FINAL

SEAGRASS AND HARDBOTTOM SURVEY

TASK ORDER NUMBER W912EP-11-F-0013

September 2011

Prepared for:

Ft. Myers Federal Channel Maintenance
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1.0 INTRODUCTION

CSA International, Inc. (CSA) was awarded Task Order Number W912EP-11-F-0013 from the U.S. Army Corps of Engineers (USACE) under the General Services Administration (GSA) contract number GS-10F-0443M for conducting a Seagrass and Hardbottom Survey in the Federal navigation channel and nearshore environment of Matanzas Pass and Fort Myers Beach, Lee County, Florida (**Figure 1**). The USACE proposes to conduct maintenance dredging throughout the 2.5 mile Federal navigation channel from the mouth of Estero Island to the terminus in the bay, including an Advanced Maintenance Dredging area, and place the dredged material in a nearshore disposal area via a pipeline placed on the seabed within a designated corridor. The purpose of the survey was to document the current condition of the benthic environment within the channel footprint and Advanced Maintenance Dredging area, a 50-ft buffer zone outside the channel toe, the nearshore disposal site, and the pipeline corridor. This draft report and attachments presents a discussion on the methods, activities performed, and findings including representative images, figures, video, and spatial data showing the location of any observed seagrass or hardbottom resources within the project format.

2.0 METHODS

The seagrass and hardbottom survey was conducted out of Fort Myers Beach, Florida from 11 to 14 July 2011 using CSA's 25-ft Parker survey vessel. All on-board navigation was conducted using Hypack® navigational software interfaced with a Trimble AG106 Differential Global Positioning System (DGPS) for vessel guidance, digital navigation logging of the precise position of the towed video camera system, and real-time display of the ship's track along the survey transects.

2.1 Towed Video Survey

For the towed video survey operations, CSA used a small, custom-built, stainless-steel, open-framed tow sled equipped with a Deep Sea Power and Light MSC 2002 advanced underwater video camera and retrieval system (**Photo 1**). Due to limited visibility, lights were secured to the tow sled and used to illuminate the seabed. Towed video data was collected along pre-plotted transect lines and all navigation data was saved in Hypack® hydrographic software. Additional video data was collected along ad hoc transect lines within the channel and around the Advanced Maintenance Dredging area to "fill in" gaps and confirm the presence of seagrass or other sensitive species within the proposed dredging area. Navigation positions were recorded in Hypack® navigation software at approximately 1-sec. intervals along each transect. Continuous video observations were made from the live video feed overlain with time, location (X,Y coordinates), and transect number. An on-board marine scientist experienced with characterizing seagrass and hardbottom habitats in southwest Florida logged all observations relative to habitat type, notable species, and/or sediment characteristics as relevant to the survey objectives. All video was recorded directly to an on-board hard disk drive and backed up simultaneously on mini-DV tapes.

2.2 Dive Operations

CSA developed a site-specific Dive Operations Plan (**Attachment A**) in accordance with Section 30 of the USACE "Safety and Health Requirements Manual," EM 385-1-1. As a corporate member in good standing with the American Academy of Underwater Scientists, all CSA divers are certified in SCUBA by at least one internationally recognized organization,

trained as specialty divers for utilizing enriched air (NITROX), trained in American Red Cross cardiopulmonary resuscitation (CPR) and first aid, and experienced with Federal dive safety practices (i.e., Occupational Safety and Hazard Administration, USACE, and Association of Diving Contractor standards). The plan was submitted to and reviewed by Mr. Brad Tarr, USACE Alternate Dive Coordinator, against the Safety Inspection Checklist for Contract Dive Operations. The Dive Operations Plan was found to meet all USACE requirements and was approved on 12 July 2011, granting permission to proceed with dive operations (**Attachment B**).

2.3 Seagrass Survey

Areas observed to contain seagrass or suspected to have seagrass within the entire 2.5 mi Federal navigation channel, Advanced Maintenance Dredging area, and 50-ft buffer zones outside the channel toe were surveyed *in situ* using a line-intercept approach. Where seagrass was located, a buoy was placed at the edge of the 50-ft buffer zone and a perpendicular line was placed into the channel (**Photo 2**). Any seagrass within 2 m on either side of the transect and within the buffer zone or channel was recorded to map the spatial area of seagrass habitat within the project footprint. To characterize the seagrass habitat and estimate species abundance, the percent cover of seagrass was estimated within a 1-m^2 quadrat using the Braun-Blanquet cover-abundance method. Where seagrass was observed, cover-abundance data was collected along each linear transect spaced approximately 150 ft apart. All spatial and directional data was recorded and logged to determine areas of seagrass habitat.

2.4 Hypack® and Video Data Processing

Data collected in Hypack® navigation software was converted from its raw format for use within other software programs such as ArcGIS or AutoCad. Raw data was reviewed for any navigation spikes or errors and corrected before being converted from a raw file and exported as a .dxf or .dwg file for application and use within a Geographic Information System (GIS) software program. Raw video data was reviewed in conjunction with the log book to correlate time and navigation coordinates with visual observations of seagrass, hardbottom, or other habitats and/or anomalies.

3.0 RESULTS

A total of 12 towed video transect lines were surveyed for seagrass and hardbottom resources; **Figure 2** shows the full survey area and locations of the video transect lines which covered 92,099 linear feet of seabed. Real-time observations of seagrass or hardbottom were documented in the log book by time of day correlating with a specific location (X,Y coordinates) recorded within Hypack® (**Attachment C**). All video was recorded onto an on-board hard disk drive and seventeen 60-minute mini-DV tapes. While conducting the seagrass survey, visibility was limited to less than ≤1 ft (**Photo 3**) throughout most of the survey area located within the navigation channel and turning basin. In the nearshore environments surveyed for hardbottom resources, visibility was also poor (1 to 2 ft) due to ongoing beach nourishment activities occurring off the northwestern tip of Bowditch Point (**Photo 4**) which resulted in increased turbidity, primarily in northern survey area off Estero Island. Tidal cycles were monitored in an attempt to utilize high tides in order to potentially increase the visibility, specifically within areas furthest from the inlet. However, only a slight improvement in water clarity was observed in association with high tides. During both the seagrass and hardbottom survey, the video sled was towed as close to the seabed as possible to document and observe the presence of any

sensitive habitats or organisms. In-water seagrass surveys were conducted via snorkel due to the shallow depths of the observed seagrass (≤2 ft at low tide); SCUBA diving was not required as anticipated.

3.1 Seagrass

A total 42,118 linear feet of seabed was surveyed along the 8 video transect lines, spaced 100 to 240 ft apart depending on location as part of the seagrass survey. **Figures 3** through **11** show the locations of the seagrass survey video transects. Transect lines were diverted from their planned routes where physical barriers such as fishing vessels or shallow water due to sand accretion was present. During the video survey, only shoal grass (*Halodule wrightii*) (**Photo 5**) was observed in a small area within the 50-ft buffer zone along video transect line number 2 (**Figure 10**), closest to the eastern edge of the exposed shoal (**Photo 6**) near the turning basin. No other seagrass was observed during the video survey within the Federal navigation channel, 50-ft buffer zone, or Advanced Maintenance Dredging area. The seabed within the channel is characterized by silty sediments and sands interspersed with pockets of shells and shell hash. This soft bottom habitat is colonized by motile invertebrates such as urchins, starfish, pin shells, oysters, and horseshoe crabs. Where artificial or natural hard substrate such as debris or rock is present, hydroids, fleshy macroalgae, and an occasional sponge or gorgonian (soft coral) was observed.

Due to the presence of seagrass along the eastern edge of the shallow shoal bordering the channel to the south, a line-intercept survey was conducted to determine the spatial extent of the seagrass within the project footprint. Buoys were placed at the edge of the 50-ft buffer zone and every 150 ft along the shoal for a total of 16 transects. CSA's marine scientist stretched a measuring tape from the buoy to the perimeter of seagrass habitat toward the navigation channel. Any seagrass within the project area was recorded to the nearest 0.1 m (**Attachment D**) to map seagrass habitat within the buffer zone and/or channel.

No seagrass was observed within the Federal navigation channel, while both shoal grass (*H. wrightii*) and turtle grass (*Thalassia testudinum*) were observed within the 50-foot buffer zone (**Photo 7**). Several narrow bands of seagrass were documented during the line intercept survey, growing the in shallow water (<3 ft) along the edge of the shoal within the 50-ft buffer zone (**Figures 10** and **11**), approximately 40 ft outside the channel toe. The total area of seagrass habitat within the 50-ft buffer zone covers an area of approximately 2,216 ft^2. To determine the abundance and species composition of seagrass within the project footprint, a Braun-Blanquet survey was also conducted along each transect (**Photo 8**). Of the 16 transects, only 6 contained any seagrass, almost exclusively shoal grass (*H. wrightii*). Cover abundance estimates were made along each transect in all locations where seagrass was observed due to its minimal coverage within the project area. A total of 13 sample points (quadrats) were collected. The typical shoal grass (*H. wrightii*) coverage ranged from 1% to 15%, with an average of 10.2%. Turtle grass (*T. testudinum*) was observed outside of the line-transect sampling range and was not detected in the sample set. Macroalgae, observed in only 2 of the 13 sample points, averaged 37.5% coverage.

3.2 Hardbottom

A total of 49,981 linear feet of seabed was surveyed along 4 video transect lines (**Figures 12** through **15**), spaced approximately 150 ft apart, as part of the hardbottom survey. Video transect lines were diverted around fixed objects such as piers and shallow waters due to sand accretion where vessels cannot enter. Transect lines 4, 5, and 6 could not be extended any

farther north than shown on **Figure 2** due to beach nourishment activities ongoing during the survey. The pipeline corridor and nearshore disposal area is characterized as a soft-bottom habitat dominated by sand and sparsely colonized by fleshy green and red macroalgae (e.g., *Caulerpa* spp. and *Laurencia* spp.), hydroids, sand dollars, conchs, and urchins. There were no hardbottom resources observed within the entire survey area, however there was a single observation of *H. wrightii* (**Photo 9**) within the northern pipeline corridor area (**Figure 2**). Due to limited visibility and beach nourishment activities, it was not possible to determine the size of this seagrass coverage within this area. The exact location along Transect 3 where this seagrass was observed in State Plane Florida East-Feet is provided in the following table.

Y	X	Latitude	Longitude
773397.07	666282.36	26.46140425°	81.96907996°

State Plane Florida East - Feet

4.0 SUMMARY

CSA performed towed video surveys for seagrass and hardbottom resources within the Federal navigation channel and nearshore environment of Matanzas Pass and Fort Myers Beach. A total of 92,099 linear feet of seabed was surveyed using a towed video system along 12 transects. **Attachment E** provides ArcGIS shapefiles of the video transect lines and seagrass habitat (provided on 2 CDs). All video data, recorded in real-time, has been copied onto 11 DVDs and are provided as **Attachment F**. In-water seagrass surveys were conducted around one shallow water shoal where narrow bands of seagrass habitat were delineated. Sparse to moderate of shoal grass (*H. wrightii)* and turtle grass (*T. testudinum*), and some macroalgae cover an area of 2,216 ft^2 within the 50-ft buffer zone approximately 40 ft outside the channel toe. Additional habitat occurs outside the buffer zone and navigation channel but was not included in this survey. Shoal grass (*H. wrightii*) coverage is approximately 10.2% coverage; turtle grass coverage is minimal and was not observed within the line-intercept transects. No other seagrass was recorded within the navigation channel, turning basin, or 50-ft buffer zone. Within the pipeline corridor and nearshore disposal area, no hardbottom resources or associated organisms were observed. Just offshore of the ongoing beach nourishment activities, one isolated patch of shoal grass (*H. wrightii)* was documented on video, along the western most transect.

Photo 1. Towed underwater video system.

Photo 2. Line-intercept method used for seagrass habitat delineation.

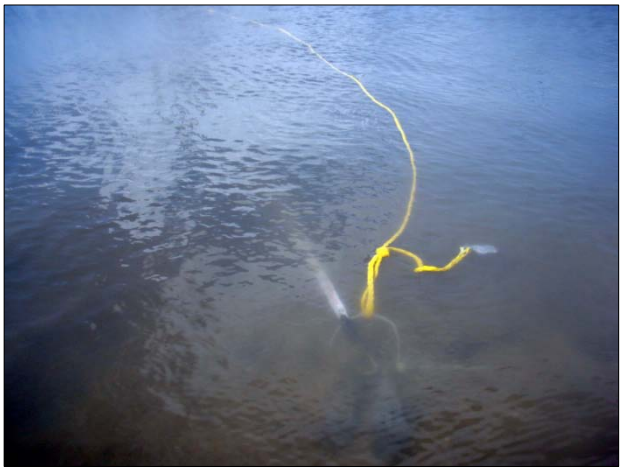

Photo 3. Limited underwater visibility within Federal navigation channel.

Photo 4. Beach nourishment activities off northwestern tip of Bowditch Point.

Photo 5. Shoal grass (*Halodule wrightii*) colonizing shallow shoal near turning basin.

Photo 6. Exposed shallow shoal near turning basin.

Photo 7. Shoal grass (*Halodule wrightii*) and turtle grass (*Thalassia testudinum*) colonizing shallow shoal near turning basin.

Photo 8. CSA scientist collecting seagrass abundance and species composition data.

Photo 9. Shoal grass (*Halodule wrightii*) observed during hardbottom survey.

Figure 1. General seagrass and hardbottom survey area.

Figure 2. Seagrass and hardbottom survey areas, transect lines, and seagrass habitat locations.

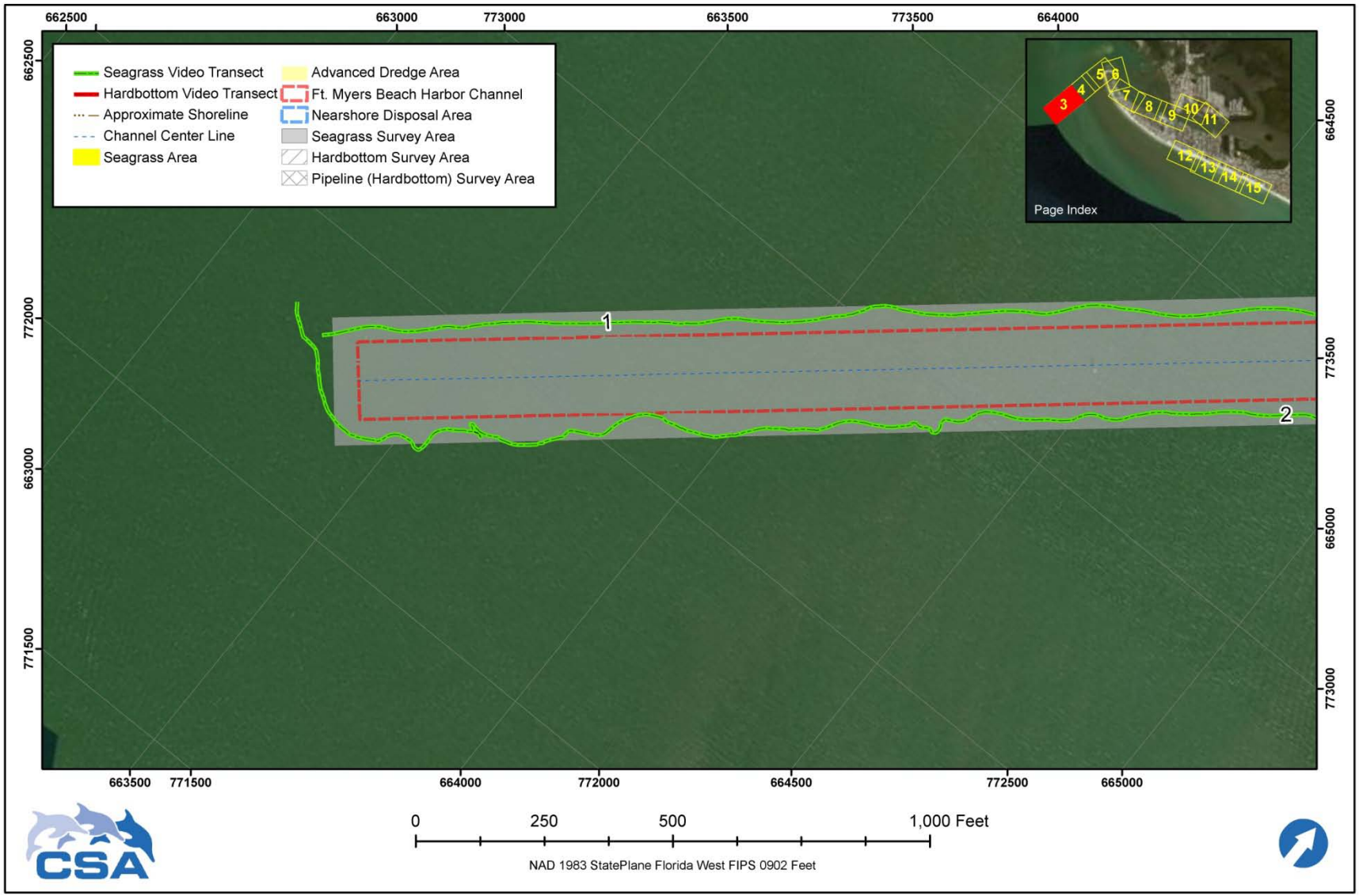

Figure 3. Seagrass survey Lines 1 and 2.

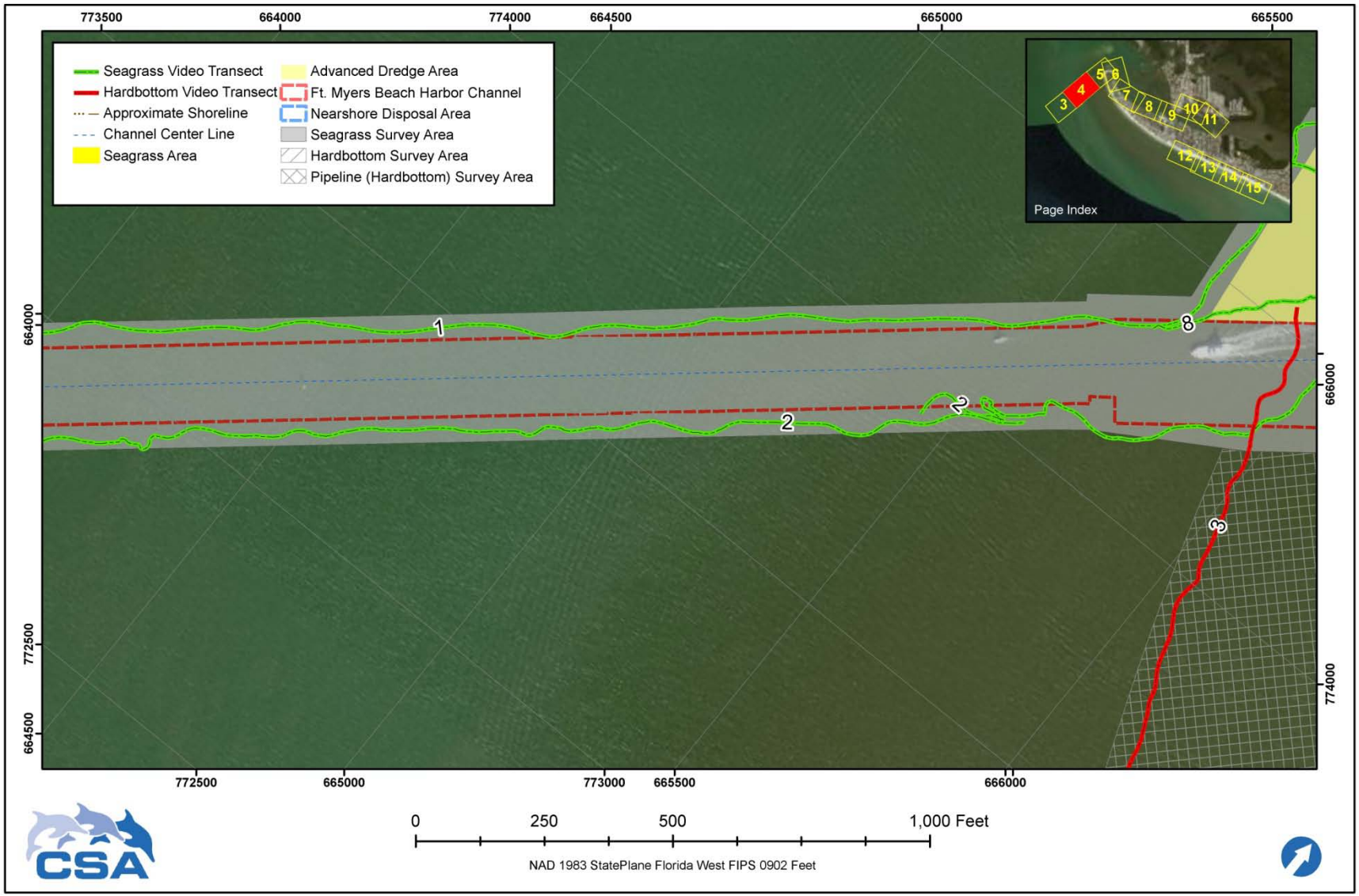

Figure 4. Seagrass survey Lines 1, 2, and 8; and hardbottom survey Line 3.

