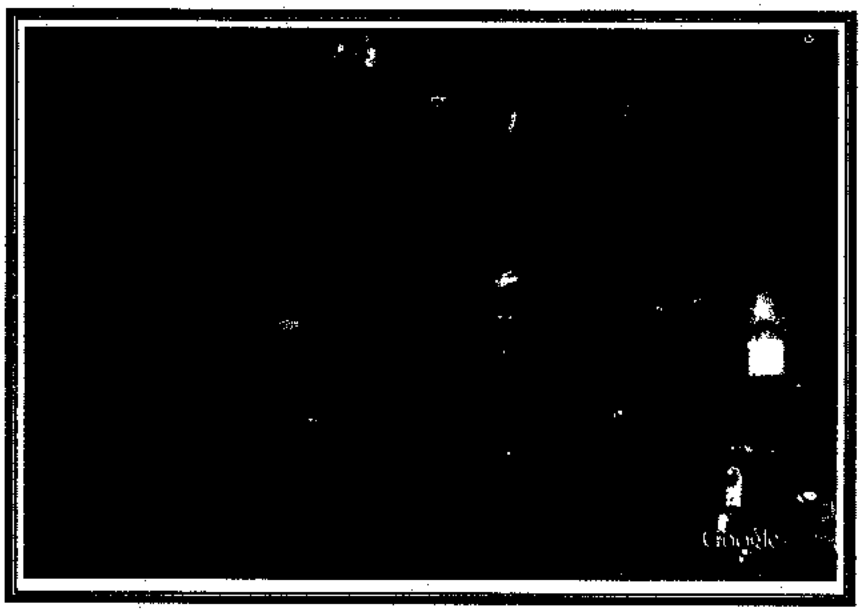
SUPPLEMENTAL
ENVIRONMENTAL INFORMATION
Mooring Buoy Repair Project

Harbor of Refuge Piti
Port Authority of Guam



ARC ENVIRONMENTAL SERVICES

November 10, 2016

1.0 PURPOSE AND NEED FOR SUPPLEMENTAL INFORMATION

The Port Authority of Guam (PAG) proposes to renovate between 29-35 mooring buoys, chains and shackles at the Guam Harbor of Refuge in Piti. A project Environmental Assessment (EA) was completed in August of 2015 by AmOrient Engineering. ARC Environmental Services Inc. was contracted to provide supplemental information through the completion of rapid assessment of conditions at four (4) representative mooring buoys within the Guam Harbor of Refuge (GHOR). Specifically, we were required to address questions enumerated in an email from Edward Curren of the United States Fish and Wildlife Service (USFWS) to the Port Authority of Guam (PAG) dated June 16, 2016 (Appendix A) which focuses on marine resources, proposed replacement/repair activities and potential impacts with emphasis on any Endangered Species Act (ESA) listed species that may be present.

This brief document is organized based upon the email questions generally in the order they were presented. Answers to these questions are necessary to complete protected species and habitat consultations with National Marine Fisheries Service (NMFS) for the Harbor of Refuge Mooring Buoy Repair Project. The Dock B Removal Project is not part of the proposed action for which this supplemental information was developed, nevertheless information here, is in part, germane to that project as well.

2.0 METHODS

The focused marine survey was conducted by ARC Environmental Services biologist Mr. Steven Johnson on November 1st, 2016 and involved snorkeling to each of the four (4) representative mooring buoys selected (see Figure 1) within the GHOR noting benthic resources to the greatest extent practical on the concrete mooring blocks, chains and shackles and immediate surroundings which is considered the Area of Potential Effect (APE). Four photographs (Appendix A) were taken in each of the cardinal directions from the center of the mooring block outwards, with the two most informative/clearest photos placed into the photo plates found in Appendix A.

