impacts. Access to the site will require navigation near shallow coral resources and there will be a potential for accidental groundings. Although informational buoys could be employed to mitigate that risk, boat grounding can seriously harm coral reefs. There is not sufficient area to construct a marina comparable in size to the YCSE proposed marina without impacting the reef which does have ESA listed *Orbicella species* and *Dendrogyra cylindrus*. Thus, a Hansen Bay Marina would be unable to service the target market.

Developing a marina at Johnsons Bay would have the greatest environmental impact due to the lush seagrass resources within the bay. While seagrass could be transplanted the overall impact would be higher than the impacts projected for the YCSE marina.

A northern Coral Harbor could potentially have less direct and indirect seagrass impact. However, because of the finer sediments in that part of the harbor, it would probably have greater impact to water quality due to resuspension of sediments during construction and operations. In order to service the proposed market, the marina would have to utilize a much larger portion of the bay than proposed in the YCSE marina design, would displace far more moored boats and would interfere with navigation in the traditional channel. The marina which is currently proposed for the northern portion of the bay involves dredging, which would have a far greater impact on the bay due to the long-term suspension of sediment and degradation of water quality as well as impacts to the mangrove community along the shoreline.

CRITERIA	LOCATIONS CONSIDERED - FIRST TIER ANALYSIS				
	PROJECT SITE	ENIGHED POND	HANSEN BAY	JOHNSON BAY	NORTHERN CORAL HARBOR
Area for Marina Development	YES	NO	NO	YES	NO
Site Impact	3.75 ac SAV	500sf mangroves	3.5 Reef w/ESA corals 1.2 ac SAV	4.68 ac SAV	1.0 ac SAV

Based on the available alternative sites that could physically accommodate a marina, the YCSE proposed site is the best location for a marina serving varying size vessels and providing needed services and amenities to boaters. The unavoidable environmental impacts of YCSE can be mitigated through seagrass transplant, Coral Bay debris clean up and ongoing maintenance of storm water facilities in the vicinity of the project. The depth of the area is adequate to moor large vessels and the approach to YCSE is not impacted by existing reefs. YCSE is proposed in an existing commercial location, in an area that has long been used for mooring boats. Thus, it is the best alternative for constructing a marina in St. John.

ALTERNATIVE DESIGNS

The developer who was looking at the northern area about 12 years ago considered dredging to move the marina closer to shore. One of the first things that was determined in this design was that no dredging would be undertaken. Due the very soft silty nature of much of the seafloor, and due to the constricted nature of Coral Harbor, any dredging would suspend sediments and keep finer particles in the water column for years. And as sediments finally did settle the heavy sediment would settle first leaving the lightest sediments to settle last leaving a fluff layer on the top which would be suspended again with the slightest water movement.

Much of the sediment in Coral Harbor is terrigenous in nature having eroded from the surrounding watershed and these sediments are finer than sands and most marine sediments. These very fine sediments would remain in suspension until the fluid velocity is insufficient for turbulent eddies to balance gravitational forces and the particles will settle out, depositing on the seabed (Masselink et al., 2014). In the inner harbor, tidal, surface wind effects, and even vessel movements will keep the finest sediments in suspension. Great Cruz Bay or Chocolate Hole in St. John, and Water Bay in St. Thomas all show the long-term effects dredging has had on water quality compared to similar bays which have not been dredged. Dredging activities potentially effects not only the site itself, but also surrounding areas, through a large number of impact vectors (e.g. turbid plumes, sedimentation, resuspension, release of contaminants, and bathymetric changes) (Wolanski and Gibbs, 1992). And sediment deposition can occur at distance from the dredging site depending on sea conditions and currents (Miller 2016).
Therefore, the marina was sited farther offshore so that no dredging is required.

Floating docks could also be considered but these would greatly increase shading impacts. To service the proposed boat mixed these would require the same number of pilings proposed and would not result in less direct impact and because of the shading issue would have more indirect impact of 66,021sf of seagrass loss just from the docks. This would also result in the acoustic impacts of pile driving.