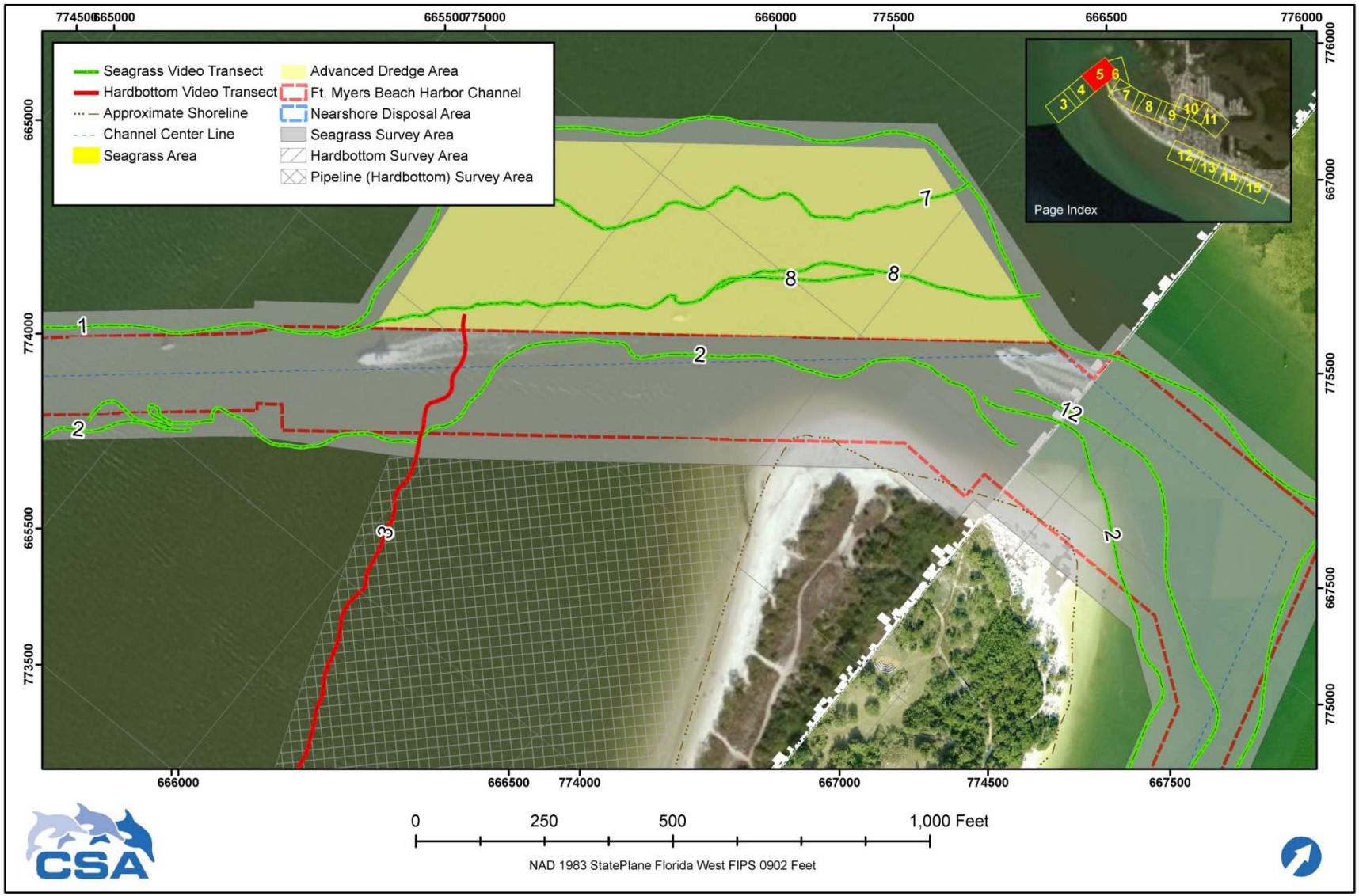

Figure 5. Seagrass survey Lines 1, 2, 7, and 8; hardbottom survey Line 3.

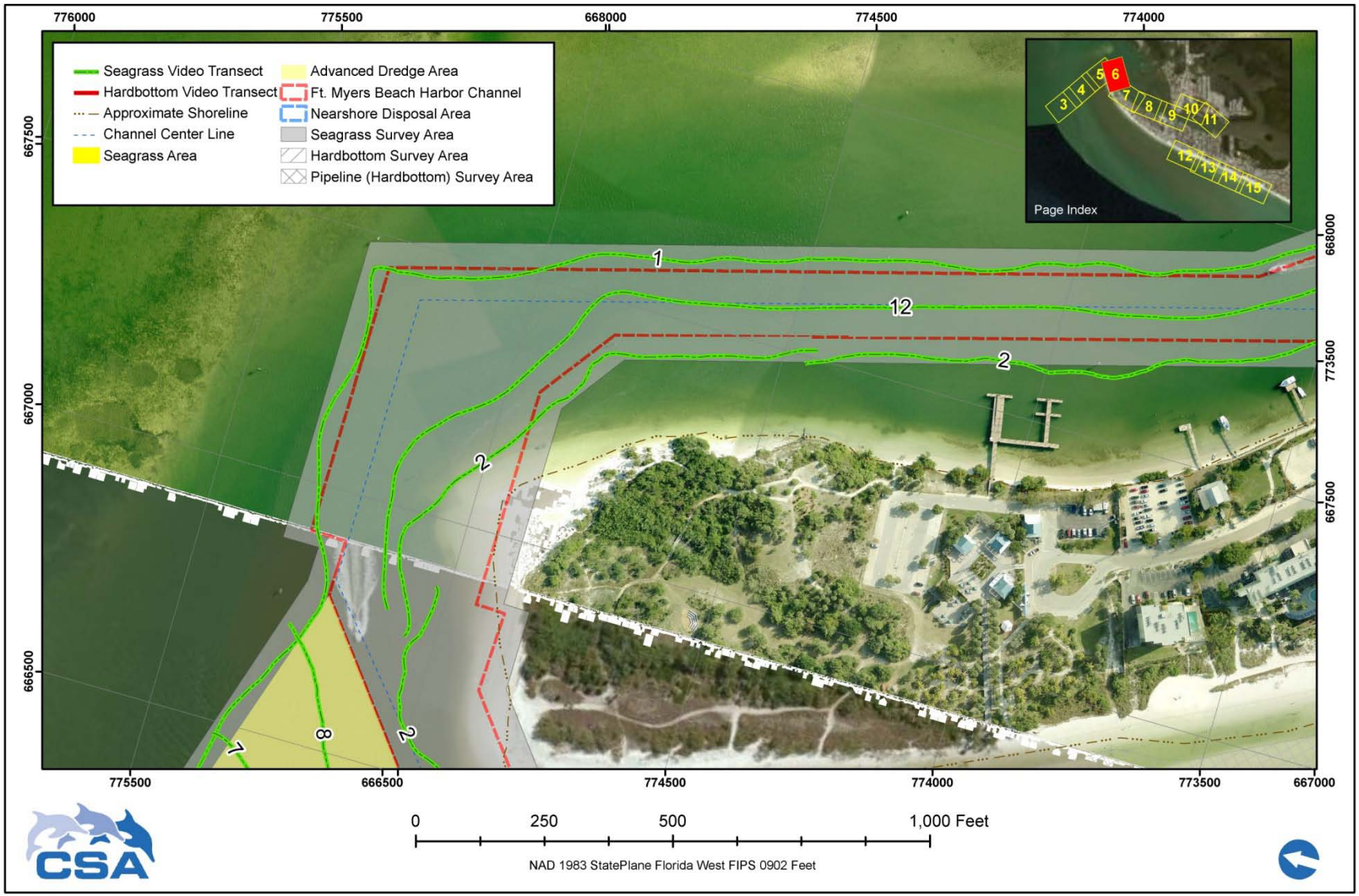

Figure 6. Seagrass survey Lines 1, 2, 7, 8, and 12.

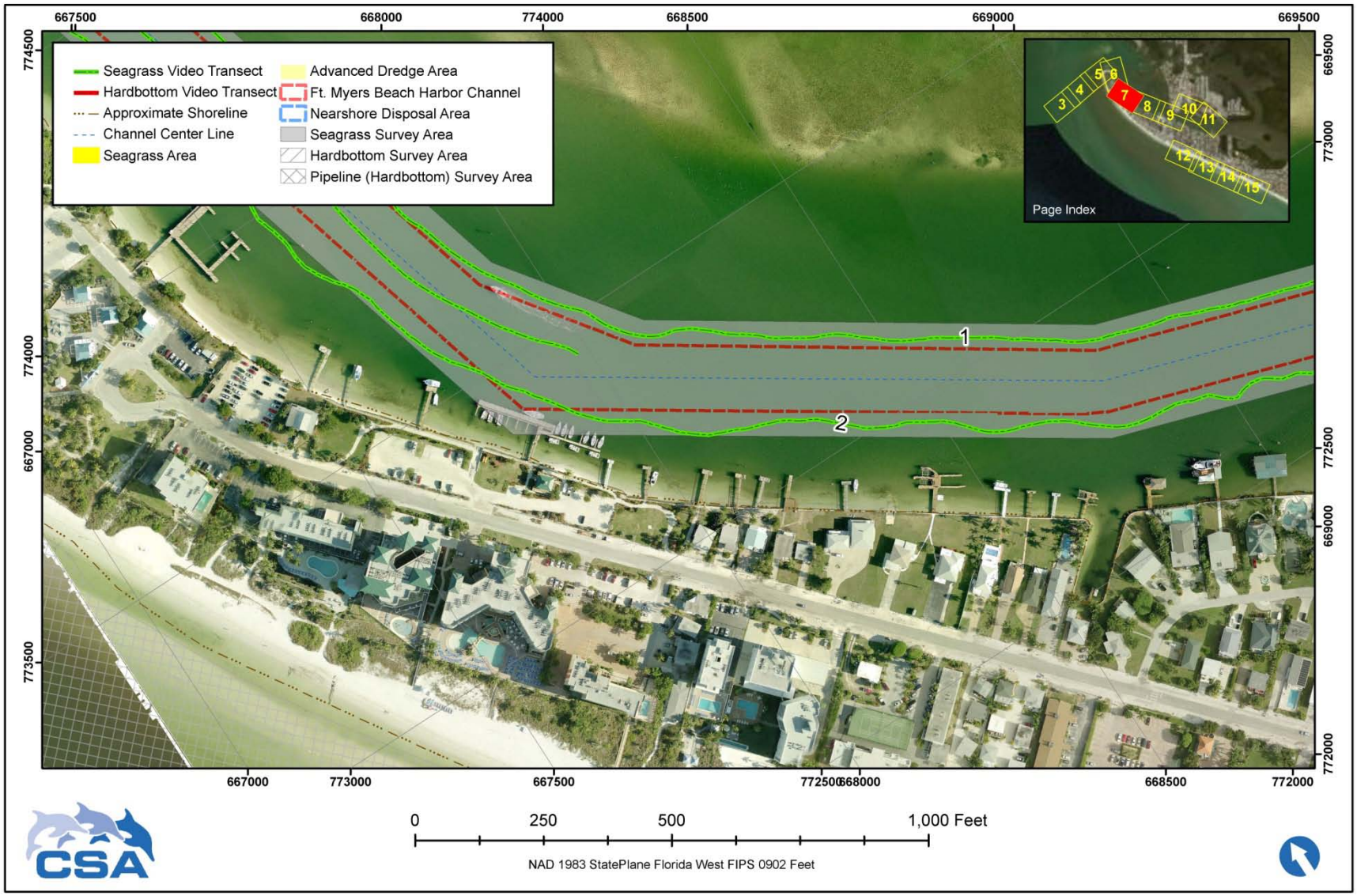

Figure 7. Seagrass survey Lines 1 and 2, continued.

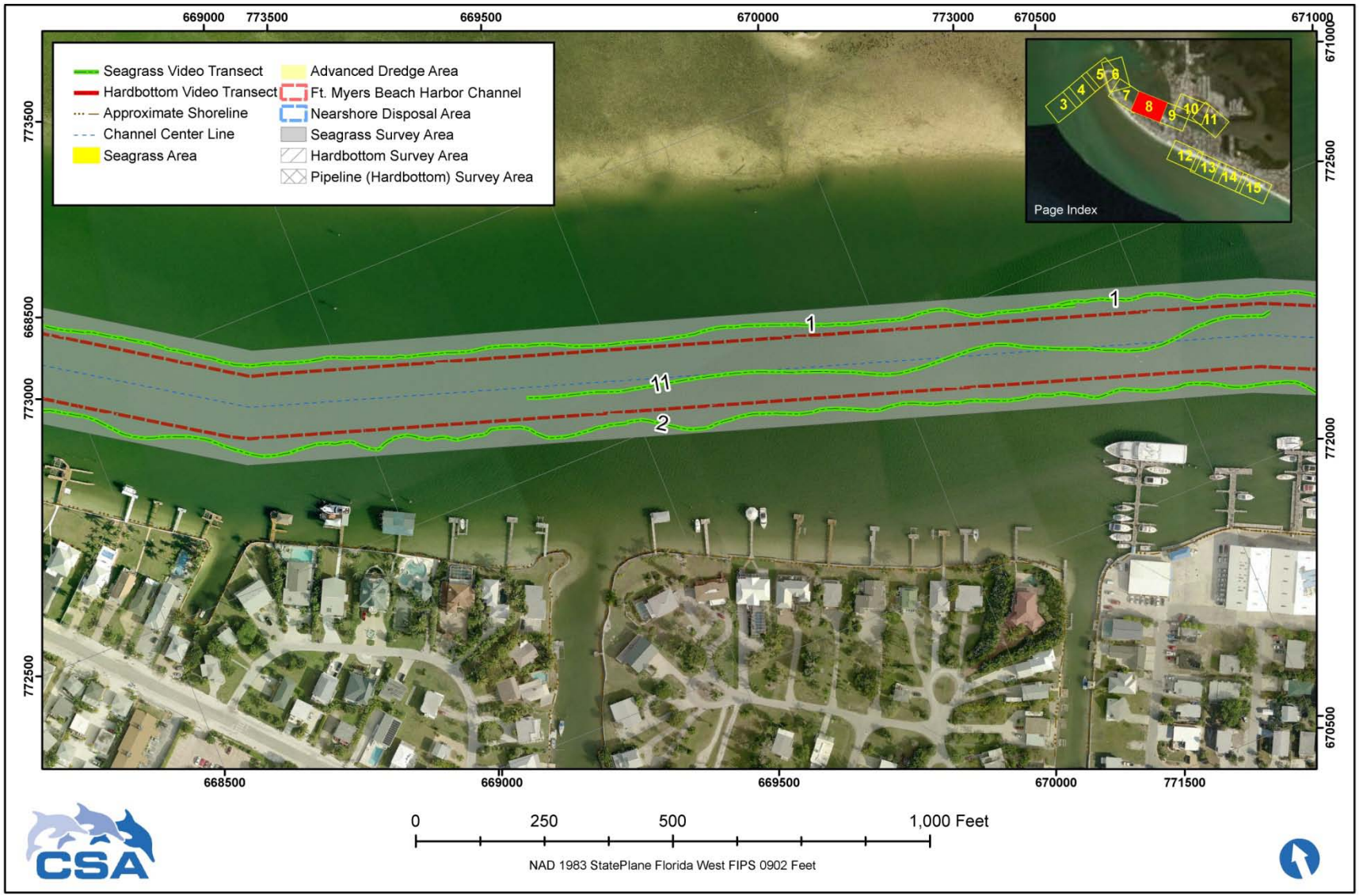

Figure 8. Seagrass survey Lines 1, 2, and 11.

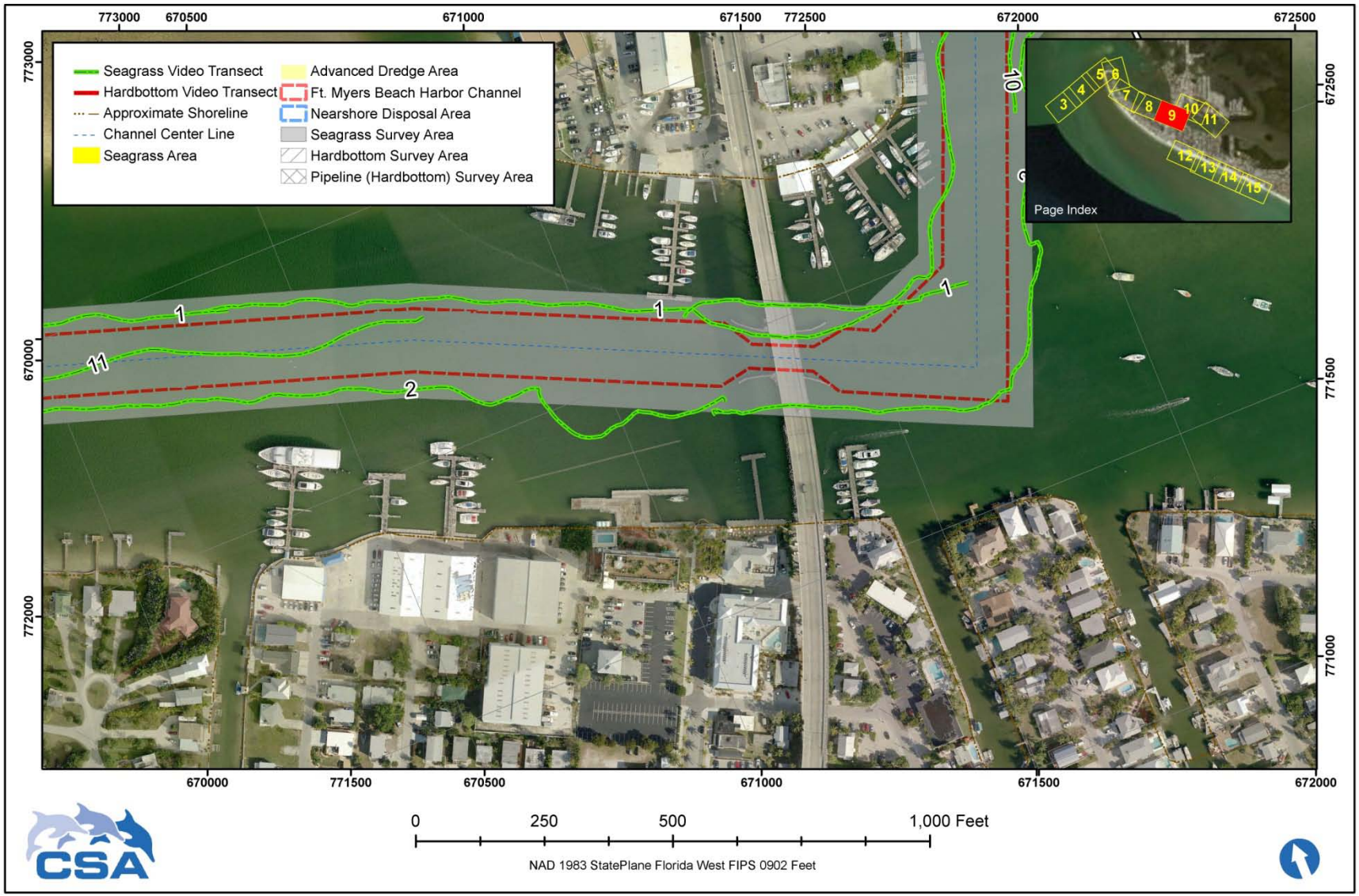

Figure 9. Seagrass survey Lines 1, 2, 10, and 11.