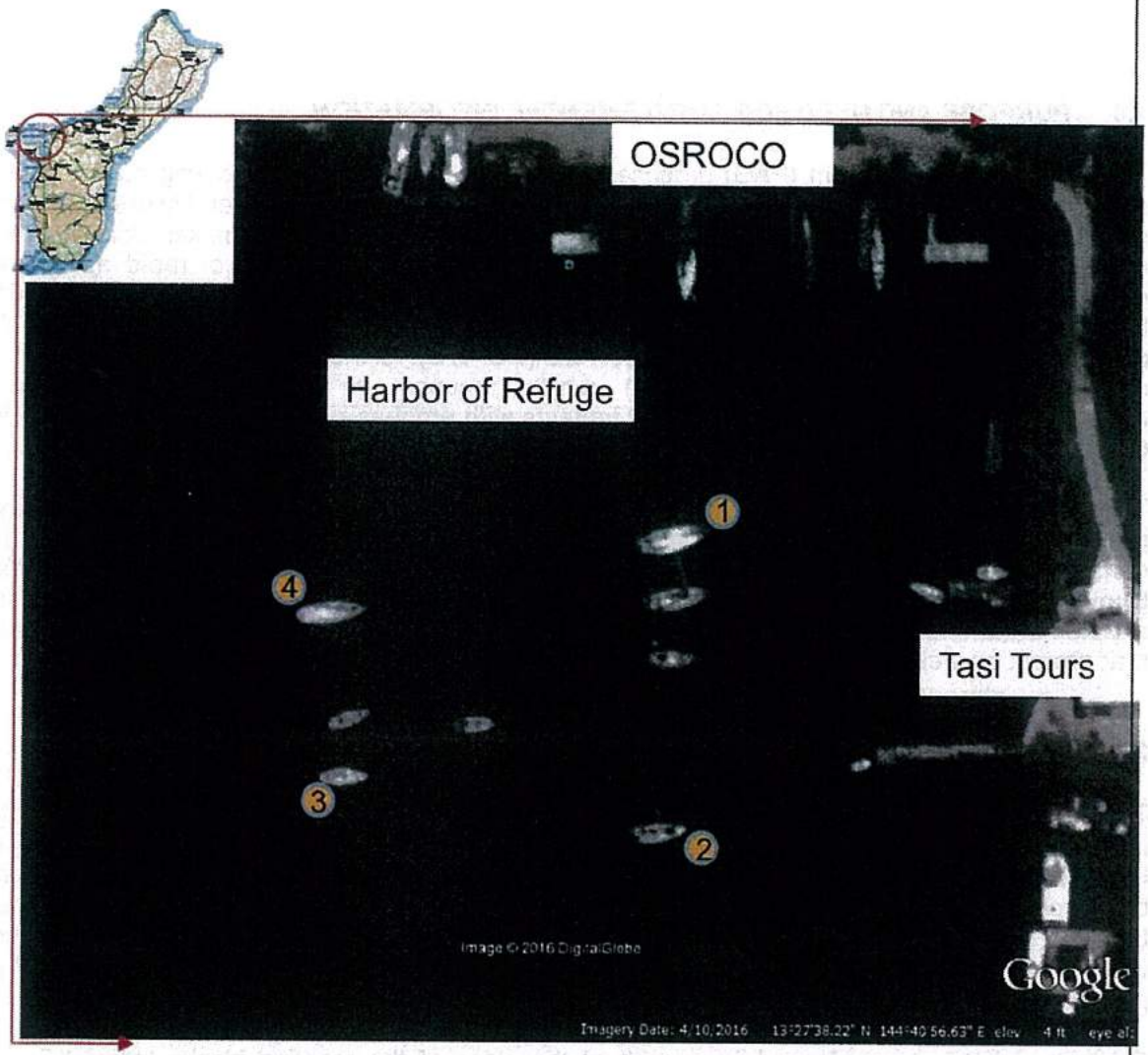
Originally, photos were planned from each of the sides of the mooring blocks (appx 1.5 x 1.5 m concrete) facing toward the mooring but high levels of turbidity prevented meaningful photos from being possible. Photos between mooring blocks were also planned but again conditions were not favorable. References relied upon for identifying resources are located at the end of this report.

3.0 CHARACTERISTICS OF THE SITE

3.1 Sediment Characteristics

The project EA reported the harbor bottom characteristics as being fine – grained and classified clay sand in one section and coarse sand and rubble in another (AmOrient, 2015). The Guam Coastal Atlas reports the benthic substrate to be comprised of Sand, Un-colonized 90-100% (Burdick, 2005).