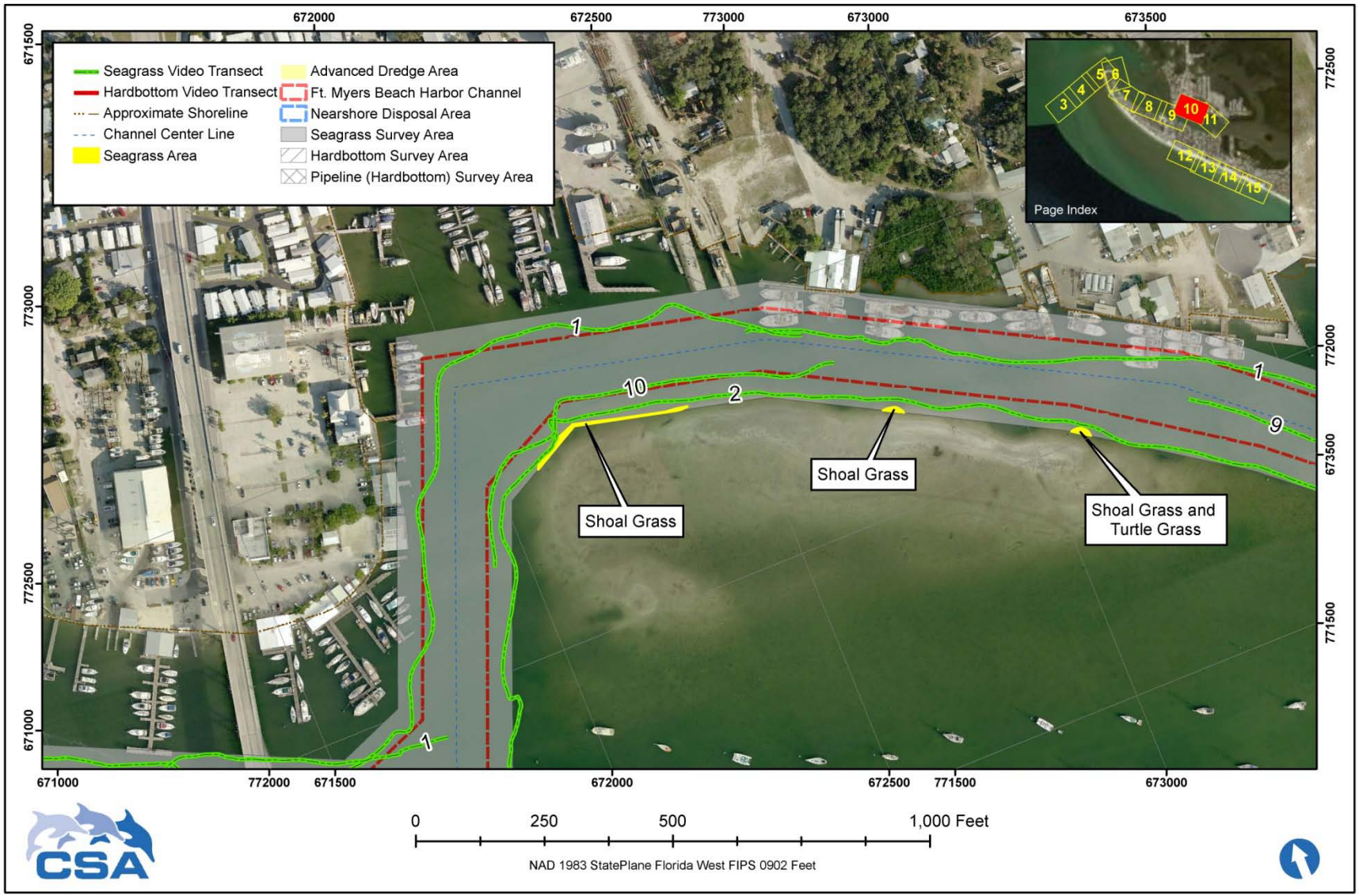

Figure 10. Seagrass survey Lines 1, 2, 9, and 10; and seagrass habitat within 50-ft buffer.

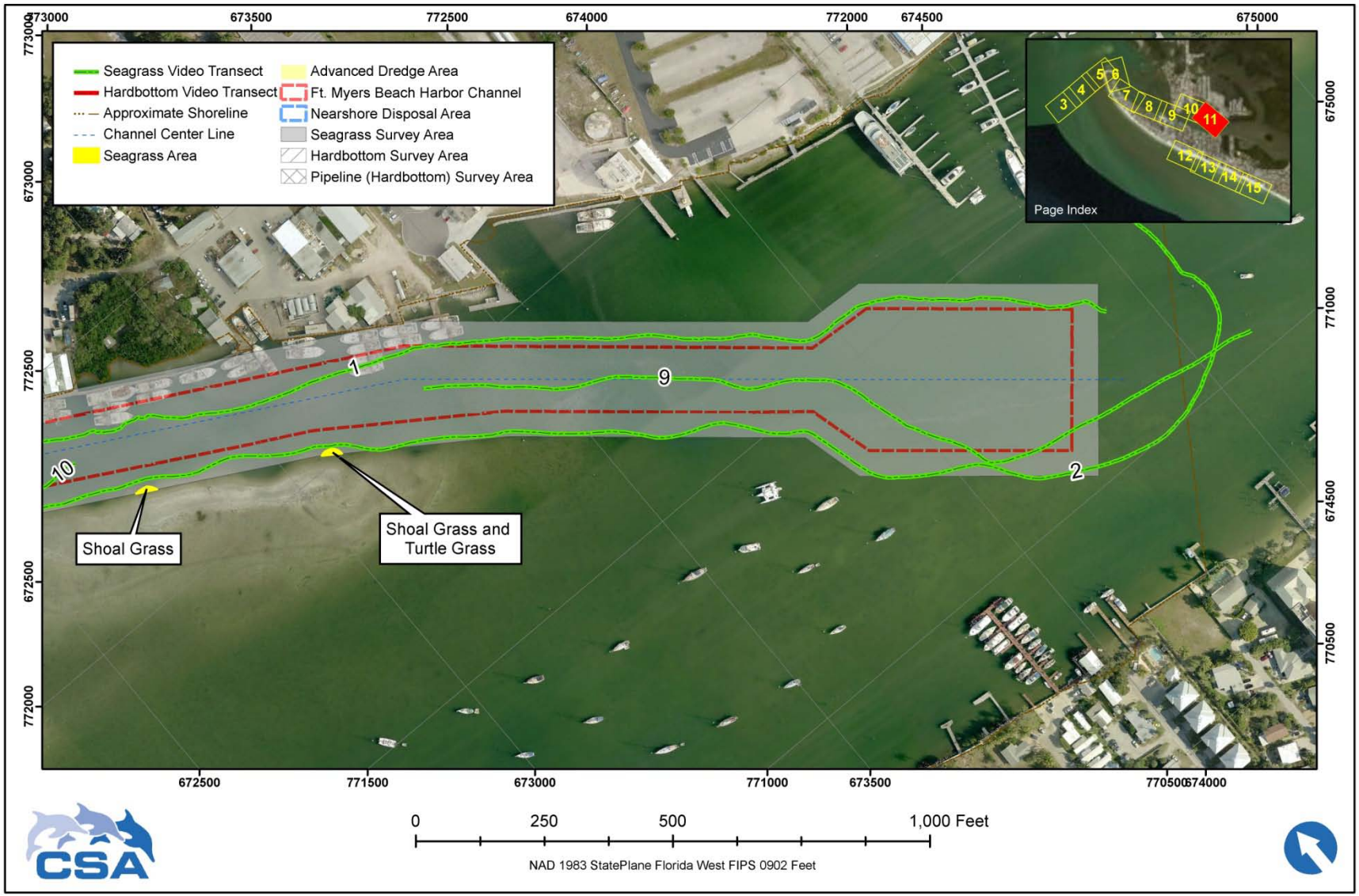

Figure 11. Seagrass survey Lines 1, 2, 9, and 10 continued; and seagrass habitat within 50-ft buffer.

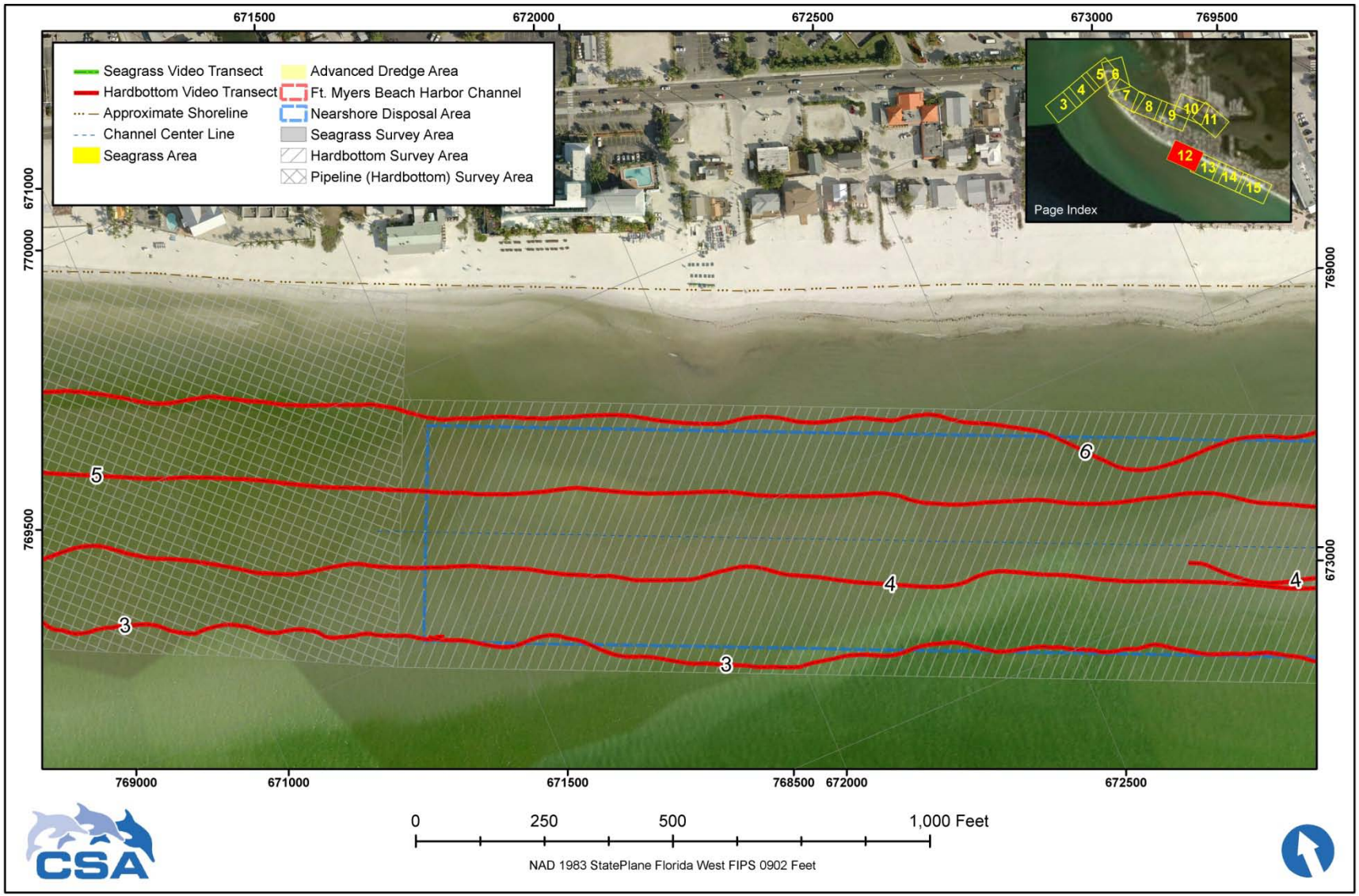

Figure 12. Hardbottom survey Lines 3, 4, 5, and 6.

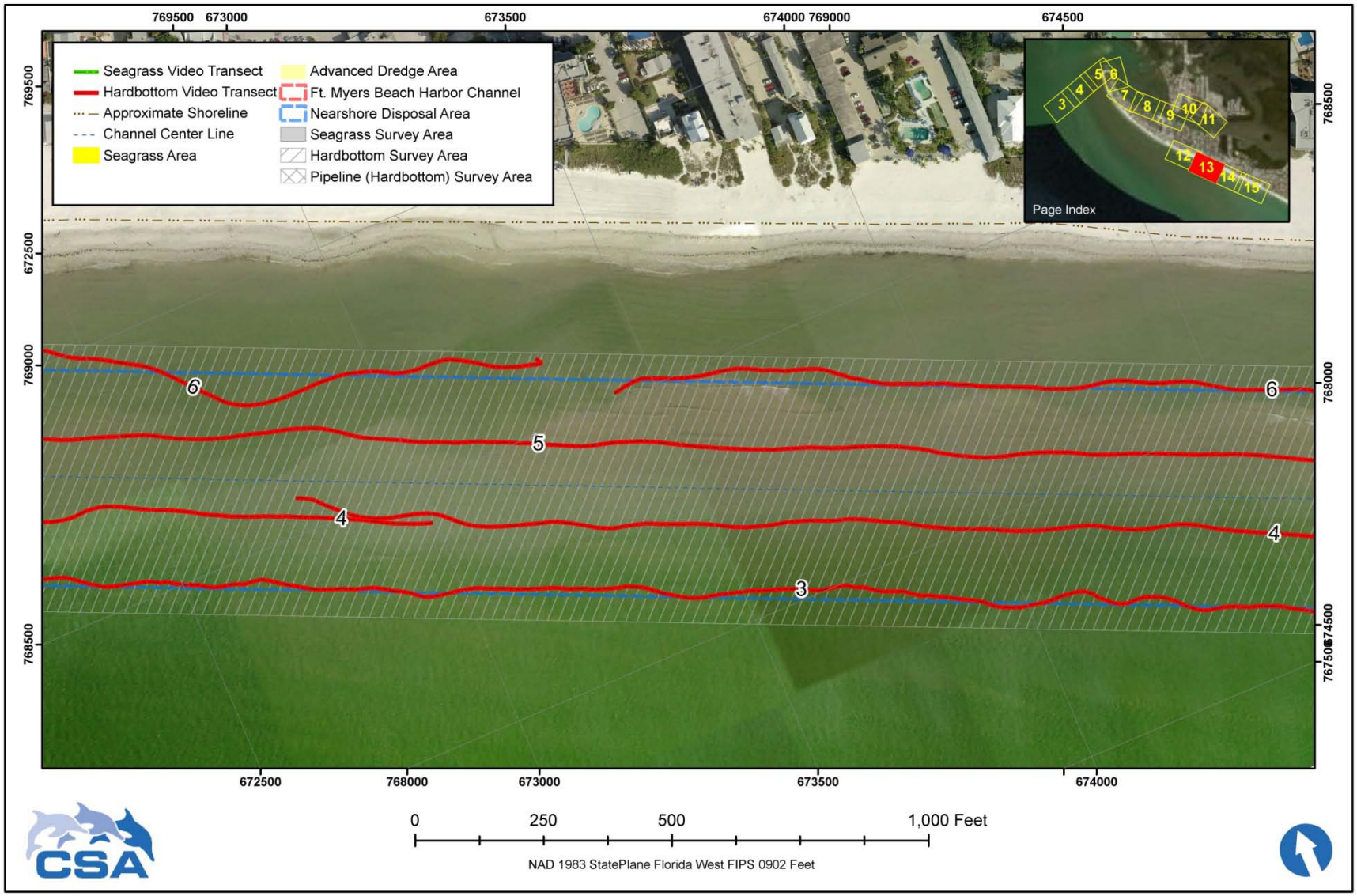

Figure 13. Hardbottom survey Lines 3, 4, 5, and 6, continued.

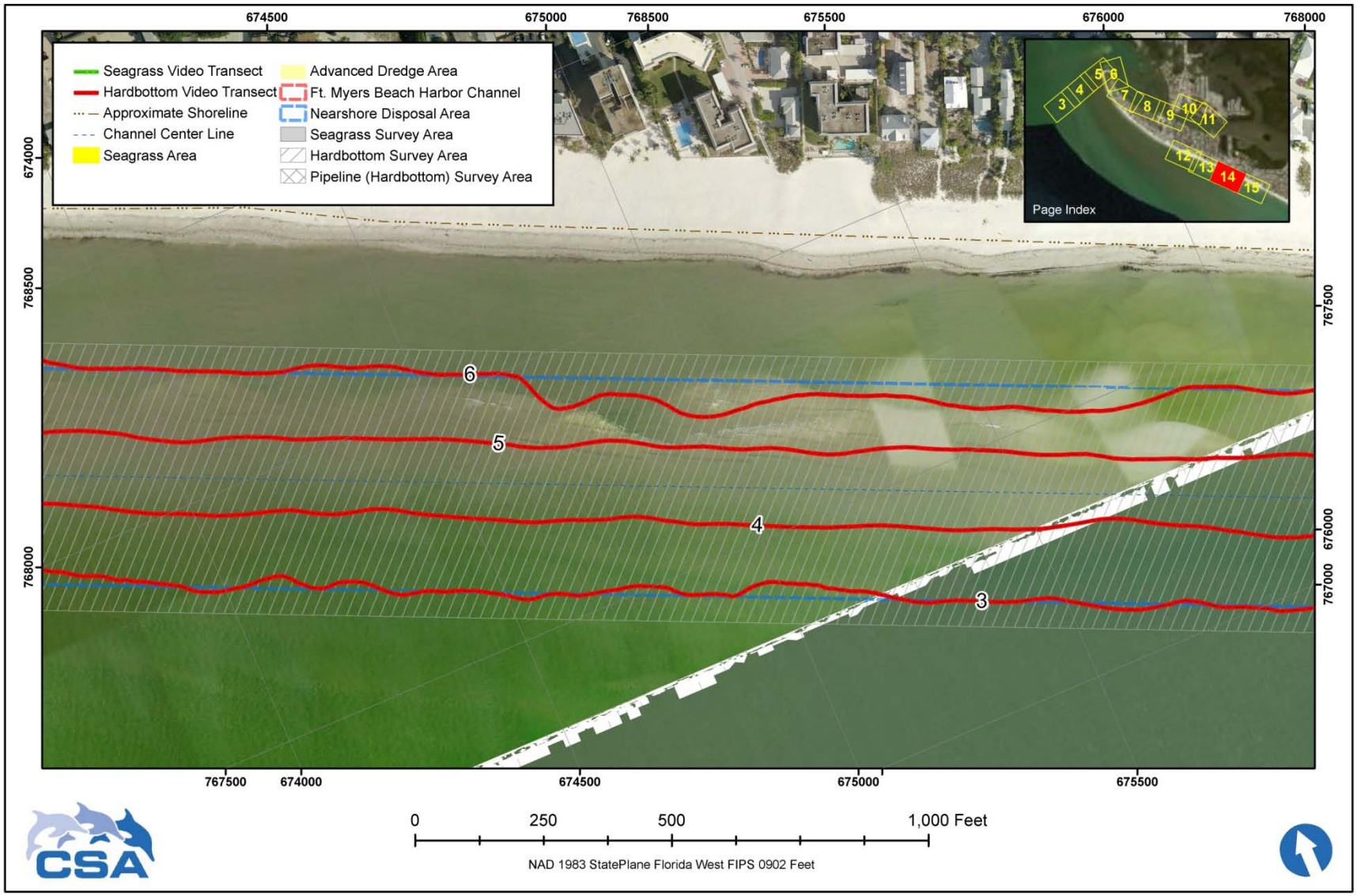

Figure 14. Hardbottom survey Lines 3, 4, 5, and 6, continued.

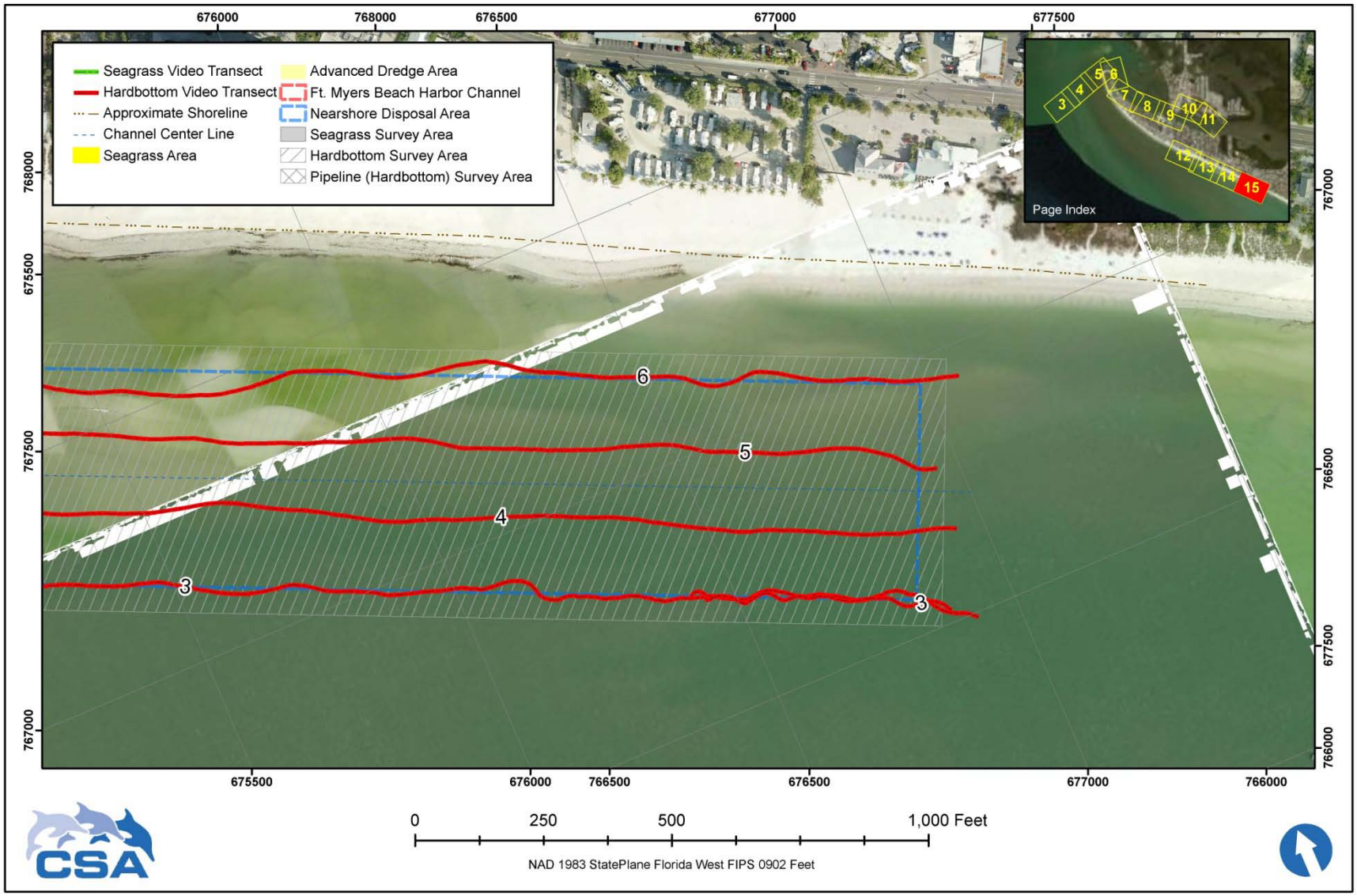

Figure 15. Hardbottom survey Lines 3, 4, 5, and 6, continued.