While sediment sampling and analysis was beyond the scope of this survey, we found during survey efforts that the bottom of the HOR to be comprised of sand of carbonate origin mixed with thick silt.



Surveyed Mooring Block Locations

N

Location/Vicinity Map
Guam Harbor of Refuge - Piti

ARC *Environmental Services*

Date
November 2016

Figure No.
1

These characteristics are indicative of sheltered areas not subject to high energy wave action or currents, where organic material and remnants of what was reported to be a shallow water estuary prior to post WWII dredging and filling, remain.

3.2 Site Biota/ESA Listed Species

The 2015 AmOrient EA did not include results of a project specific marine survey. During the rapid marine assessment completed for this report, the marine biota of the GHOR mooring area (Area of Potential Effect) was found to be comprised predominantly of fleshy macroalgae. The fleshy macroalgae *Halimeda opuntia* is the dominant biota on the submerged infrastructure and surrounding bottom with coverage estimated between 15% and 60%. In natural environments, *Halimeda opuntia* can form large beds that are several meters long. In the GHOR, they also attach to concrete mooring blocks and associated ropes and buoys. Additionally, the brown macroalgae *Padina jonesii* and filamentous turf algae (<2cm in height) are present on GHOR structures (estimated coverage/density <5%). None of the three Endangered Species Act (ESA) coral species listed in 2014 by NOAA Fisheries, *Acropora globiceps, Acropora retusa* and *Seriatopora aculeata,* were observed on or around the four mooring buoys/blocks or bottom between these features. Photographs of conditions where turbidity levels were manageable are found in Appendix B.

Of the two (2) ESA listed sea turtles known to regularly inhabit Guam waters, only the threatened green sea turtle *Chelonia mydas* has been recorded in the vicinity of the GHOR, specifically the Piti Channel (AmOrient, 2015). Sea turtles primarily feed upon macroalgae and sea grasses (USFWS, 1997). Both *Halimeda spp.* and *Padina spp.* have been found in trace amounts (<5% by vol.) in sea turtles during a study conducted in Australia (Forbes, 1996).

According to the project EA, operators utilizing the GHOR and the Aquaworld Marina have never observed sea turtles in the GHOR facility. The Guam Department of Agriculture Division of Aquatic and Wildlife Resources (GDOA DAWR) regularly conducts aerial surveys for sea turtles on Guam. A telephone conversation with a GDOA DAWR wildlife biologist Mr. Tom Flores who is familiar with sea turtle surveys revealed that the agency did not have records of turtle sightings in the GHOR.

Since, sea turtles have not been observed in the GHOR, it is likely that the site is not preferred due to some combination of the complex interdependent mix of variables thought to influence sea turtle habitat suitability for feeding (Forbes, 1996) or nesting.

3.3 Salinity, Temperature and Depth

According to a Technical Report published by the University of Guam Marine Laboratory (1979) focusing on the potential for ocean thermal conversion in the vicinity of Apra Harbor the average surface temperature is 84.5° Fahrenheit (F). Temperatures remain relatively constant deviating by only 4-5°F throughout the year. Average salinity is 34.43% (UOGML, 1979). These gross temperature and salinity values remain valid today with very little variation due to the location and physical layout of the GHOR relative to the Apra Harbor location studied in the report.

No hydrographic survey has been completed for the GHOR. The average depth has been reported as being minus 8 Feet MLLW (AmOrient 2015). Observations of estimated depth recorded during survey

activities ranged between minus 6 and 15 feet.

3.4 Frequency of Site Disturbance

As can be expected, the GHOR is subject to daily disturbance resulting from vessel traffic. The project EA states there are moorings for approximately 59 vessels. At any given time, the number of vessels present and the traffic patterns vary depending on use by residents, tourism operators and transient vessels (AmOrient, 2015).

Natural disturbances occur in the way of storm events. Guam is frequented by tropical storms and typhoons. Typhoon season corresponds to the summer and fall months during the "wet" season. The GHOR was developed to shelter vessels from the effects of these storm events.