ATTACHMENT A

Dive Operations Plan

DIVE OPERATIONS PLAN

CSA International, Inc. Scientific Diving Services
In Support of USA Engineer District, Jacksonville
Order Number W912EP-11-F-0013
Seagrass and Hardbottom Resource Surveys

July 2011

Revision 1

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1.0 INTRODUCTION

CSA International, Inc. (CSA) has developed the following Dive Operations Plan in accordance with the CSA Safe Diving Practices Manual (**Attachment A**) and the project requirements. CSA, as a contractor, will perform seagrass diver surveys in support of work being conducted for the U.S. Army Corps of Engineers (USACE) in the Fort Myers Beach Federal Navigation Channel. The USACE is proposing to conduct maintenance dredging of the Federal Navigation channel and requires a determination on the pre-construction condition of the benthic environment with respect to seagrass and hardbottom. The Dive Operations Plan covers underwater assessment operations conducted to provide ecological and positional data of seagrass habitat to prepare a report showing mapped areas of sensitive seagrass habitat within the buffer areas surrounding the proposed dredging locations.

It is understood that CSA diving operations are only one part of the overall scope of work for the project, and that all CSA diving operations will comply with all requirements of Section 30 of the USACE "Safety and Health Requirements Manual," EM 385-1-1 (15 September 2008, which supersedes EM 385-1-1 [3 September 1996]), and Appendix O "Manning Levels for Dive Teams." CSA operates under Scientific Diving Guidelines as defined by the Occupational Safety and Health Administration (OSHA) 1910 Subpart T App. B. CSA is a member of the American Academy of Underwater Sciences (AAUS).

1.1 SITE DESCRIPTION

Specific locations for the diver seagrass surveys will be determined using towed video data collected within the 50-ft buffer from the channel toe throughout the entire 2.5 mi Fort Myers Beach Federal Navigation Channel and advanced maintenance dredging area. Specific location data (X,Y coordinates) will be collected in Hypack® where seagrass is observed or suspected to be present in order for divers to return and conduct *in situ* ground-truthing, characterization, and mapping exercises.

2.0 SCOPE OF WORK – ECOLOGICAL SUPPORT DIVING OPERATIONS

Divers will swim perpendicular to the channel along a linear transect and record the presence of seagrass habitat within 2 m on either side of the transect. The shoreward extent of the seagrass habitat that is within the project footprint will be recorded using either a hand-held or telemetric GPS system. This line-intercept approach will be used to map the spatial extent of the seagrass habitat and provide information regarding potential impacts. To characterize the seagrass habitat and estimate species abundance, divers will visually estimate the percent cover within a 1-m^2 quadrat using the Braun-Blanquet cover-abundance method. Quadrat data will be collected every 5 m along the linear transects, which will be spaced no greater than 150-ft apart. All spatial and directional data will be recorded and logged to create a spatial map of the seagrass habitat by area and species.

2.1 FIELD INVESTIGATION REPORT

Data deliverables from the towed video and seagrass diver surveys will include methodologies for the towed video surveys, diver surveys, data processing and analysis, maps and figures, dive and field logs, and a summary of the field results. CSA will submit a report in draft format for review by the USACE Project Manager and a final version will be delivered electronically to USACE with all USACE comments incorporated.

3.0 DIVING PARAMETERS

Based on a review of the information from the site, the maximum bottom depth will be 15 ft (~5 m). According to the U.S. Navy (Navy) Dive Tables, the maximum allowable bottom time for 20 ft is 325 minutes (see **Attachment B**). Therefore, bottom time will not be a safety concern for this project. All underwater work will be in accordance with the CSA Safe Diving Practices Manual (**Attachment A**).

All divers will follow the Navy Dive Tables and monitor their dive computers (**Attachment B**). No altitude adjustments will need to be made to the Dive Tables, as all working dives under this program will occur at sea level. During dive operations, a Standby Diver will be ready for rapid deployment in the event a submerged diver needs assistance. All topside safety checks and checklists will be completed and logged in the Pre-Dive/Post Dive Checklists prior to the commencement of operations (**Attachment C**). Dives will be documented for each working dive in a Dive Log/Dive Tender Log (**Attachment D**).

3.1 ENVIRONMENTAL CONDITIONS

The expected environmental site conditions are as follows:

- Water depths (Diving Mode): 0-15 ft
- Water visibility: 0-15 ft (water clarity depends on tidal conditions and location)
- Water temperature: ≥80ºF
- Water currents: <0.5 kt
- Wave conditions: diving operations will not be conducted in sea conditions greater than 3.3 ft, due to the protected nature of the survey area; seas greater than 3 ft are not expected

3.2 DIVE TEAM

The CSA seagrass survey dive team will consist of three divers – a Lead Diver, a Buddy Diver, and an Alternate/Standby Diver.

Divers' duties and responsibilities include, but are not limited to, the following:

- be a certified diver with appropriate diving qualifications;
- maintain appropriate level of fitness for diving;
- have training and/or experience in the performance of the assigned task;
- assure dive equipment is in good condition;
- perform assigned task in a safe and efficient manner; and
- perform as a Standby Diver, as necessary.

The CSA dive team outlined in **Table 2** will conduct the scientific diving for the project. Dive team qualifications are included in **Attachment E**.

Table 2. CSA dive team responsible for conducting survey.

Position	Personnel	Role
Diver Scientist	Anne McCarthy	Project oversight/Lead Diver
Diver Scientist	Debbie Fawcett	Buddy Diver
Diver – Alternate/Standby	Dustin Myers	Alternate/Standby Diver

3.3 DIVING, SURVEY, AND EMERGENCY MEDICAL EQUIPMENT

The following equipment will be used for the contracted tasks:

Diving Equipment:

- Standard SCUBA with gauges;
- Weight belts;
- Buoyancy compensation vest;
- Dive watch;
- Swim fins;
- Dive compass;
- Dive knife; and
- Whistle/flare.

Survey Equipment:

- Still cameras in underwater housings;
- Clipboard with data sheets/slates;
- Quadrats; and
- Survey tapes.

Emergency medical equipment (to be supplied by and on board the buoy installation dive contractor vessel):

- Emergency oxygen equipment, and
- Comprehensive first-aid equipment.

3.4 DIVING COMPRESSOR AND AIR REQUIREMENTS

All high-pressure diving air compressors (compressors used to fill SCUBA tanks) will be required to meet standards for air quality. Compressors must have been tested for air quality within the past year and meet the standards set in OSHA regulations, 29 CFR 1910, SubQPart T and BS EN 12021. Air compressor certifications should be available for inspection.

The air source utilized for diving operations and SCUBA tanks will be provided by CSA. CSA will use 80-ft^3 air tanks filled with standard air.

3.5 DIVE PROCEDURES

Prior to each dive, a pre-dive meeting will take place. The Dive Supervisor will describe the tasks to be accomplished during the dive, outline the hazards that may occur, and explain emergency procedures, should they be required. A record of each pre-dive meeting will be kept, documenting personnel present and information discussed. An assessment of each diver's physical and neurological condition will be made prior to the commencement of dive operations. Neither diver, Lead or Buddy, will enter the water until both divers are fully dressed and ready to begin the operations. All dive gear will be checked for proper operation prior to each day's dive. Divers will abort diving operations on the bottom when a diver's air supply reaches 500 psig (34 bar). The Dive Supervisor will be responsible for logging each diver's descent and ascent for every dive, as well as for running the Dive Tables for each diver's repetitive dives.

Following each field day, a daily debriefing will take place, the day's events will be discussed, and any events that may possibly have comprised an unsafe condition will be addressed. Equipment requirements and concerns also will be addressed during the daily debriefing. A record of each post-dive meeting will be kept documenting personnel present and items discussed.

Dive procedure checklists (**Attachment C**) and equipment certifications are contained in the CSA Safe Diving Practices Manual (**Attachment A**). The dive plan, CSA Safe Diving Practices Manual, hazard analysis, and emergency information will be available to team members on site at all times. Any individual who finds an unsafe condition will report the situation to the Dive Supervisor, and operations will not continue until the unsafe condition has been corrected.

3.6 DIVING VESSEL

The vessel will contain all necessary safety and communications equipment required for safe diving operations. During diving operations, the vessel will exhibit and fly the international flag identifying that diving operations are underway. The Dive Supervisor and/or the Vessel Master will monitor U.S. Coast Guard (USCG) Search and Rescue (SAR) Unit Marine Radio via very high frequency (VHF) radio Channel 16.

4.0 ACTIVITY HAZARD ANALYSES

The described scope of work presents hazards for contractor personnel. All diving (commercial, scientific, or archaeological) inherently presents a degree of risk for injury and exposure to elements that endanger working personnel. CSA has attempted to anticipate situations that might arise during diving or deck operations and the subsequent required emergency actions. These situations will be covered in the Emergency Management Plan (**Section 5.0**). The following subsections deal with the potential hazards associated with the specific diving tasks related to the referenced scope of work.

4.1 SITE-SPECIFIC HAZARDS

All diving operations will be performed from a vessel positioned near the work site. Diving operations will be conducted while the vessel is anchored. All diving and diving-related equipment will be placed on the vessel in a manner as not to interfere with or be in line with the diving operations. On site, diving will take place in water depths no greater than 15 ft. This water depth will not require a manned decompression chamber on site; however, medical facilities operating a decompression chamber located close to the work area will be detailed, in the event of an emergency.

4.2 FIXED-STRUCTURE HAZARDS

Within the survey area, structures such as fixed piers, bridges and docks are will be considered during diving operations. Personnel will ensure that proper methods for diving around and near fixed structures are utilized, including ensuring all divers are aware of locations and potential hazards such as direct hits while swimming in limited visibility conditions.

4.3 OVERHEAD HAZARDS

Divers will be made aware of any overhead structures prior to diving operations. Divers will either be out of the water or at a safe location during the placement and/or removal of buoys with anchors/weights or other dangerous loads that may be associated with the diving operations.

Tended SCUBA operations, including diver entry and/or diver exit, will not be conducted in conjunction with the motorized movement of the vessel. Divers also will be made aware of the position of entry ladders and other overhead obstructions that may be considered a hazard. All divers will be aware of the vessel during entry and exit.

Due to the nature of this scope of work, a number of diver entries and exits will be conducted. Divers will be made aware of the hazards, and all precautions will be taken to identify and avoid these hazards prior to the dive, including safe entry and exit from the dive vessel and maintaining visual sight of vessel, if possible, immediately upon entering the water and upon ascending to the surface. In addition, dive team members will stay in sight of each other at all times, ascending and descending to the work site in a slow and safe manner.

4.4 HYPERTHERMIA

Operations in warmer climates involving strenuous activities can, even in relatively cool weather, lead to excessive sweating and overheating of the body's core. This is particularly true

when a person wears protective clothing that may reduce the body's ability to discard excess heat. This situation may lead to dehydration, heat cramps, heat exhaustion, or possible heat stroke and increases the potential for decompression sickness. All personnel will be aware of the signs and symptoms of hyperthermia and be prepared to act immediately in the event of the following injuries:

- Dehydration – Signs include feeling lightheaded, sluggish, and/or dizzy. The affected person will be moved to a cool, shaded area and given cool water to drink.
- Heat cramps – Heat cramps are muscle cramps. Usually, these cramps occur in the arms or legs but may be in the abdominal or chest muscles as well. These cramps are caused by excessive body fluid loss through sweating. The affected person will be moved to a cool, shaded area and given cool water to drink.
- Heat exhaustion – Signs include heavy sweating, weakness, fast pulse, normal body temperature, headache, dizziness, nausea, and vomiting. The affected person will be moved to a cool, shaded area and placed lying down with legs straight and elevated 8 to 12 in. The affected person will immediately be cooled by any means available (ice, water, etc.). Cold water will be given to drink only if person is conscious. The affected person will be transported to the nearest hospital if no improvement is noted within 30 minutes or if the person loses consciousness.
- Heat stroke – Signs include high body temperature, unconsciousness, hot skin, rapid pulse and breathing, weakness, dizziness, or headache. The head and shoulders will be kept slightly elevated, and the airway will be checked to make sure the person is breathing. The affected person will immediately be transported to the hospital.

4.5 MARINE CREATURES

During diving operations, unanticipated encounters with hazardous marine organisms can produce potential injuries to divers and result in the need for medical attention. In most injuries, these medical requirements can be treated with an on-board first-aid kit. In some instances, severe reactions/injuries can occur that require emergency medical care. If warranted, the affected diver will be evacuated to the nearest emergency medical center for treatment. A listing of the more common hazardous marine organisms and their corresponding injuries and treatments are noted in **Table 3**. Suggested first-aid kit contents are listed in **Attachment F**. (First-aid kit is supplied by CSA.)

Table 3. Common potentially hazardous marine organisms with corresponding injury and recommended treatment.

Marine Organism	Injury Type	Medical Requirement
Jellyfishes – Ctenophora and Cnidaria	Tentacle sting	On-board first-aid
Coral, oyster, shell mollusks	Scrapes, lacerations, and skin rashes	On-board first-aid; antibiotics, if required
Horseshoe crab – Anthropoda	Puncture wound	Local emergency medical care, if warranted
Shark	Puncture wounds and lacerations	Local emergency medical care
Spiny sea urchin	Puncture wound	Local emergency medical care, if warranted

4.6 GENERAL RECOMMENDATIONS AND CONTROLS FOR HAZARDS

- Dive staff will be thoroughly briefed on any vessel traffic or work being conducted in the vicinity of the dive operations site. In order to facilitate the safe conduct of diving operations, a distinct line of communications will be implemented that flows from pre-dive planning sessions. In the event that a diver is injured, the Dive Supervisor will determine whether the injured diver can be aided by the in-water Buddy or if the Standby Diver should be deployed. In conjunction with ongoing rescue response, the Dive Supervisor or the Vessel Operator will immediately implement the pre-determined emergency protocols and communication procedures.
- The dive station and immediate topside work zone will be kept organized and free from extraneous equipment. Dive teams will be tagged with a dive buoy, and their progress will be monitored via visual observation of dive buoys and voice communications with the divers.
- Appropriate dive apparel will be worn for the on-site water temperature, and bottom times will be adjusted for the bottom water temperature.

A detailed Hazards Analysis/Risk Assessment is included in **Table 4**. Risk ranking descriptions and likelihood of occurrence/consequence of hazards are described in **Tables 5** and **6**, respectively.

Table 4. Hazards Analysis/Risk Assessment.

Hazard	Consequences/Risk	Severity	Safeguard(s)/Control Measure(s)	Risk Matrix	
				Likelihood	Risk Rank
Lifting accidents, dropped equipment	Injuries, damage to or loss of equipment/ material	Major	Lifting procedures, lift plan, worker awareness, qualified/experienced personnel	Remote	B
Boarding/loading boats	Trips, falls, injuries, damage to or loss of equipment	Minor	Designated boarding/loading areas and procedures, first-aid, clear work procedures	Infrequent	A
Work in security controlled area	Blocked access to work area, interruption of work activities	Major	Liaison with security apparatus; submission of security document; submission and obtaining of authorized camera permits, equipment permits, and personnel passes at earliest opportunity; continuing contact/clearance with security apparatus as work progresses; timely notifications of changes in work activities/schedules	Remote	B
Man Over-Board (MOB)	Loss of personnel	Major	PFDs, work deck rules, safety chain, MOB procedures	Infrequent	C
Hygiene in the galley	Illness, impacts to work productivity	Minor	Bottled water, HSE inspections to include hygiene and drinking water requirements	Infrequent	A
General health and safety (offshore/on water)	Heat exhaustion and overheating, exposure, dehydration, minor injuries	Moderate	Adequate drinking water available, sunscreen, light clothing, clear decks, designated work areas and clear work procedures, first-aid	Infrequent	B
Spillage of fuels, oils, and lubricants	Environmental degradation, regulatory fines, damage to reputation	Major	Refueling on land or in port only, adequate capacity for full-day operations	Infrequent	C

Table 4. (Continued).

Hazard	Consequences/Risk	Severity	Safeguard(s)/Control Measure(s)	Risk Matrix	
				Likelihood	Risk Rank
General health and safety (onshore)	Exposure, dehydration, minor injury	Moderate	Adequate shade, adequate drinking water available, sunscreen, light clothing, clear/designated work areas, clear work procedures, work breaks	Infrequent	B
Road/driving accidents	Collisions, damage to vehicles or equipment, injury	Major	Use of licensed and experienced drivers, safe driving at posted speeds, seatbelts	Remote	B
Personal security threats	Injury, kidnapping, fatality	Major	Security briefing, personnel awareness	Remote	B
Food-/water-/blood-borne pathogens	Debilitating illness, impacts to productivity	Moderate	Worker training, HSE briefing, emergency response plan	Infrequent	B
Unsafe weather/sea state conditions	Damage to vessels, injury to or loss of divers	Major	Weather forecast reviews, continuous monitoring of local weather, ongoing communications, delay/cancel/abort weather thresholds	Remote	B
Rough sea conditions	Injuries, MOB, damage to or loss of equipment/materials	Moderate	Check for secure deck and equipment/ materials before getting underway, use of PFDs	Infrequent	B
Bottom hazards (e.g., debris, low visibility, snags, currents)	Entanglement leading to drowning, loss of divers	Major	Underwater communications, bottom hazard mapping, GPS, buddy diver, standby rescue diver, standby vessel, diver awareness	Infrequent	C
Vessel mechanical failure or damage	Loss of vessel, vessel adrift, stranded divers	Major	Rigorous vessel maintenance and inspection, standby vessel, float plan, established communications	Remote	B
Unsafe deck conditions (e.g., wet, cluttered)	Slips, trips, falls, MOB, damage to equipment	Moderate	Clear decks, designated work areas, clear work procedures, emergency response plan	Infrequent	B
Underwater obstructions, contact with bottom, grounding	Damage to seabed features/organisms, damage to boats/ equipment, injuries	Major	Review of nautical charts, mapping of navigation hazards, experienced boat operators	Remote	B
Other vessel/traffic shipping	Collisions, diver injuries	Major	Communications system, deck watch, regular contact with port, dive flags	Remote	B
Dive operations from small boats	Diver injury, fatality	Major	Established water entry and exit procedures between dive team, support crew, and boat operator	Infrequent	B
Diving equipment failure or loss of air	Loss of air, buoyancy impacts, impact to work productivity	Major	Dive equipment maintenance and inspection, diver training, octopus, Buddy Diver, bailout bottles, backup equipment, emergency oxygen and defibrillator equipment on board, comprehensive first-aid equipment	Remote	B
Decompression illness	Loss of consciousness, fatality, impact to work productivity	Major	Diver logs, dive computers, mandatory shallow water safety stops, underwater communications, standby rescue diver, ready access to decompression facilities, emergency response plan	Remote	B
Contaminated air supply	Diver injury, fatality	Major	Maintenance and inspection of air compressors	Remote	B

Table 4. (Continued).

Hazard	Consequences/Risk	Severity	Safeguard(s)/Control Measure(s)	Risk Matrix	
				Likelihood	Risk Rank
Lost diver, diver separation	Drowning injury, fatality, impact to work productivity	Major	Buddy Diver, underwater communications, Standby Diver, separation procedures, diver equipment (e.g., whistles/ lights)	Remote	B
Dangerous wildlife (sharks, sea snakes, jellyfishes, sea urchins)	Poisonous bites, lacerations, traumatic injuries	Minor	Avoidance, protective equipment, first-aid kit, first-aid experience of team, emergency response plan	Remote	A
Medical emergencies (injured/unconscious diver/worker, limited timely medical access/support)	Lack of/late medical attention leading to medical complications, possibly disablement/ fatality	Major	Emergency procedures for diver extraction, established communications to shore, standby vessel, onshore emergency support, emergency response plan, emergency oxygen and defibrillator equipment on board, comprehensive first-aid equipment	Remote	B
Emergency preparedness	Inadequate response to emergencies	Minor	Conduct drills, HSE inspection to review emergency systems	Infrequent	A

HSE = health, safety, and environment; GPS = global positioning system; MOB = man over-board; NAUI = National Association of Underwater Instructors; and PFD = personal flotation device.

Table 5. Risk ranking descriptions.

Risk Ranking	Description
A	Broadly acceptable
B	Tolerable
C	Subject to further study; identification of risk reduction measures and Cost Benefit Analysis
D	Subject to further study; identification of risk reduction measures and Cost Benefit Analysis
E	Unacceptable

Table 6. Risk matrix.

Likelihood of Occurrence		Consequence of Hazard				
		1	8	16	50	100
		Minor	Moderate	Major	Critical	Catastrophic
0.5	Insignificant	A (0.5)	A (4)	B (8)	B (25)	C (50)
1	Remote	A (1)	B (8)	B (16)	C (50)	D (100)
2	Infrequent	A (2)	B (16)	C (32)	D (100)	D (200)
5	Occasional	A (5)	C (40)	C (80)	D (250)	E (500)
10	Frequent	B (10)	C (80)	D (160)	E (500)	E (1,000)

5.0 EMERGENCY MANAGEMENT PLAN

5.1 EMERGENCY PROCEDURES

All diving operations will be conducted in strict accordance with the CSA Safe Diving Practices Manual (**Attachment A**).

5.2 EMERGENCY PHONE NUMBERS

The primary method of communication during any dive site emergency will be via VHF radio. The dive support vessel will have one operational VHF radio. A cellular phone also will be available for use. Emergency telephone numbers and monitored VHF frequencies posted at the dive station will include, but not be limited to the following:

Emergency Contact List

Project vessel:	CSA 25-ft Parker
Anne McCarthy:	CSA Project Manager
Land line:	(772) 219-3050
Cell:	(561) 676-6989
Kathleen McConnell:	USACE COTR
Office:	(904) 232-3607
Cell:	(941) 504-4835
Police:	911
Coast Guard:	Channel 16

Hospital Contact Numbers

The nearest operational recompression chamber for each dive location (name, address, and phone number), keep in mind an injured diver should be taken to the closest hospital first:

Hyperbaric Chamber:
Lee Wound Care
13778 Plantation Road
Fort Myers, Florida 33912
(239) 343-0454

Nearest Hospital, but No Recompression Chamber:
Lee Memorial Hospital
3776 Cleveland Avenue
Fort Myers, Florida 33901
(239) 343-2000

Emergency Transport for an Injured Diver: USCG SAR Unit
Marine Radio, USCG SAR Unit: VHF Channel 16
Lee County Police: (239) 477-1000

5.3 DIVING RESCUE PROTOCOLS

The following are detailed rescue protocols that will be followed by all diving personnel in the event of an emergency. These protocols are outlined for reference only and should only be used when they pertain to the specific emergency at hand. In the event that any diving- or vessel-related emergency should occur, the USCG will be contacted immediately and organize and coordinate all emergency personnel and services. As soon as the injured person(s) is stabilized on board, the vessel will begin transit to an agreed upon location whereby shore-based emergency personnel will take over and transport the injured personnel to the nearest hospital or chamber.

Tag Out

In general, all pumps, valves, gates, or any other equipment that could compromise diver safety will be de-energized or, in as many ways as deemed safe by the Dive Supervisor, be taken out of service and tagged with a “Danger Tag.” All dive team members will be briefed on tagged-out equipment, the importance of ensuring that said equipment is not activated, and that under no circumstance will the tag or tags be removed by anyone except the Dive Supervisor. The client will be notified of all tagged equipment and asked to brief his crew in regard to the meaning of the tags and the potential for personnel endangerment.

Diving operations will not be conducted in areas where differential pressures cannot be equalized. There are no anticipated or foreseeable problems regarding differential pressures for this project.

Actions Upon Discovery of Fire

- Fire on a vessel is a very serious emergency. Fire can develop from a variety of different places and can include electrical fires, engine fires, fuel fires, and fire erupting from other combustible materials. Upon discovery of a fire, all hands should immediately sound alarm and muster whatever fire-fighting tools are available, including fire extinguishers and water buckets (if appropriate to the type of fire). Depending on the severity of the fire, emergency services should be contacted as soon as possible to assist in controlling the fire and/or to provide emergency rescue services. Once the fire is under control and extinguished, appropriate points of contact should be notified.

Loss of Air

In the event of a loss of main air:

- Switch to back-up air supply (bailout bottle);
- Immediately begin ascent from water according to normal procedures;
- Remove diver from the water; and
- Contact Dive Supervisor and resolve cause of the loss of air.

Fouled (Entangled) Diver

- Have diver clear himself immediately before continuing work; and
- If the diver cannot clear himself, have in-water Buddy or Standby Diver clear the diver.

Loss of Vital Support Equipment – Dive Vessel

- In the event that the dive vessel becomes unable to pick up the diver following his dive, a rescue line with a buoy will be trailed behind the vessel while at anchor. A life ring with 30 m (100 ft) of line will be accessible from the vessel to throw to the diver, if needed.

Injury/Illness of Surface Crew

- Dive Supervisor will assess the extent and nature of the illness.
- If required, immediate first-aid and CPR techniques will be administered and emergency services contacted for assistance and rescue.
- If divers are underwater, they will immediately be given instruction to return to the dive support vessel. In the event the emergency "Return to the Vessel" signal (rapid blows to the hull of the vessel with a hammer) is given, divers will abort their task and return to the vessel.
- Upon the safe recovery of the divers, the vessel will return to the dock or await emergency rescue services to evacuate the injured crew member or diver.
- The local ambulance will transport the injured diver to the appropriate medical aid under the supervision of the Emergency Medical Team (EMT) or the designated personnel.

Diver Rapid Ascent

- Dive Supervisor will coordinate the rescue effort.
- Standby Diver(s) will assist in extraction, if needed. Standby Diver(s) will be recovered as soon as conditions permit.
- Diver will be removed from the water. If unconscious, tenders will shackle diver into lifting device and assist in bringing him up the ladder.
- Personnel trained and qualified in administering CPR and basic first-aid will remove the diver's mask and check for breathing and pulse. If breathing is absent but pulse is present, they will start mouth-to-mouth ventilation while removing the dive suit. If breathing and pulse are absent, they will remove the suit and begin CPR. The diver's feet will be raised above his head to prevent the migration of air bubbles within the blood stream.
- When the medical team arrives, they will take charge, providing the diver's condition is not a dive-related medical problem; the Dive Supervisor or his designee will remain active in the medical treatment. Other personnel will assist as necessary.
- The local ambulance will transport the injured diver to the appropriate medical facility under the supervision of the EMT or the designated personnel.

Injured Diver

- Depending on the nature and severity of the injury, an injured diver may be treated on-board the dive vessel by the dive team using first-aid techniques and a standby first-aid kit. If the diver's injuries are extensive and require emergency medical attention, the following actions will be taken:
  - Dive Supervisor will assess diver's injuries and immediately begin emergency first-aid procedures.
  - If warranted, the Dive Supervisor will immediately implement pre-determined emergency protocols. The injured diver will be transported to the nearest point of pickup. The Dive Supervisor will continue emergency first-aid or CPR techniques until rescue services arrive.

- Dive Supervisor also will immediately notify the Project Manager and other appropriate points of contact.

Unconscious Diver

- The Standby Diver(s) will be instructed to prepare to assist in diver extraction if needed. Once the diver is extracted, Standby Diver(s) will be recovered as soon as conditions permit. Standby Diver(s) will be continuously monitored during diver extraction.
- The unconscious diver will be removed from the water with the aid of topside personnel, under the direction of the Dive Supervisor.
- The Dive Supervisor will immediately contact USCG and assist in the coordination of the rescue effort.
- Personnel trained and qualified in administering cardiopulmonary resuscitation (CPR) and basic first-aid will remove the diver's mask and check for breathing and pulse. If breathing is absent but pulse is present, they will start mouth-to-mouth ventilation while removing the dive suit. If breathing and pulse are absent, they will remove the dive suit and begin CPR.
- When the EMT arrives, or the dive support vessel reaches the dock, the EMT will take charge, providing the diver's condition is not a dive-related medical problem; the Dive Supervisor or his designee will remain active in the medical treatment. Other personnel will assist as necessary.
- The pre-designated transport vehicle will transport the injured diver to the appropriate medical aid (Medical Center or Recompression Chamber) under the supervision of the EMT or designated personnel.

Recompression Chamber

- The EMT will transport the diver, being actively supplied oxygen, to the Recompression Chamber. The Dive Supervisor, or his designee and the responding Dive Medical Technician, will accompany the ambulance.

ATTACHMENTS

ATTACHMENT A

CSA International, Inc. Safe Diving Practices Manual

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INTRODUCTION

The safety program for CSA International, Inc. (CSA) diving operations will utilize the Association of Diving Contractors (ADC) Manual of Safe Practices in Commercial Diving, Occupational Safety and Health Administration (OSHA) and State standards, and any rules or regulations of the governing country of client where diving or sea operations occur. All supervisors will thoroughly acquaint themselves with safety manuals, and applicable rules and regulations to ensure that diving operations are carried out in compliance with the enclosed ADC Manual of Safe Diving Practices in Commercial Diving, with the attached depth limits and other instructions, as well as the OSHA Standards for Safe Diving Practices.

This manual will be available at the scene of all operations where CSA personnel are conducting diving operations. The CSA on-site supervisor will ensure that all personnel associated with diving operations are familiar with the Safe Practices Manual and its location on site. The U.S. Navy Manual decompression schedules and other procedures are included for reference.

All diving operations and/or related or accompanying tasks are to be carried out in strict accordance with the practices, procedures and guidelines which are listed in The U.S. Navy Diving Manual, The Consensus Standards for Commercial Diving Operations and OSHA Commercial Diving Operations 29 CFR 1910.401.

PHYSICAL HAZARDS

Following is a discussion of a variety of hazards that should be considered when undertaking any diving or survey operation for CSA. These items below discuss physical hazards, boat safety and subsea hazards that may occur at any time. CSA employees should be familiar and aware of these hazards when conducting any operation.

Hypothermia

Although unlikely, wintertime air and water temperatures may be low enough to expose the body to rapid heat loss and a cooling of the body's core temperature. In cold water, the body will lose heat many times faster than in the air. Even outside of the water, wet clothing will conduct heat away from the body much faster than dry clothing. Rapid heat loss can cause loss of consciousness and, if not checked, death. To protect against hypothermia, personnel should wear proper wetsuits and other protective clothing. If clothing becomes wet, personnel should move to a protected, preferably warm area until their clothes dry or can be changed out for dry clothes.

Hyperthermia

Operations in warmer climates, involving strenuous activities can, even in relatively cool weather, can lead to excessive sweating and overheating of the body's core. This is particularly true when a person wears protective clothing that may reduce the body's ability to discard excess heat. This situation may lead to dehydration, heat cramps, heat exhaustion, or possible heat stroke and increases the potential for decompression sickness. All personnel will be aware of the signs and symptoms of hyperthermia and will be prepared to act immediately in the event of the following injuries:

- Dehydration – Signs include feeling lightheaded, sluggish, and/or dizzy. The affected person will be moved to a cool, shaded area and will be given cool water to drink.
- Heat cramps – Heat cramps are muscle cramps. Usually these cramps occur in the arms or legs but may be in the abdominal or chest muscles as well. These cramps are caused by excessive body fluid loss through sweating. The affected person will be moved to a cool, shaded area and given cool water to drink.
- Heat exhaustion – Signs include heavy sweating, weakness, fast pulse, normal body temperature, headache, dizziness, nausea and vomiting. The affected person will be moved to a cool, shaded area and placed lying down with legs straight and elevated 8 to 12 inches. The affected person will immediately be moved to a cool, shaded area and will be cooled by any means available (ice, water, etc.). Cold water will be given to drink only if person is conscious. The affected person will be transported to the nearest hospital if no improvement is noted within 30 minutes or if person loses consciousness.
- Heat stroke – Signs include high body temperature, unconsciousness, hot skin, rapid pulse and breathing, weakness, dizziness or headache. The head and shoulders will be kept slightly elevated and the airway will be checked to make sure the person is breathing. The affected person will be immediately transported to the hospital.

Noise

Some operations may require the use of generators, pumps, compressors, engines, and other equipment that can generate high levels of noise. Short-term exposure to extremely loud noise

and/or long-term exposure to low level noise can cause hearing loss. Personnel assigned to a high noise area should wear proper hearing protection.

Aquatic Life

Injuries from aquatic life are classified in one of three major categories: 1) punctures, 2) stings, and 3) bites. Puncture wounds can be caused by sea urchin, spiny fish, or stingrays. If possible, any foreign material in the wound must be removed. Toxin may have been injected and must be treated by soaking the wounded area in water as hot as the victim can tolerate for 20 minutes. Some divers may be hypersensitive to contact with marine animals and may require medical attention.

Stinging corals, jellyfish, sea anemones, etc. all present possible dangers to divers. First-aid for stings, such as those from jellyfish or coral, includes removal of the stinging materials and application of a neutralizing agent. Medical attention is required if the injury is serious, significant blood loss occurs, or the patient shows signs or symptoms of an allergic reaction.

Gloves should be worn during restoration work in order to avoid further damage to corals and to protect diver's skin from contact with cement/epoxy.

Lifting

During some operations, there may be several instances when personnel would be called on to lift and/or carry a heavy load, sometimes over rough or unstable terrain. When doing so, personnel should be instructed to observe the following rules:

- Test the load – before attempting to lift a load, test it to make sure it can be moved safely;
- Plan the move – check the travel path to make sure it is clear;
- Use a wide, balanced stance with one foot head of the other;
- Keep the back in its normal arched position while lifting – bend at the knees or hips to distribute the forces more evenly;
- Bring the load as close to the body as possible – do not let the back become the fulcrum;
- Keep the head and shoulders up – maintain the arch in the lower back;
- Tighten the stomach muscles – this unloads the spine and puts the weight on the stomach;
- Lift with the legs and stand up in a smooth, even motion – use leg strength to lift, straightening the knees and hips;
- Move the feet to change direction – do not twist at the waist, as this will stress the supporting structures of the back; and
- Communicate with a buddy if they are involved in the lift – this reduces the likelihood of sudden or jerking movements.

Boat and Water Safety

When personnel are boarding a boat, they should:

- Know who the Vessel Captain is – he/she has the ultimate authority over their actions on the boat;
- Know who the supervisor is – he/she knows what their duties are and can answer any safety or health questions that they have;
- Become familiar with the layout of the boat;

- Know where emergency equipment (e.g., fire extinguishers, life jackets, life rings, and life rafts) is stored;
- Know how to use emergency equipment; and
- Do not board a vessel without a U.S. Coast Guard approved personal flotation device – wear the device properly.

While personnel are on board the boat, they should:

- Watch out for slippery deck surfaces, especially if they are covered or stained with oil – use sorbent pads to clean up oil and/or to improve traction along walkways;
- Watch out for erratic boat motions in rough seas – use safety lines when they are working on the deck;
- Avoid taking medicines for seasickness – may cause drowsiness;
- Do not become distracted by the task at hand – know where they are and what is going on around them; and
- Be aware of ropes and lines on deck – keep clear of lines being deployed.

If personnel fall over board, they should:

- Orient themselves to floating hazards in the area;
- Move away from hazards if in danger; otherwise stay put until rescued;
- Look for a flotation aid thrown from a vessel;
- Avoid unnecessary movement of arms and legs;
- Float as still as possible, with legs together, elbows close to sides, and arms folded across the front of life jacket; and
- Try to keep head and neck out of water and do not panic.

If personnel observe someone fall overboard, they should:

- Not take their eyes off the victim;
- Point to the victim while raising the alarm;
- Notify others by calling “man overboard;” and
- Throw a flotation aid to the victim. Do not throw device at victim, but near enough to victim that victim can easily swim to device.

If a victim is semiconscious, personnel should:

- Check for breathing and heart beat – administer CPR, if necessary;
- Move the victim to a cool environment;
- Remove the victim’s clothes – do not massage the skin;
- Insulate the victim from further heat loss – wrap the victim in a blanket;
- Do not attempt aggressive warming; and
- Gentle re-warming can be attempted by placing a bottle filled with warm water next to the victim’s head, neck, arm pits, or groin.

Do not give the victim anything to eat or drink, and never offer alcohol.

EQUIPMENT

The key to equipment safety is to know how to operate a piece of equipment properly before using the equipment. Personnel who are unsure how to use a piece of equipment should ask their supervisor.

Personal Protective Equipment

The primary objective of personal protective equipment is to prevent the skin from coming into contact with chemicals, oil, aquatic life, and working materials (cement/epoxy). Items that should be available upon need include rain slicker, rubber gloves, rubber boots, and a hard hat. Duct tape should be wrapped around the wrists and ankles to seal the rain slicker to the gloves and boots and prevent the migration of chemicals and oil up the arms and legs.

On shore, a lightweight, disposal suit and cloth gloves can be worn, particularly in warm to hot weather. These items do not provide the same degree of protection; however, they can be changed if they become heavily soiled.

When personnel are engaged in and activity where oil can splash into the eyes, or they are using or are around equipment that produces flying objects, they should wear safety glasses. If they wear contact lenses, they should wear tight fitting goggles.

Underwater Equipment

Divers should be trained prior to use of equipment underwater (e.g., pneumatic drills, lift bags). Safety procedures as outlined in 29 CFR 1910.401 (OSHA – Commercial Diving Operations) should be followed at all times (see attached).

Other General Safe Equipment Practices

- Keep alert around moving equipment – understand and follow the signals of the equipment operators;
- When operating equipment, be sure to wear the proper safety equipment – safety glasses, hearing protection, hard hat, etc.;
- When operating equipment, do not wear loose clothing or rings;
- Be familiar with the equipment – know any safety features and how to shut equipment down if a problem arises;
- Make sure all engine and electrically driven equipment is in proper operating condition, including ground wires; and
- Do not operate electrical equipment while standing in water.

When working around equipment wear the proper safety equipment, keep alert, and move away if they sense that the equipment poses a threat to their safety and/or health. Never engage in horseplay while using or working around equipment.

DIVE PLAN AND DIVER SAFETY

Assignments and Responsibilities

At every project involving SCUBA diving, a CSA Dive Supervisor will be assigned. A dive crew will consist of at least a four-man team. On each dive a two-man dive team will be identified to

conduct underwater operations; the surface team will be composed of one Standby Diver, gear ready to assist the two-man dive team in the event of an emergency, and a topside supervisor. Each dive crew will be coordinated and controlled by a Dive Supervisor. The dive plan and the safety of the dive team are the responsibility of the Dive Supervisor.

The Dive Supervisor will plan all dives and review any pertinent safety or procedural information for the current project and the conditions prior to each dive. The Dive Supervisor will ensure that proper records and logs are kept for each dive. In addition, the Dive Supervisor shall also be responsible for the calculation of repetitive dives using the dive tables. He also shall assign an assistant to review these calculations to ensure that all dives are performed under the no-decompression limits.

The Dive Supervisor should also designate a dive leader for each dive team that enters the water. The dive leader is responsible to keep track of the dive team, and ensure that the work at hand is carried out in a safe and efficient manner. The dive leader should constantly monitor his team's air supply, bottom time, task progress as well as the overall safety and well being of the team. Although the dive leader will participate in the work of the dive team, he should not become so engrossed in the work that he loses track of his responsibility to the dive team. It also is the responsibility of the dive leader to terminate the dive should he sense dangerous or unsafe conditions of any type. After the dive, the dive leader should give a full report on the progress of the dive as well as any problems or suggestions to the Dive Supervisor.

The designated dive team leader also will undertake the responsibilities of the Dive Supervisor, when the Dive Supervisor is conducting a dive and the dive leader is on the surface. These responsibilities are outlined in the paragraphs above and include, monitoring the dive team, and keeping all logbooks.

Dive Operations

Diver operations will be kept safe at all times. The assigned Dive Supervisor will monitor all operations. The Dive Supervisor is responsible for recording bottom times and surface intervals for each diver/dive team. The depth at the site shall be noted and appropriate bottom times and surface intervals will be calculated and strictly supervised.

CSA Diving policy does not allow SCUBA dive's deeper than 100 ft. All SCUBA diving shall be conducted under the buddy system with a standby diver on the surface monitoring the dive and prepared to assist the dive team in the event of an emergency.

All underwater operations will be kept within the safe no-decompression diving limits set forth in the diving tables. A copy of the decompression tables will be available at every dive location and Emergency Contact numbers will be posted on the work vessel.

General Diving Practices

The following general diving practices will be followed:

- All divers will be certified in SCUBA by an internationally recognized organization.
- All divers will be surface-tended with hardwire or line pull communications.
- Prior to starting a dive, the dive team will run through a basic check of the dive teams equipment (i.e., air on, weight belt attached, fins on, etc.) and general dive plan.
- Display a dive flag on the surface vessel at all times during diving operations.