3.5 Proposed Action

The PAG proposes to renovate between 29 and 35 mooring buoys including chains and shackles (AmOrient, 2015). The existing hardware can be removed in one or a combination of the three following methods:

1. Manual removal of shackle using hand tools and breaking bar leverage. This method can be used by 2-3 divers if there is adequate clearance at the shackle to permit use of a pipe wrench and extension and if the shackle material has not deteriorated significantly. This method would only require a small skiff for support.

2. Compressed air saw. A metal saw driven by compressed air can be used to sever shackles thereby freeing the chain and buoy and allowing for replacement or repair. This method would use very similar labor and equipment as the manual method but a generator and compressor would be present on the work skiff.

3. Underwater torch. A pair of divers can use an underwater cutting torch to sever the shackle freeing the chain and buoy. This would require the necessary torch cutting equipment be placed on the skiff and would likely be the most costly alternative.

In all cases chain, shackles and buoys would be staged in an upland location and disposed of at a Guam EPA permitted facility, recycled through one of several permitted vendors, or where appropriate, reused.

4.0 DESRIPTION OF IMPACTS

Impacts that could result from renovation of the GHOR mooring shackles, chains and buoys were covered in the project EA. Any additional details made possible as a result of our survey activities are contained in the following statements below.

4.1 Coral Reef Resources (ESA Listed Coral Species)

No Impact. No coral reef resources (to include ESA listed species) were identified in the project APE during the rapid assessment survey. Given the limited nature of the proposed action and specific site conditions (absence of stony coral), no impacts to coral reef resources will occur and a no effect upon ESA listed coral species determination is considered an appropriate recommendation.

Algae that are present on top of the concrete mooring blocks would be disturbed during work. Algal growth on the shackles, chains and buoys would be removed with those elements they are attached to. New algal recruitment would occur on any newly installed features over time.

4.2 ESA Listed Turtle Species

No Impact. No ESA listed turtles have been documented in the GHOR. No critical habitat has been designated in the GHOR. The GHOR is not a known turtle nesting site nor considered a preferred foraging grounds for listed sea turtles. The AmOrient project EA statement recommending a *"no effect"* determination relative to ESA listed sea turtles, remains appropriate.

4.3 Sediment/Rates

No Significant Impact. Existing sediments (re-suspended during daily vessel activity) may be re-suspended during renovation activities as divers work to remove and replace shackles, chains and buoys, however this re-suspension will be temporary as sediments will settle following work activities. New sediment will not be added to the area nor will sediment rates change.

4.4 Water Quality

No Significant Impact. Water quality will be degraded as re-suspension of silts occurs. Water quality could be affected through the release of petroleum products and other contaminants from the work skiff and related equipment, if they are present. Silt will re-settle in place following work. The threat of contaminant release into the water would be mitigated through use of Best Management Practices (BMPs) routinely required by permitting agencies to preclude refueling near the water, staging of absorbent pads and ensuring that fuel and other potential contaminants are properly stored and managed.

4.5 Depth

No Impact. The proposed action does not involve dredging, filling or any other activity that action would change water depths.

4.6 Contaminant Release

No Impact. See section 4.3 Water Quality above.

4.7 Tidal Flow, Currents and Wave Patterns

No Impact. The proposed action does not involve dredging, earth work, or filling or any other activity that would change currents, wave patterns or tidal movement.

4.8 Salinity and Temperature

No Impact. The proposed project would not impact ambient salinity or temperature characteristics in the GHOR.

5.0 REFERENCES

AmOrient Engineering. Final Guam Harbor of Refuge Capital Improvement Project Piti, Guam – Environmental Assessment, August 2015.

Burdick Dave. Guam Coastal Atlas, November 2005.

Forbes, Gregory A. The Diet and Feeding Ecology of the Green Sea Turtle (Chelonia mydas) in an algal-based coral reef community. PhD Thesis James Cook University 1996.

Lassuy, Dennis R. Oceanographic Conditions in the Vicinity of Cabras Island and Glass Breakwater for the Potential Development of Ocean Thermal Energy Conversion on Guam. UOG technical Report No. 53. July 1979.

Littler, Mark M and Diane S. South Pacific Reef Plants: A Divers' Guide to the Plant Life of South Pacific Coral Reefs. February 2003.

National Marine Fisheries Service. Recovery Plan for the U.S. Pacific Population of the Green Turtle *(Chelonia mydas)*. 1998.