- Every dive team will take a buoy with them at all times so that surface personnel can track the dive team.
- Enter the water in a safe manner (no swan dives from the bow pulpit).
- Wait for your buddy at or near the surface and descend together slowly.
- Equalize pressure early and often during descent.
- Once on the bottom note the conditions, (i.e., visibility, direction of current, water depth, air pressure, and potential hazards).
- Adjust your buoyancy for the project at hand.
- Remain with your diving partner at all times.
- Each diver monitors their dives to ensure that they remain within no-decompression limits (see sample dive log).
- Each diver will be responsible for monitoring their gauges to ensure that they do not dive deeper than the anticipated maximum depth as described in the pre-dive briefing.
- Each diver is responsible for ensuring that they do not overexert themselves.
- Each diver will be responsible for understanding, and maintaining a dive plan for each dive.
- All dives will be terminated when one member of the dive team has exhausted his air supply to 500 psi in their tank.
- Divers will ascend together, up their buoy line at no greater then .5 ft/sec ascent (ascend no faster than 30 ft per minute). If possible, plan a 3-minute safety stop at 15 ft.
- A standby diver on the surface and complete set of gear will be available for each working dive.
- Upon completion of the dive any physical limitations, health problems or sickness should be reported to the Dive Master, or health and safety officer.
- All divers will receive training in tools, equipment or systems relevant to task.
- A diver shall be line-tended from the surface or accompanied by another diver in the water, and there will be continuous visual contact during the diving operations.

Equipment Procedures and Checklists

All diving and support equipment will be well maintained and in good working order at the onset of each job. The importance of routine maintenance, spare parts and backup equipment cannot be stressed enough. Each diver will own and be responsible for his equipment. This will ensure that each diver will be responsible and maintain equipment.

SCUBA Gear

All SCUBA gear should be well maintained and in good working order. Regulators should be professionally cleaned and serviced once a year. Each regulator will have a functioning pressure gauge and depth gauge. SCUBA tanks will have a current Visual Inspection Rating (VIP) as well as a current hydrostatic certification approval stamped in the shoulder of the tank. If any SCUBA tank is not properly certified, it should not be filled or used for diving until the proper testing and certification can be obtained. SCUBA tanks should never be filled beyond the designated working pressure and should always be handled with care. All divers shall wear a functional buoyancy compensator. This is perhaps the most important piece of equipment for the SCUBA diver and should be checked frequently.

Surface Supply Diving Gear

Surface supply diving gear should also be well maintained and in good working order. Below is a checklist of components that should be tended before each dive:

- Compressor – Fuel, oil, filters, connections and fittings, belts, relief valves, drain water.
- Air Hose – Make sure that the hose is free of kinks, leaks or abrasions. Also make sure that the hose is long enough for the job at hand and has been properly coiled. If necessary, add flotation to the dive umbilical. Inspect the communications wire and the pneumo hose.
- Hats/Helmets – Diving hats should be in good working order with full communications and sound air connections.
- Communications Stations – Comm boxes should be tested prior to each dive in order to ensure good communication between the diver(s) and the surface.
- Backup Air Supply – A secondary source of breathing air should be established and tested before each diving day in order to insure an adequate air supply in the event that the primary air source fails.

DEPTH LIMITS FOR AIR DIVING

All diving operations and/or related or accompanying tasks are to be carried out in strict accordance with the practices, procedures and guidelines which are listed in The U.S. Navy Diving Manual, The Consensus Standards for Commercial Diving Operations, and OSHA Commercial Diving Operations 29 CFR 1910.401. The following table outlines the safe diving limits for Commercial Diving and Scientific SCUBA Diving operations.

Notes: Depth Limits for Air Diving

1. These limits are based on a practical consideration of working time versus decompression time and oxygen tolerance limits. These limits shall not be exceeded except by specific authorization from the Designated Person in Charge of the diving operation or a higher authority.
2. Under normal circumstances, do not exceed the limits of U.S. Navy no-decompression tables. Dives requiring decompression may be made if considered necessary by the Designated Person in Charge of the dive operation. The total time of SCUBA dive, including decompression, must never exceed the duration of the apparatus in use, disregarding any reserves.
3. A recompression chamber is required on the scene for all dives where planned decompression exceeds 30-minute water stops, and for all dives deeper than 100 ft.
4. Exceptional exposure dives are not permitted. Exceptional exposure dives are printed in RED in the Standard Air Decompression Table (U.S. Navy Diving Manual) and are computed for emergency use only. Such situations defy complete assurance of safety, even if the correct decompression schedule is used.
5. Do not exceed the limits of the Standard Air Decompression Table for exceptional exposure (U.S. Navy Diving Manual).
6. For air dives deeper than 130 ft, the diver must use equipment with a reserve air supply capable of life support for a minimum of three (3) minutes at the working depth. This system must function independently of surface control or surface reserve supplies.

DIVING ACCIDENT PROCEDURES

In the event of a diving accident, which may result in recompression therapy, the following actions are to be taken immediately:

I. Diving Supervisor takes charge of treatment and immediately recompresses diver, utilizing U.S. Navy Treatment Table Procedures.

II. Notify the Diving Medical Consultant that a diving accident involving recompression has taken place. The following information should be provided:
   a. Depth of dive.
   b. Duration of dive.
   c. Surface interval at first symptoms.
   d. Treatment Table in use.
   e. Response to treatment.

III. Modify treatment if directed by the Diving Medical Consultant.

IV. Notify the job site Project Manager:
   Anne McCarthy: (561) 676-6989
   CSA Main Office: (772) 219 3000

V. Maintain an accurate and legible chamber log.

NOTE: All recompression treatment is to be reported whether response to treatment is effective or not. Remember that you are performing a medical treatment and consultation with a doctor is a practical, as well as a legal necessity.

NOTE: Detailed, legible logs are necessary for medical evaluation and verification of proper action having taken place in the event of residual complications. ABSOLUTELY NO ERASURES ARE PERMITTED.

The following are detailed Procedures that should be followed in the event of an emergency. These procedures are detailed and event specific. All CSA Dive Masters, Supervisors, Dive Team Leaders and divers should be familiar with these procedures and capable of executing these procedures in the event of an emergency.

Emergency Procedure One – Unplanned Positively Buoyant Ascent (Blow Up)

A. When ascent occurs from depth of 100 ft or less:
   a. Diver must exhale continuously to surface.
   b. Notify topside he is “blowing up.”
   c. Tender takes in all excess slack in umbilical or lifeline.
   d. Supervisor immediately takes charge of treatment.
B. On surface:
   a. Quickly examine diver for serious injury, gas embolism and decompression sickness.
   b. No sign or symptoms of gas embolism or decompression sickness:
      1. If no decompression was required, recompress diver to 40 ft for time equal to time spent on surface, plus double the omitted ascent time.
      2. If decompression is required, and in-water decompression stops were not required or have been completed, or diver is within emergency surface decompression limits (in accordance with U.S. Navy Diving Manual): Recompress diver in accordance with U.S. Navy Surface Decompression Table, using oxygen or air. In addition, you must double both time of surface interval and omitted ascent time, and add this time to stop at 40 ft on “Sur D O2" Table or 20 ft stop on “Sur D Air” Table.
      3. If decompression was required, and in-water decompression stops were not completed and diver is not within surface decompression limits: Recompress diver to depth appropriate for Treatment Table No. 5 or 1A, and treat in accordance with U.S. Navy Procedure for table selected (note: inside tender required, notify medical consultant).

c. Any sign or symptom of gas embolism or decompression sickness:
   1. Recompress immediately to depth appropriate for Treatment No. 6 or 6A, and treat in accordance with U.S. Navy Procedure for table selected (note: inside tender required, notify medical consultant).

C. Blow up from depths greater than 100 ft but less than 165 ft.

D. Upon reaching surface:
   a. There is a good chance diver will be unconscious.
   b. Quickly check for serious injury.
   c. Decompress immediately to depth appropriate for treatment.
      Table 6 or 6A, and treat in accordance with U.S. Navy Diving Manual. Notify medical consultant.

E. Blow up from depth greater than 165 ft:
   a. Recompress to depth diver blew up from.
   b. Remain at depth until signs and symptoms are relieved.
   c. Diver's bottom time is computed from time he left the surface on this standard dive, until the time he leaves the bottom during treatment.

F. Decompress dive according to U.S. Navy Standard Decompression Table appropriate for depth and time of dive.
   a. Complete all required decompression stops at depth greater than 165 ft.
   b. At 165 ft, shift to Treatment Table 6 or 6A in accordance with U.S. Navy Diving Manual procedures. Notify medical consultant.

Emergency Procedure Two – Severance of Diver's Hose Bundle

A. When it is determined that diver's hose is severed:
   a. Remain calm and think.
   b. Diver should start ascent, exhale continuously, and observe caution against surface hazards.
   c. If another diver is in the water, he should be sent to assist diver in trouble and/or standby diver should be sent down with emergency gas supply to meet diver in ascent.
   d. Tender should take up severed hose and report location of diver's bubbles.
   e. Diving Supervisor musters all available assistance for possibility of lost or injured diver.

B. On surface:
   a. The same procedures should be used as with any emergency ascent.
   b. If treatment is necessary, consult qualified medical personnel.
   c. Determine cause of emergency and correct to prevent damage to other divers.

Emergency Procedure Three – Loss of Voice Communication in the Water

A. Upon loss of communication between diver and radio operator:
   a. Terminate Diving Operations and begin the following procedures.
   b. Immediately use proper hand signals to check whether diver is O.K.
   c. If diver returns proper signal, there is no need for emergency actions in section B, below.
   d. Retrieve diver and determine cause of communications problem, do not resume operations until communications have been restored.

B. If diver does not return proper signal:
   a. Diver is probably in trouble.
   b. Have other diver in water investigate and/or send down Standby Diver.
   c. If there is any doubt as to diver's condition, do not hesitate to start bringing him toward surface; Standby Diver can meet him on the way to surface.
   d. Alert qualified medical personnel and recompression chamber for possible treatment of injured diver.

Emergency Procedure Four – Loss of Visual Communication or Communication with Tender

A. Quickly determine if Buddy is or is not in trouble if close at hand, but do not waste time on extended search.
B. Get to the surface and notify Diving Supervisor. It may well be the other diver is already on surface or will soon arrive using same procedure. Otherwise, alerted Diving Supervisor can muster all available assistance.
C. Alert medical personnel.
D. Alert recompression chamber for possible treatment of injured diver.

Emergency Procedure Five – Loss of Communication in Chamber

A. Upon loss of audio communication, one or both backup methods of communications should be employed.
   a. Use of plastic slate and grease pencil observed through view port.
   b. Use of leather maul and Standard U.S. Navy hand signals.

Emergency Procedure Six – Entanglement or Entrapment

A. When a diver is trapped or tangled:
   a. The most important thing is to “remain calm and think.” In most cases the diver will still have a gas supply.
   b. Analyze the situation and notify topside.
   c. If a simple effort will not get the diver free, send other diver in the water and/or standby diver (with emergency gas supply and/or other necessary tools and equipment) to free diver.
B. Once diver has been freed and returns to surface:
   a. Quickly check for serious physical injury.
   b. Diver may be overtired and emotionally exhausted.
   c. Diver suffers from or approaching hypothermia must be warmed by hot bath, hot shower, hot air, etc., and then kept warm by means of blankets, etc. Consult qualified medical personnel.
   d. If free ascent was made, diver may be suffering from gas embolism and must be treated immediately.
C. If decompression is required and/or omitted:
   a. Recompress according to appropriate U.S. Navy Table and consult qualified medical personnel.

Emergency Procedure Seven – Interruption of the Surface Gas Supply

A. When loss of gas supply to diver occurs:
   a. Diver should notify topside.
   b. Dive team should activate the Reserve Backup Air Supply on the surface.
   c. Diver should prepare to engage the Emergency Bailout Bottle.
   d. Diver should immediately start ascent and exhale continuously.
   e. Jettisoning weights may be necessary to allow free ascent.
   f. Diver should exercise caution against injury from surface objects.
   g. Diver should not jettison mask; gas supply may return during ascent.
B. On surface:
   a. If decompression is required:
      1. Check diver for physical injury.
      2. Due to free ascent, diver may have gas embolism.

3. Recompress according to appropriate U.S. Navy Diving Table. Extended recompression may be necessary.
4. In the event of any signs of decompression sickness or gas embolism, consult qualified medical personnel.
5. After decompression, diver should remain in the area of the chamber and be observed for several hours.

b. If no decompression is required:
   1. Check diver for physical injury.
   2. Observe diver for signs of gas embolism.

c. Diver should remain in the chamber area under close observation.

Emergency Procedure Eight – Loss of Gas Supply SCUBA

A. When loss or depletion of gas supply occurs, diver should:
   a. Remain calm.
   b. Buddy breathe utilizing octopus regulators and start ascent at recommended U.S. Navy ascent rates (30 ft/min).
   c. If tended from topside, diver should give proper signal and start ascent.
   d. Diver should exhale continuously to the surface.
   e. Exercise caution against physical injury from surface obstructions.

B. On surface:
   a. The same procedure should be used as used for SCUBA diver.
   b. If treatment is required, notify qualified medical personnel.

Emergency Procedure Nine – Oxygen Poisoning (Toxicity)

A. At first sign of oxygen poisoning while in recompression chamber:
   a. Immediately stop mask breathing and breathe chamber atmosphere.
   b. If diver goes into convulsions, protect him from harm from banging against chamber.
   c. Do not vent chamber.
   d. Do not try to pin diver down.
   e. Protect his tongue with padded depressor.
   f. Do not put finger in his mouth.
   g. Convulsions nearly always stop in a very few minutes.
   h. Continue breathing air for 15 minutes after all signs and symptoms cease. During this period, a tender should be locked in (extra).
   i. Return to the table that was being used and continue where you left off.

Should O2 toxicity recur, follow same procedure as on first occurrence except: when all signs of symptoms are relieved, switch to proper air table and complete decompression.

ATTACHMENT B

U.S. Navy Dive Tables

U.S. NAVY DIVE TABLES

Table 9-6. *Unlimited/No-Decompression Limits and Repetitive Group Designation Table for Unlimited/No-Decompression Air Dives.*

Depth (feet)	Depth (meters)	No-Decompression Limits (min)	Group Designation A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	3.0	unlimited	60	120	210	300	797	*									
15	4.6	unlimited	35	70	110	160	225	350	452	*							
20	6.1	unlimited	25	50	75	100	135	180	240	325	390	917	*				
25	7.6	595	20	35	55	75	100	125	160	195	245	315	361	540	595		
30	9.1	405	15	30	45	60	75	95	120	145	170	205	250	310	344	405	
35	10.7	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	12.2	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	15.2	100		10	15	25	30	40	50	60	70	80	90	100			
60	18.2	60		10	15	20	25	30	40	50	55	60					
70	21.3	50		5	10	15	20	30	35	40	45	50					
80	24.4	40		5	10	15	20	25	30	35	40						
90	27.4	30		5	10	12	15	20	25	30							
100	30.5	25		5	7	10	15	20	22	25							
110	33.5	20			5	10	13	15	20								
120	36.6	15			5	10	12	15									
130	39.6	10			5	8	10										
140	42.7	10			5	7	10										
150	45.7	5			5												
160	48.8	5				5											
170	51.8	5				5											
180	54.8	5				5											
190	59.9	5				5											

* Highest repetitive group that can be achieved at this depth regardless of bottom time.

U.S. NAVY DIVE TABLES

Table 9-7. *Residual Nitrogen Timetable for Repetitive Air Dives.*

Locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies.

Next read vertically downward to the new repetitive group designation. Continue downward in this same column to the row which represents the depth of the repetitive dive. The time given at the intersection is residual nitrogen time, in minutes, to be applied to the repetitive dive.

* Dives following surface intervals of more than 12 hours are not repetitive dives. Use actual bottom times in the Standard Air Decompression Tables to compute decompression for such dives.

** If no Residual Nitogen Time is given, then the repetitive group does not change.

Repetitive group at the beginning of the surface interval

Repetitive group	Surface interval															
A	0:10 12:00*															
B	0:10 3:20	3:21 12:00*														
C	0:10 1:39	1:40 4:49	4:50 12:00*													
D	0:10 1:09	1:10 2:38	2:39 5:48	5:49 12:00*												
E	0:10 0:54	0:55 1:57	1:58 3:24	3:25 6:34	6:35 12:00*											
F	0:10 0:45	0:46 1:29	1:30 2:28	2:29 3:57	3:58 7:05	7:06 12:00*										
G	0:10 0:40	0:41 1:15	1:16 1:59	2:00 2:58	2:59 4:25	4:26 7:35	7:36 12:00*									
H	0:10 0:36	0:37 1:06	1:07 1:41	1:42 2:23	2:24 3:20	3:21 4:49	4:50 7:59	8:00 12:00*								
I	0:10 0:33	0:34 0:59	1:00 1:29	1:30 2:02	2:03 2:44	2:45 3:43	3:44 5:12	5:13 8:21	8:22 12:00*							
J	0:10 0:31	0:32 0:54	0:55 1:19	1:20 1:47	1:48 2:20	2:21 3:04	3:05 4:02	4:03 5:40	5:41 8:50	8:51 12:00*						
K	0:10 0:28	0:29 0:49	0:50 1:11	1:12 1:35	1:36 2:03	2:04 2:38	2:39 3:21	3:22 4:19	4:20 5:48	5:49 8:58	8:59 12:00*					
L	0:10 0:26	0:27 0:45	0:46 1:04	1:05 1:25	1:26 1:49	1:50 2:19	2:20 2:53	2:54 3:36	3:37 4:35	4:36 6:02	6:03 9:12	9:13 12:00*				
M	0:10 0:25	0:26 0:42	0:43 0:59	1:00 1:18	1:19 1:35	1:36 2:05	2:06 2:34	2:35 3:08	3:09 3:52	3:53 4:49	4:50 6:18	6:19 9:28	9:29 12:00*			
N	0:10 0:24	0:25 0:39	0:40 0:54	0:55 1:11	1:12 1:30	1:31 1:53	1:54 2:18	2:19 2:47	2:48 3:22	3:23 4:04	4:05 5:03	5:04 6:32	6:33 9:43	9:44 12:00*		
O	0:10 0:23	0:24 0:36	0:37 0:51	0:52 1:07	1:08 1:24	1:25 1:43	1:44 2:04	2:05 2:29	2:30 2:59	3:00 3:33	3:34 4:17	4:18 5:16	5:17 6:44	6:45 9:54	9:55 12:00*	
Z	0:10 0:22	0:23 0:34	0:35 0:48	0:49 1:02	1:03 1:18	1:19 1:36	1:37 1:55	1:56 2:17	2:18 2:42	2:43 3:10	3:11 3:45	3:46 4:29	4:30 5:27	5:28 6:56	6:57 10:05	10:06 12:00*

New Repetitive Group Designation

Repetitive Dive Depth feet/meters	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
10 3.0	**	**	**	**	**	**	**	**	**	**	**	797	279	159	88	39
20 6.1	**	**	**	**	**	**	917	399	279	208	159	120	88	62	39	18
30 9.1	†	†	†	349	279	229	190	159	132	109	88	70	54	39	25	12
40 12.2	257	241	213	187	161	138	116	101	87	73	61	49	37	25	17	7
50 15.2	169	160	142	124	111	99	87	76	66	56	47	38	29	21	13	6
60 18.2	122	117	107	97	88	79	70	61	52	44	36	30	24	17	11	5
70 21.3	100	96	87	80	72	64	57	50	43	37	31	26	20	15	9	4
80 24.4	84	80	73	68	61	54	48	43	38	32	28	23	18	13	8	4
90 27.4	73	70	64	58	53	47	43	38	33	29	24	20	16	11	7	3
100 30.5	64	62	57	52	48	43	38	34	30	26	22	18	14	10	7	3
110 33.5	57	55	51	47	42	38	34	31	27	24	20	16	13	10	6	3
120 36.6	52	50	46	43	39	35	32	28	25	21	18	15	12	9	6	3
130 39.6	46	44	40	38	35	31	28	25	22	19	16	13	11	8	6	3
140 42.7	42	40	38	35	32	29	26	23	20	18	15	12	10	7	5	2
150 45.7	40	38	35	32	30	27	24	22	19	17	14	12	9	7	5	2
160 48.8	37	36	33	31	28	26	23	20	18	16	13	11	9	6	4	2
170 51.8	35	34	31	29	26	24	22	19	17	15	12	10	8	6	4	2
180 54.8	32	31	29	27	25	22	20	18	16	14	11	10	8	6	4	2
190 59.9	31	30	28	26	24	21	19	17	15	13	10	10	8	6	4	2

Residual Nitrogen Times (Minutes)

† Read vertically downward to the 40/12.2 (feet/meter) repetitive dive depth. Use the corresponding residual nitrogen times (minutes) to compute the equivalent single dive time. Decompress using the 40/12.2 (feet/meter) standard air decompression table.

ATTACHMENT C

Pre-Dive/Post-Dive Checklists

PRE-DIVE/POST-DIVE CHECKLISTS

Pre-Dive Checklist

	Dive flags (sport and/or alpha) are prominently displayed during diving operations
	Means of communication is available and working (i.e., cellular telephone, landline telephone, NAVSAT, emergency phone list, etc.)
	All emergency and support equipment are available and fully functional prior to dive
	Drinking water and fluids are available
	All dive techniques and dive plan is understood by all dive team members
	Air pressure is checked and air is turned on
	All tools are available and ready to hand to divers
	Complete diving first-aid kit, first-aid handbook, oxygen resuscitator and backboard are ready
	Dive Officer kit on site, including a complete set of Navy Dive Tables

Post-Dive Checklist

	Notify watch on the vessel's bridge when operations are completed
	Strike the dive flags
	Dive team buddies have remained together for a minimum of 30 minutes after each dive and have monitored each other’s condition during that time
	Recover and stow all support equipment
	Ensure that all personal dive equipment and support equipment is thoroughly cleaned and properly stowed
	Perform required preventative maintenance
	Tag all damaged or malfunctioning equipment and remove from use
	Refill all SCUBA cylinders
	Log all dives and topside activities
	Monitor all divers for signs and symptoms of pressure-related illnesses or injuries for a minimum of 2 hours after each dive
	Conduct a dive operations debrief and critique operations
	Ensure that all dive logs have been completed

ATTACHMENT D

Dive Log/Dive Tender Log Form

DIVE LOG/DIVE TENDER LOG

Date _____/____/2011_____ CSA Job No. _____

Name of Diver_____ Diving Supervisor _____

Dive	Task	Initial Tank Pressure	Time Down	Time Up	Bottom Time	Water Depth	Table Used	Repetitive Group

Conditions:

Water Temp. _____

Sea State _____

Visibility _____

ATTACHMENT E

Dive Team Qualifications

IANTD

"The Leader in Technical Training"

NITROX • TRIMIX • EANx CAVE • EANx WRECK • DEEP AIR

INTERNATIONAL ASSOCIATION NITROX & TECHNICAL DIVERS

Diver

International Association of Nitrox and Technical Divers

Anne E. Shoffner McCarthy

28680

18 August 1997

Instructor: Douglas E. Kesling

Facility : UNCW - NURC

Location : Key Largo, Florida

This individual is qualified at the level of

Enriched Air Nitrox Diver

ASMcCarthy

Cardholder Signature

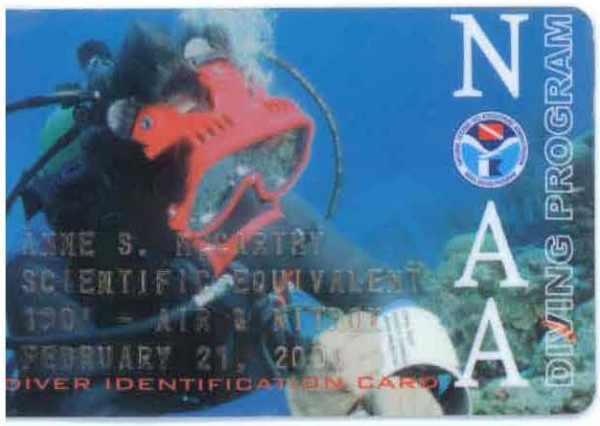
David A. Dinsmore

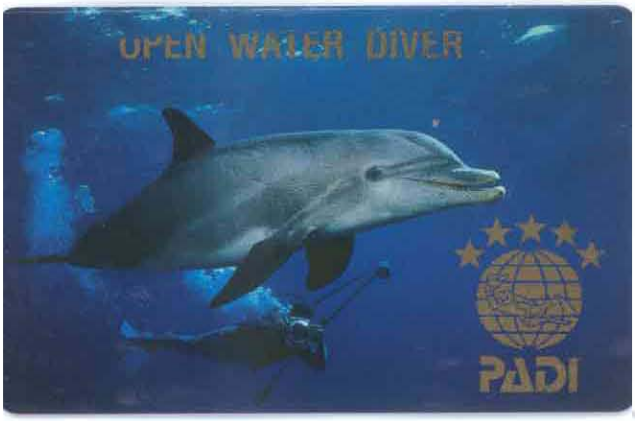
Director, NOAA Diving Program

The person whose name appears on the front of this card has demonstrated the skills and knowledge required by the NOAA Diving Program for the certification level indicated. For questions regarding equivalent certification with other government, scientific, or recreational diving organizations or agencies - or if this card is found, please contact:

In case of a diving emergency, contact Diver's Alert Network (919)684-8111

NOAA Diving Program
7600 Sand Point Way NE
Seattle, WA 98115-0070
(206) 526-6196





ANNE S. MC CARTHY

Diver No. 86302980

Birthdate 06 JUL 1971

Cert.Date 29 JUN 1986

Instr.No. CD-1799

C. EDWARD PEMBERTON

561

ADVENTURE SWIM SCUBA/TRAVEL

7664 NORTHSHORE DRIVE

KNOXVILLE, TN 37919

(423) 690-3483

This diver has satisfactorily met the standards for this certification level as set forth by PADI, 30151 Tomas Street, RSM, CA 92688-2125 www.padi.com

ASHI-approved Certification Card

Lenz, KC
Authorized Instructor (Print Name)

Cardholder's Signature

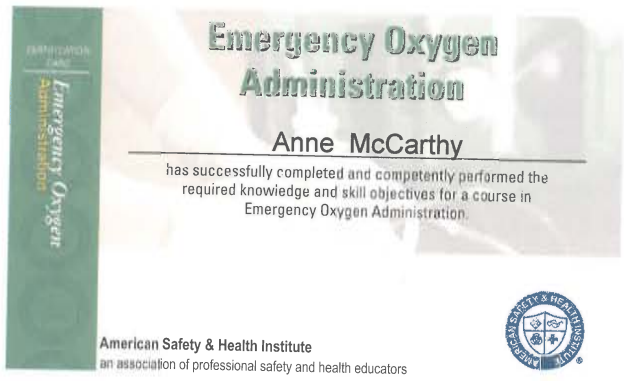
06/01/2011
Date Completed

06/30/2013
Renewal Date

772-878-3085
Training Center Phone No.

Training Center I.D.

Successful completion indicates cardholder has met required knowledge and skill objectives of the curriculum to the satisfaction of an ASHI-authorized Instructor. Certification does not guarantee future performance, or imply state licensure or credentialing.



ASHI APPROVED CERTIFICATION CARD

Lenz, KC
Authorized Instructor (Print Name)

Holder's Signature

06/01/2011
Date Completed

06/30/2013
Renewal Date

772-878-3085
Training Center Phone No.

Training Center Note

Successful completion indicates card holder has met the required knowledge and skill objectives of the curriculum to the satisfaction of an ASHI authorized Instructor. ASHI's curriculum is consistent with widely accepted guidelines for emergency oxygen administration. Successful completion does not guarantee future performance, nor imply state certification or licensure. Rate this program online at **www.ashinstitute.org** or call (800) 246-5101.

Strike through the modules ***NOT*** completed.
This card contains unique security features to protect against forgery.

90-1

DEBORAH A. KILBANE

STUDENT NO. **9707165353**
BIRTHDATE **10 JUN 78**
CERT.DATE **25 JUN 97**
INSTR.NO. **MSDT-23141**
SAYLOR
TRAINED BY **3015**
CAPTAIN HOOK'S
DIVE CENTER
MARATHON, FL

This diver has satisfactorily met the standards for this certification level as set forth by: PADI, P.O. Box 25010, Santa Ana, CA 92705

OPEN WATER DIVER

PADI®

CAPT HOOK'S MARINA & DIVE CT
11833 OVERSEAS HWY
MARATHON, FL 33050
(305) 743-2444

Deborah A Kilbane
Cardholder Signature

NAUI Instructor/NAUI Official Signature

This credential verifies that the individual named has demonstrated the skills and knowledge necessary to meet NAUI Worldwide Diving Course Standards for the indicated certification level. If a junior restriction is indicated on the front of this card the individual must be accompanied by a parent or designated guardian.

NAUI WORLDWIDE
DIVE SAFETY THROUGH EDUCATION

If found, please return to: NAUI
9942 Currie Davis Dr., Suite H
Tampa, FL 33619-2667
U.S.A. (813) 628-NAUI

NAUI WORLDWIDE

ADVANCED SCUBA DIVER

DEBORAH KILBANE

3/26/98 INST 10393

ADVENTURES UNLIMITED

SSI® SCUBA SCHOOLS INTERNATIONAL

TEMPORARY CERTIFICATION

The person named has completed all requirements for the rating of

Enriched Air Diver

Date issued: 1 March 05

This card has been issued as proof of completion until delivery of permanent certificate, and is valid for a period of 30 days from date of issue.

© 1986 Concept Systems, Inc. Reorder #1012

SSI® SCUBA SCHOOLS INTERNATIONAL

TEMPORARY CERTIFICATION

Deborah A. Kilbane
DIVER'S NAME

Force E Scuba
SCHOOL

Lynley M. Dows 5248
INSTRUCTOR NUMBER

CERTIFICATION CARD
Basic First Aid
for the Community and Workplace

AMERICAN SAFETY & HEALTH INSTITUTE

Basic First Aid
for the Community and Workplace

Debbie Fawcett

has successfully completed and competently performed the required knowledge and skill objectives for:

☐ Adult
☐ Pediatric
☐ Adult and Pediatric

Void if more than one box is checked.

ASHI-approved Certification Card

Lenz, KC
Authorized Instructor (Print Name)

Cardholder's Signature

06/01/2011
Date Completed

06/30/2013
Renewal Date

772-878-3085
Training Center Phone No.

Training Center I.D.

Successful completion indicates cardholder has met required knowledge and skill objectives of the curriculum to the satisfaction of an ASHI-authorized Instructor. Certification does not guarantee future performance, or imply state licensure or credentialing.

CERTIFICATION CARD
Emergency Oxygen Administration

Emergency Oxygen Administration

Debbie Fawcett

has successfully completed and competently performed the required knowledge and skill objectives for a course in Emergency Oxygen Administration.

American Safety & Health Institute
an association of professional safety and health educators

ASHI APPROVED CERTIFICATION CARD

Lenz, KC
Authorized Instructor (Print Name)

Holder's Signature

06/01/2011
Date Completed

06/30/2013
Renewal Date

772-878-3085
Training Center Phone No.

Training Center Note

Successful completion indicates card holder has met the required knowledge and skill objectives of the curriculum to the satisfaction of an ASHI authorized Instructor. ASHI's curriculum is consistent with widely accepted guidelines for emergency oxygen administration. Successful completion does not guarantee future performance, nor imply state certification or licensure. Rate this program online at **www.ashinstitute.org** or call (800) 246-5101.

HEARTSAVER CPR AED

Heartsaver®
CPR AED

American Heart Association®

PEEL HERE

Debbie Fawcett

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver CPR AED Program. Optional completed modules are those **NOT** marked out:

Child CPR AED Infant CPR Written test

06/01/2011
Issue Date

06/2013
Recommended Renewal Date

Training Center Name: Emergency Medical Consulta TC ID #: FL05170

TC Info: Port St Lucie, FL, 34894
772-878-3085

Course Location: CSA International

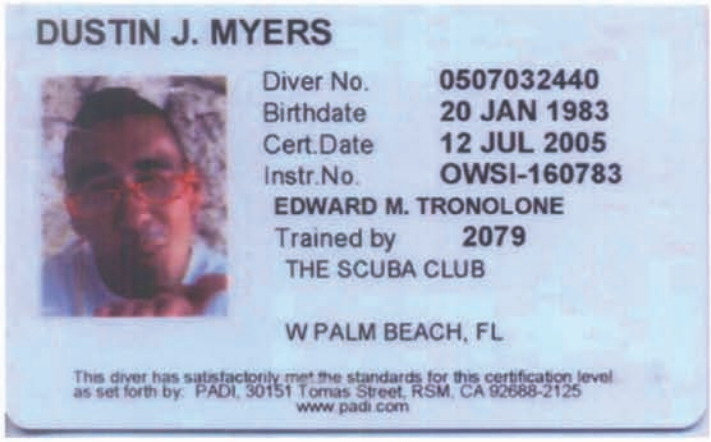
Instructor Name: Lenz, KC Inst. ID #

Holder's Signature

© 2011 American Heart Association *Tampering with this card will alter its appearance.* 90-1813

Strike through the modules ***NOT*** completed.
This card contains unique security features to protect against forgery.

90-1

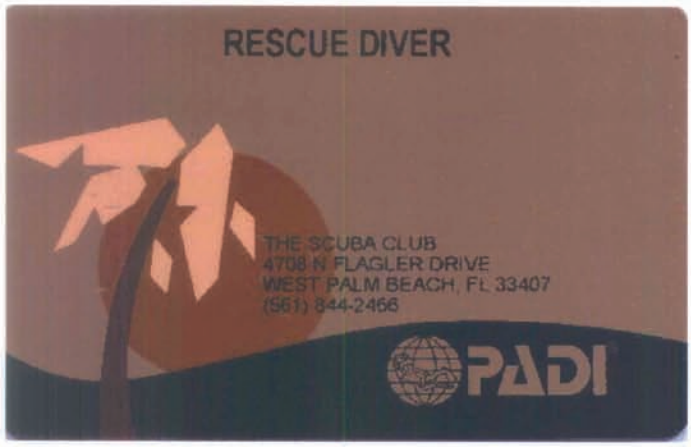


DUSTIN J. MYERS

Diver No. 0507032440
Birthdate 20 JAN 1983
Cert.Date 12 JUL 2005
Instr.No. OWSI-160783
EDWARD M. TRONOLONE
Trained by 2079
THE SCUBA CLUB

W PALM BEACH, FL

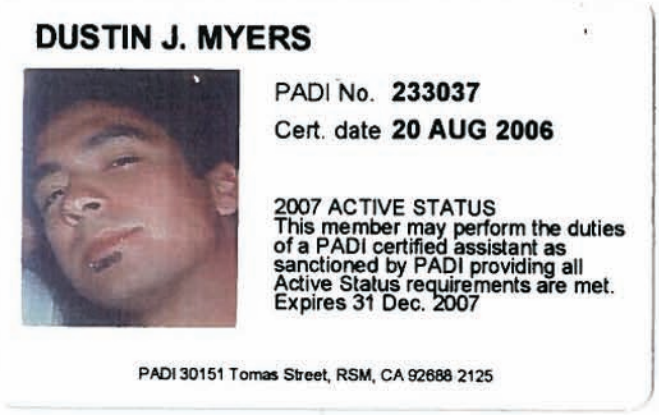
This diver has satisfactorily met the standards for this certification level as set forth by: PADI, 30151 Tomas Street, RSM, CA 92688-2125
www.padi.com



RESCUE DIVER

THE SCUBA CLUB
4708 N FLAGLER DRIVE
WEST PALM BEACH, FL 33407
(561) 844-2466

PADI



DUSTIN J. MYERS

PADI No. 233037
Cert. date 20 AUG 2006

2007 ACTIVE STATUS
This member may perform the duties of a PADI certified assistant as sanctioned by PADI providing all Active Status requirements are met. Expires 31 Dec. 2007

PADI 30151 Tomas Street, RSM, CA 92688 2125

DIVEMASTER

PADI

CERTIFICATION CARD

Basic First Aid for the Community and Workplace

Basic First Aid

For First Aid Providers in the Community and Workplace

2005 Science & Guidelines

Dustin Myers

has successfully completed and competently performed the required knowledge and skill objectives for a course in:

Pediatric First Aid **Adult First Aid** **Universal First Aid**

(Knowledge and skill not assessed if crossed out above)

American Safety & Health Institute
an association of professional safety and health educators

ASHI APPROVED CERTIFICATION CARD

Daniel Mikels
Authorized Instructor (Print Name)

Holder's Signature

09/16/2009
Date Completed

09/30/2011
Renewal Date

772-878-3085
Training Center Phone No.

Emergency Medical
Training Center Note

Successful completion indicates card holder has met required knowledge and skill objectives of the curriculum to the satisfaction of an ASHI authorized Instructor. Successful completion does not guarantee future performance, nor imply state certification or licensure. Program content is based upon recommendations of the 2005 National First Aid Science Advisory Board (*Circulation* ©2005) and other evidence-based treatment recommendations. Rate this program online at **www.ashinstitute.org** or call (800) 246-5101.

CERTIFICATION CARD

Emergency Oxygen Administration

Emergency Oxygen Administration

Dustin Myers

has successfully completed and competently performed the required knowledge and skill objectives for a course in Emergency Oxygen Administration

American Safety & Health Institute
an association of professional safety and health educators

ASHI APPROVED CERTIFICATION CARD

Daniel Mikels
Authorized Instructor (Print Name)

Holder's Signature

09/16/2009
Date Completed

09/30/2011
Renewal Date

772-878-3085
Training Center Phone No.

Emergency Medical
Training Center Note

Successful completion indicates card holder has met the required knowledge and skill objectives of the curriculum to the satisfaction of an ASHI authorized Instructor. ASHI's curriculum is consistent with widely accepted guidelines for emergency oxygen administration. Successful completion does not guarantee future performance, nor imply state certification or licensure. Rate this program online at **www.ashinstitute.org** or call (800) 246-5101.

American Heart Association
Learn and Live

Heartsaver® AED

Dustin Myers

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA for Heartsaver AED Program.

Modules Completed: (A) (B) (C)

09/16/2009
Issue Date

09/2011
Recommended Renewal Date

Training Center: Emergency Medical Consultants

TC Address Contact Info: 866-4-EMC-INC/medicaltraining.cc

Course Location: Emergency Medical Consultants

Instructor: Daniel Mikels

Holder's Signature

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ATTACHMENT F

First-Aid Kit Contents

FIRST-AID KIT CONTENTS

Kit includes:

- 1 DAN Dive and Travel Medical Guide
- 1 pair nitrile gloves
- 1 DAN Oronasal Resuscitation Mask

Medications/Tools Module:

- 2 Ibuprofen (2/pkg)
- 6 Diphenhydramine (antihistamine)
- 4 sting relief pads
- 4 antibiotic ointments
- 2 antacids (2/pkg)
- 3 disposable thermometers
- 1 antidiarrheal caplet
- 3 tubes of cortisone cream
- 1 antimicrobial towelette
- 1 hot compress
- 1 disposable razor

Fractures/Sprain Strain Module:

- 1 cold compress
- 2 triangular bandages
- 1 Ibuprofen (2/pkg)
- 3 safety pins
- 1 3-in. elastic bandage

Stop Bleeding/Shock Module:

- 2 4-in. x 4-in. gauze pads (2/pkg)
- 1 8-in. x 10-in. trauma pad
- 3 antiseptic towelettes
- 1 pair nitrile gloves
- 1 pencil
- 1 accident report form

Wounds (Cuts) Care Module:

- 1 20cc irrigation syringe with tip
- 5 Providone iodine swabs
- 15 strip bandages 1 in. x 3 in.
- 5 knuckle wound strips
- 2 patch bandage 2 in. x 3 in.
- 1 pkg wound closure strips (0.25 in. x 1.5 in. – 10/pkg)
- 5 2-in. x 2-in. gauze pads (2/pkg)
- 4 4-in. x 4-in. gauze pads (2/pkg)
- 1 cotton swabs (2/pkg)
- 3 non-adhering dressing
- 2 2-in. conforming gauze bandages
- 1 adhesive tape 1 in. x 10 yds
- 1 EMT shears
- 1 splinter picker forceps
- 2 tincture of benzoin swabs
- 3 antiseptic towelettes
- 2 Stockinette bandages
- 1 eye pad
- 1 eye patch
- 1 4-oz eye wash

ATTACHMENT B

Dive Operations Plan Approval

CONTRACT DIVE OPERATIONS
12 July 2011

Contract No: W912EP-11-F-0013
Contractor: CSA International Inc.
Project: Seagrass and Hardbottom Resource Surveys
Locations: Fort Myers Beach, Lee County, FL

I have conducted a review of the Safety Inspection Checklist for Contract Dive Operations, along with the Dive Operation Plan in accordance with the U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1; September 2008). All items have been satisfactorily met, therefore, permission to proceed with the dive plan, as presented, is hereby granted.

Brad Tarr

Brad Tarr
Alternate Dive Coordinator
US Army Corps of Engineers
Environmental Branch, Planning Division
701 San Marco Blvd.
Jacksonville, Florida 32232-0019
904-232-3582

ATTACHMENT C

Log Book

ACOE. JOB 2363
FT MYERS/ MATANZAS PASS

10 July 2011 AM, TW, DM

1230 DEPART STUART
1530 ARRIVE FT MYERS BEACH AM TW
MEET DM @ MATANZAS INN
1600 LOAD BOAT, LAUNCH
1700 AT MARINA/HOTEL, ASSEMBLE
TOW SYSTEM
2000 EOD

11 July 2011 TW DM AM

0700 BEGIN OPS
0735 TEST CAMERA / VISIBILTY
0747 SOL 1 LOGGING 13 FT Inshore → offshore
SAND / SHELL HASH, LOW LIGHT, NO SAV
FILE 001_0747.raw → .vid
0751 SAND / MUD
0754 NO VISIBILTY / MUD
0756 SAND / MUD
0758 14.6 FT MUD BOTTOM
0759 15.0 FT " " / NO VIS.
0802 13.5 FT " "
0803 @ SHRIMP BOATS
OFF LINE SOME
0805 13.9 FT MUD / SAND
0807 16.6 FT MUD / SAND occ. shell
0811 15.5 FT " "
0812 17.0 FT "
horseshoe crabs, catfish
0813 17.8
0815 STOP LOGGING, Fuel generator
0825 START logging 001_0825.vid
0826 SAND Bottom 17.0 ft
0828 14.7 ft sand bottom
occ. debris, sponge
0829 11.0 sand / mud
0834 10.2 ft mud / sand
0836 8.0 ft SB (SB = Soft Bottom)

7/11/11, cont

0836 SHIFT survey line to outside 2363.FT My.
of piling due to safety concerns
0837 13.8 ft
16.6
0840 16.3 FT mud/SB
0842 16.8 SB /occ. sponge/hydroids
0848 12.6 ft SB on. STAF15H
0850 13.1 FT SB/under Bridge/SB
0855 16.0 ft SB other side of Bridge
0857 A TAPES TAPE 2
0859 15.7 FT SB
0903 16.8 FT SB
0905 14.4 ft SB urchin, hydroids
shell hash
0908 STOP Logging. BATHROOM BREAK
0922 LEAVE DOCK
SHORT LINE TO GET N SIDE
OF BULKHEAD
00928 START LOGGING SB 001_0928.vid
0934 15.2 UNDER BRIDGE SB
0935 14.7 ft SB
0936 STOP Logging
call client - DIVE PLAN
0957 START LOGGING 001_0957.vid
13.7 ft SB
1001 13.4 ft SB / NO SAV / Hydroids
1005 13.0 ft SB / " "
occ. urchin

7/11/11, cont
2363, FT Myers

1010 12.9 ft SB / no SAV
1013 13.0 ft SB / no SAV
1016 12.8 ft SB / no SAV
1021 13.2 ft SB / no SAV
BIVALVES / oyster
1023 14.1 ft SB / no SAV
1027 14.2 " "
1031 13.1 " " / hydroids, sponge
SB / no SAV
1035 13.4 SB / no SAV
4 TAPES #3 oyst. shell, one octocoral?
1043 12.1 ft SB / no SAV
SOG - 0.7 kt
1047 12.7 ft SB / no SAV
SOG - 0.7 kt
1052 15.0 ft SB / no SAV
SOG - 0.76 kt
1055 17.0 SB / no SAV
1056 18.0 ft SB / no SAV
TIDE TURNING ebb.
1101 19.9 ft SB / no SAV
oyster shells / clam shells
1105 no vis / dragging
shells / mud
1108 12.6 ft shells / SB SOG - 0.68

top of FMB South Boundary

1111 13.1 ft urchins / shells / SB
1113 11.0 ft SB / shells

2363 ACOE
FT Myers
7/11/11 cont

1116 10.8 Ft SB/no SAV
SOG 0.97 pinshell
1120 10.2 SB/no SAV
1025 8.8 ft SB/no SAV
near ADV. MAINT AIDE
1128 BOAT WAKES - camera up/down in sand.
1131 no visibility. SB/no SAV/no HB
one sponge
1132 12.8 ft
1135 11.2 Ft
1136 13.2 Ft SB/SAV/no SOG - 1.0 Kt
1140 Δ TAPES - #4
1141 13.9 SB/SAV no
1143 13.8 SB/no SAV no HB
occ. urchin, starfish, sponge
1150 one small octocoral ~5.6 Ft
1153 " "
10 SB, occ. octocoral/sand/sponge
1157 more common. occ. ?/
sponge/living assemblages w/
hydroids, etc.
1158 13.6 Ft SOG - 0.88 Kts
1201 13.4 ft SB/no SAV or HB
1203 Stop Logging/EOL Line 1

1227 SOL #2 cont. TAPE 4
OFFshore → Inshore ADD #45 002_1227.vid

2363, FT MY/EB
7/11/11

1231 SB/no SAV 13.6 ft SOG - 0.71 Kts
occ. sponge
current pushing to SE very poor vis.
urchins, pen shells, sponge, crab holes
1235 SB/no HB/SAV 13.5 ft
1238 octocoral
vis. very limited.
1240 " " 13.4 ft SB/no SAV/no HB
pins, sponges, assemblages, urchins
1241 occ. octo
1244 13.4 ft SB/no SAV/no HB 0.51 Kt
tanic water from rainfall
1249 more common sponges, pins, urchins SB/no HB/no SAV
1250 13.2 ft SOG - 0.66 Kts
1254 no vis hitting bottom
tanic H2O - SB/ WAVES from Boat
off line sine
1255 Back on-line
1259 13.6 ft SOG - 0.35 kt
SB/ shell hash
1304 A TAPE #5
SB/ tanic H2O/ low vis.
1309 12.2 Ft
no vis / Bumping bottom SB/ urchins/shells
1311 11.2 Ft
all SB - silty layer
1313 OFF line - SHRIMP BOAT

2363, cont
Ft Myers
7/11/11 cont.

1316 9.0 ft
1316.57 STOP Logging - Camera Flying sideways
1319 START Logging 002_1319.vid
1324 STOP logging
visibility nearly zero
Attempt pipeline/disposal area
Disposal Area LINE #3 S → N
1340 SOL #3 continue Tape #5
SAND, MACRO
1347 6 FT SAND/MACRO/Hydroids
1349 STOP Logging - no vis.
1430 At Dock
Set Targets @ 50' outside
Toe of channel in potent. SG (Seagrass)
locations - snorkel/check for
SG.
1730 Completed SG survey on snorkel of east
shoal.
set targets, tapes (L.T. method) & BB
scores
→ Data on next pages

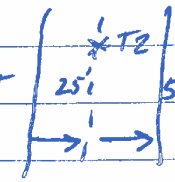
1800 Clean boat/END ops

7/11/11
SG, Snorkel

T = Target SG = seagrass CT = Channel Toe
Hw = Halodule wrightii TSG - total seagrass
BB = Braun Blanquet score MA = MACRO ALGAL

TARGET # 1 @ 50' from Channel toe
Ø SG w/in Buffer zone. Depth > 8 FT

T#2 @ 25' - SG present
FROM T2 Measured toward S. CT
0 → 6M Ø SG Ø Macro
6 → 9m H. wrightii



0 → 9M approx

BB Scores -

@9M FROM T2 ① Hw - 4 (50-75%) 4 TSG Ø MA Ø Coral
sediments · fines/silty muds
· @ Low tide seagrass @ 40 cm

@7.5 m ② Hw - 1 (< 5%)
@6.0 m ③ Hw - 0.1 (solitary)
@7.0 m ④ Hw - 1 (< 5%)
@8.0 m ⑤ Hw - 1 (< 5%)
@8.5 m ⑥ Hw - 3 (25-50%)

T# 3 @ 50' from Channel toe
NW 0-2.2 m SG / Hw
BB Scores @ 0-0.8 m - 0.5 (num. sm. cover)
1-1.8 m - 1.0 (< 5%)
Vis < 3" 1.8-2.6 m - 0.1

T4 - Ø SG w/ Buffer
T5 - Ø SG " "
T6 - E from T6 0-1 m
Hw ~ 90 cm deep @ low tide
BB = 1 (< 5%) Hw only

7/11/11

T7 – Ø SG w/in Buffer
T8 – Ø SG " "
T9 – Ø SG " "
T10 – Ø SG " "
T11 – exposed @ 50' edge
0-1m Ø SG – expl. no SG
1-3 m HW BB = 3 (25-50%)
MA = 1 (5-25%)
>3 Ø SG
T12 – Ø SG w/in Buffer
T13 – Ø SG – exposed walking Bank
T14 – Ø SG
T15 – just w of marker # 26 (Red)
0-3.3 HW/Tt (Thalassia)
BB – random @ 1-2m approx.
BB Score = 1 (25-50%) HW only
T16 – Ø SG
T17 – Ø SG

7/12/11

New Tape #6

0630 TW, DM AM Prep Boat / test equip.

0700 DEPART DOCK

0710 START Logging SOL #2 Tape #6

SB / NO SAV hydroids occ.

File

0715 8.3 ft 0.8 KTS SOG

SB - SOFT Bottom

002_0710.nid

0723 8.7 ft 0.79 Kt SOG

SB / hydroids

0727 10.4 ft

SB / hydroids occ. sponge & starfish

pitted shoal / muds / silts & fines / shells

0731 6.6 ft

0735 hydroids, lots, shallow, transducer

not picking up.

0736 SB / shells

0741 SB / no SAV

< 5 ft

0744 seagrass for couple rounds

0745 SB / no SAV

0745 deadsg. blades SB / hydroids

0746 MACROALGAE

0747 5.0 ft SB / some MACRO

0750 ? ft SB

0751 3.7 ft SB / no SAV / hydroids

0754 seagrass ? * Target *

0755 seagrass - HW

0756 NO SAV

0757 NO SAV / SB

SB = 50 ft Bottom

2363.
FT MYERS AREA

7/12/11 CONT

0750 SB/NO SAV
0803 9.5 ft 0.67 kt SOG
SB/NO SAV
0805 MARKER 18 / TIDES Δ TIDES #1 @ 0810
0808 13.8 ft SB/shell hash NO SAV
0812 13.3 ft SB/shell hash ——
0815 going under Bridge SB } little faster
0817 clear Bridge SB/14.8 ft
0821 Hump - STOP LOGGING

0823 START Logging 002_0823.vid
rocks/Bottom/debris pull up camera
0826 camera down 16.4 ft 0.7 kt SOG
SB/shell hash some debris
- off line B/C shrimp boat outside 25' inside(?) 50 ft Buffer
0828
0830 15.1 ft SB
0841 13.0 ft SOG - 0.58 kts
SB/shell hash
0848 12.9 ft SOG - 0.32 kts → 0.64 kts
SB/shell hash
0857 SB/shell hash 14.9 ft
0902 15.4 ft SB/shell hash
0908 15.5 ft SB/shell hash
0909 urchin SB

2363, Ft Myers
ACE
7/12/11, cont.

HDO 40/40 7/12/11
49, 50, 51, 52

0918 Δ TAPE # 8
SB / NO SAV / NO HB - shell hash / hydroids
0919 13.1 Ft
SB / SH / NO SAV / NO HB
0926 14.7 Ft SOG - 0.82 Kts
SB / NO SAV / HYDROIDS
0932 - OFF LINE - Sail BOATS / DOCKS
silt / fines - no visibility
0939 PLUMES OF SILT occ. hydroid
0.70 KB 13.2 ft
0943 silt / hydroids / shell hash
0948 STOP logging → Hydroids stuck on camera.
0951 START logging
silt / shells / hydroids
File = 0002 - 0951.vid
0952 13.0 ft
0955 Shell has / SB
1000 OFF line - SHALLOW SHOAL Area
1002 no vis, hitting sand bottom
1004 10.5 Ft
SB / SAND
1007 STOP logging - Hydroids on camera
START logging
File = 0002 - 1018.vid
1018 camera
1023 SAND / SB no vis. Hitting bottom
1024 8.0 Ft Sand no vis

2363, Ft Myers

7/12/11

1025 No vis –
1027 Δ Tape # 9
No vis, Beach nourishment
& pile driving @ Bowditch point
sand bottom when hits
1029 Bring up / Keep logging – Remove hydroids
1032 CAMER DOWN @ 12.2 ft
near Outer edge of vis
Sand
1035 SB/Hydroids 14.0 ft
1038 15.2 SB
HYDROIDS – Dense
1040 Close where ended on 7/11/11 –
continue
1043 SB
1043 Large sponge? debris? – No sponge
1045 off line – large boat wake
15.9 ft
1046 coral head? / Sponge? – No coral / sponge
1049 working, SB 15.6 ft
1051 stop logging EOL #2 verified on snorkel
1104 start logging SOL # 3 003_1104.vid
pipeline corridor area
9.7 ft
1106 SAND / Lo vis
1111 8.3 F
Sand / Lo vis / HYDROIDS

7/12/11, con
2363, FT Myers

1118:40 HW - Target
1119 pull up - over pipeline for nourish. project
1120 / camera Back down
1128 cross pipeline
1123 Sand 6.6 ft
1129 sand 6.7 ft 0.89 kt
1134 sand 6.6 ft 1.6 kts.
1136 sand / conch
1141 Δ Tape # 10
SAND 6.4 ft
1150 sand 6.4 ft
1056 sand dollars 6.4 ft
1208 Sand
1215 6.0 ft sand dollars / conch
1241 SAND, stop logging no vis.

check Depths of NSHore lines
#3 - 6.0 ft
#4 - 6.0 ft
#5 - 6.0 ft
#6 - 4.4 ft

1330 END ops - no visibility

Tomorrow - transect @ western shoal
@ 50' Buffer to check for
Seagrass & other suspect areas
continue w/ HB surveys

HDD Files 53-61

2363
FT MYERS/ACOE

7/13/11

0645 AT DOCK, TEST EQUIPMENT
HDD – FILE 53 TAPE 11
0700 DEPART TO HB SURVEY AREA
STARTING LINE S/SE of nourishment
area – too shallow (too turbid
0729 START Logging #6
NO VIS. SAND (Exposed @ Lowtide)
006_0729.vid
SAND - HITTING BOTTOM
0738 2.8 ft Hydroids, Bring up camera
0739 Back Down
0745 2.0 Ft SAND, SOG = 1.5 Kts
0757 STOP logging - swim area only Bridge
start again on south side
0804 START Logging
006 – 0804.vid
0806 5.0 ft SAND.
0814 Dirty H2O, avoiding Buoys
4.0 ft
0820 3.3 ft sand
0822 Off line to avoid Buoys, Sand
0824 - < 2 ft hit SAND bottom
Stop logging.
0830 START Logging SAND
006_0830.vid
0832 2.5 Ft SAND
0839 ~~Cartergo~~ Cauleefa

2363 Ft Myers
ACOE

7/13/11 cont.

0841 A TAPE #12 SAND
0843 2.4 Ft off line around shoal
0848 1.9 Ft Sand
0853 4.3 Ft poor vis - organics
over sand

FILE =
0857 stop logging EOL #6 005 — 0903.vid

0903 Start Logging #5 4.7 Ft
0908 SAND — poor vis/organics @ bottom
0913 very poor vis. hit sand bottom
4.2 Ft
0926 SAND poor vis. 3.7 Ft SOG — 1.75 kts
0934 5.5 Ft sand
0940 Stop logging - PIER

0946 Restart Line #5 on N side of pier
poor vis, sand
0954 A TAPE #13
0955 SAND HYDROICS on camera
0958 6.1 FT Sand
1003 5.9 Ft — sand close to nourishment
1005 stop logging

1007 EOL #4 004 — 1007.vid
sand
1017 6.1 FT SAND | conch
1023 6.6 FT SAND SOG = 1.53 Kts

2363 FT Myers/ACE

7/13/11 Cont.

1027 6.6 ft sand
1031 conchs
Sand 6.7 ft
1040 offline to go around tip of pier
7.5 ft sand
1047 Sand 7.6 ft
poor vis.
1054 5.8 ft sand
~1059 stop logging DVR - stuck
& Tape #14
1110 start logging 004_1110.vid
1111 tuft of Algae
1112 6.9 ft sand
1120 ∅ vis - sand but bottom 7.5 ft
south side has poor vis.
1126 sand 6.8 ft
1135 sand 6.2 ft
EOL #5

1157 Logging line #3 sand
1204 Sand Bottom - hydrocots/caulepa
red algae (Laurencia)
1209 no vis SAND Bottom
w/ Macro algae -
1212 Caulerpa/Laurencia & sand bottom
1221 sand / algae (sparse) poor vis.
1232 sand only no vis / - hitting bottom
1232 & Tape 0 #15

~~26~~ 2363 ~~#7~~ Mye

7/13/11 con

1235 sand no vis / hit bottom to see 8.3 ft.

1236 off line some - being pushed in by wind

1255 7.0 ft sand

1304 Stop logging @ line 4

1319 Drop C target

Drift transect #A on on SW corner of disposal area

1331 Stop logging - poor vis / not working well

Try to snorkel / take photos

1345 Jumped in. felt bottom - no vis

fine sand w/ some silts

MACRO / Urchins

1348 Depart site

S → N

1355 Add. transect #1 in adv. maint area

Continue tape 15

Begin Logging

SAND only 1.1 kf

FILE 2

001 - 1355.vis

1356 5.5 ft

1410 sand 16.6 ft

1411 Change tape # 16

1415 Stop logging

1418 ADD Transect # 2 N → S in adv. maint area

SAND

2363,

7/13/11, cont

1419 002_1418.vid

1420 stop logging - current pushing
go different direction

1422 FILE 001_1422.vid
Sand 13.2 ft

1434 12.8 ft
SAND

1437 11.6 ft Sand

1442 15.0 ft Sand

SOFT BOTTOM

1443 Sand/shell hash
18.2 ft

1444 End Logging

1500 @ Dock Clean Boat
rename HDD files

2363
FT MYERS, ACOE
7/14/11

0745 DEPART DOCK AFTER CHECKING OUT
0809 START LOGGING TAPE #17
down channel mid 001_0809.vid
0810 8.7 ft soft bottom (SB)
1.13 Kts
0817 SB ~~11 ft.~~
0817 SB 13 ft in turning basin
0827 SB 14.6 @ SHRIMP BOATS
STOP LOGGING
0837 Start logging in channel - edge of E shoal 002_0837.vid
soft bottom - NOSAV 11.0 ft
0842 7.0 ft SB
0847 10.6 ft SB STOP logging

0854 Start logging 15.7 ft 003_0854.vid
0902 soft Bottom throughout 13.2 ft
0905 STOP logging

0911 start logging 004_0911.vid
SB / hydroids 13.8 ft
SOG 1.70
0928 STOP LOGGING
END VIDEO OPERATIONS

0940 BEGIN DEMOBILIZATION while transit to EAST SHOAL

7/14/11

1430 ATTIVE STUART
1530 UNLOAD TRUCK / END FIELD OPS

ATTACHMENT D

Data Sheets

EAST SHOAL TARGET #1 50 Ft From Channel Toe

Target #2 25ft From Channel Toe

@ Target #2 @ 9m from T2 HW ① BB Score 4 (50-75%)
Sed. Fines/Silty muds depth @ L. tide ~ 40cm

@ 7.5m From T2 ② BB 1 (<5%) mud/silts / fine seds
@ 6.0m from T2 ③ BB 0 a1 (Solitary)

From 0-6m from T2 Ø SG / Ø MACRO

~~@ 6.0m from T2 4 BB 48m~~
@ 7.0m from T2 ④ BB 1 (<5%)
@ 8.0m from T2 ⑤ BB 1 (<5%)
@ 8.5m from T2 ⑥ BB 3 (25-50%)

Job 23363
FT MYERS
ACOE

Target #3
0 - 2.2 m NW From T#3 into Channel Buffer Zone - H. wrightii

BB Score @ 0-0.8 M ① BB score 0.5 Num. small cover
1-1.8 ② BB score 1.0 (<5%)
1.8-2.6 ③ BB score 0.1

Silty/fines muds vis < 3 inches

T1 - Ø SG in Buffer Zone
* @ L Tide SG only Exp @ 25 cm T5 - Ø SG B/t Center & Buffer edge
T4 - Ø W/in Buffer Deep
T6 - 0-1 M E of T6 H.W. ~ 90 cm deep @ low tide
BB Score - ① only = (<5%) = 1

11/11/11

Target #7 Ø SG from buffer edge to channel toe

From TL 0-1.5m Ø SG Macro only @ 75-100% (5) BB
1.5-2.0m HW @ 2 (5-25%)

Target #8 - Edge of 50 ft Buffer
Measure out from edge to 10m Ø SG.
photos

Target #9 Edge of 50' Buffer
Ø SG W/in Buffer Zone

Target #10 - Edge of 50' Buffer Ø SG

Target 11 - From 0-1m exposed Ø SG to East of #11
1-3m HW only from buffer edge
BB Score (3) 25-50% TMA
(1) 5-25%

Target #12 Ø SG w/in Buffer

Target #13 Ø SG Walk along Bank

Target #14 Ø SG w/in Buffer

Target #15 Just W of Marker #26 BB (1) 25-50% HW
0-3.3 HW/TE inside Buffer zone Ø TE w/in BB

Target #16 Ø SG W/in Buffer Target #17 Ø SG in Buffer zone

ATTACHMENT E

ArcGIS Shapefiles of Video Transect Lines and Seagrass Habitat

(ArcGIS Shapefiles – Digital Format Only)

ATTACHMENT F

Towed Video Data

(Video Data – Digital Format Only)