NOAA Fisheries, Pacific Island Region. Field Identification Guide to the Corals of Guam listed as "Threatened" under the Endangered Species Act. June 2015.

Verons, J.E.N. Corals of the World. 2000.

Appendix A

Correspondence

Dora Cruz Perez

From: Edward Curren <edward_curren@fws.gov>
Sent: Thursday, June 16, 2016 8:38 AM
To: Dora Perez; Dot Harris; Tom P Flores; Jay Gutierrez
Subject: GU BIG Hbr of Refuge/BA Agat Dock B Removal Projects Environmental Data
Attachments: GU Hbr of Refuge CIP Project.pdf

Folks,

Additional information is needed for consultations with NMFS. Some of the information can be found in the AmOrient CIP Project (attached) for the Harbor of Refuge project, but additional information is needed for the Protected Species and Habitat consultations for both the Harbor of Refuge and Dock B removal.

In general, the following is needed:

1) Description of survey techniques, references

2) Site Characteristics

- Sediment characteristics
- Description of the biota found at the project site, especially ESA- listed species. Are there coral reef colonies at or adjacent to project site? If so describe the spatial extent, generalized statements of coral colony sizes. Identify coral to genus level if possible.
- What is typical salinity and temperature regime/range?
  What is the normal frequency of site disturbance, both natural and man-made?
- What is the area of proposed impact (work footprint & far afield)?

3) Description of Impacts

- Nature and duration of activity(s)
- Description of the benthic community be disturbed
- Will coral reef colonies be impacted?
- Will sediments be altered and/or sedimentation rates change?
- Will turbidity increase?
- Will water depth change?
- Will contaminants be released into sediments or water column?
- Will tidal flow, currents or wave patterns be altered?
- Will ambient salinity or temperature regime change?
- Will water quality be altered?

Please let me know if additional clarification of necessary information is needed.

Si yu'os ma'ase.

Flinn

- TOM GUTIERREZ

- TINO AGUON

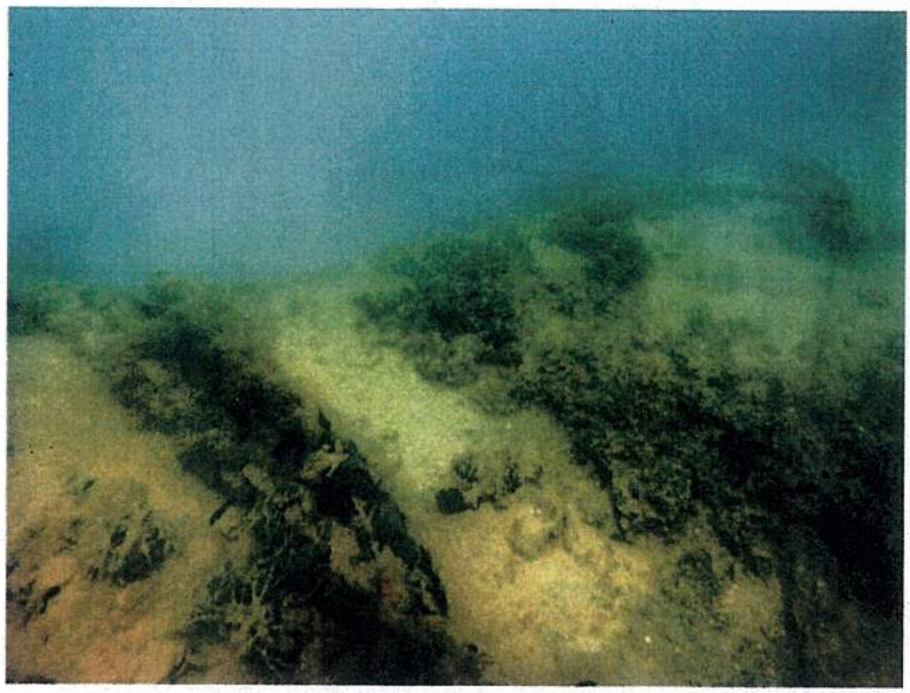
****

Edward Flinn Curren

Appendix B

Photos

1A



1B

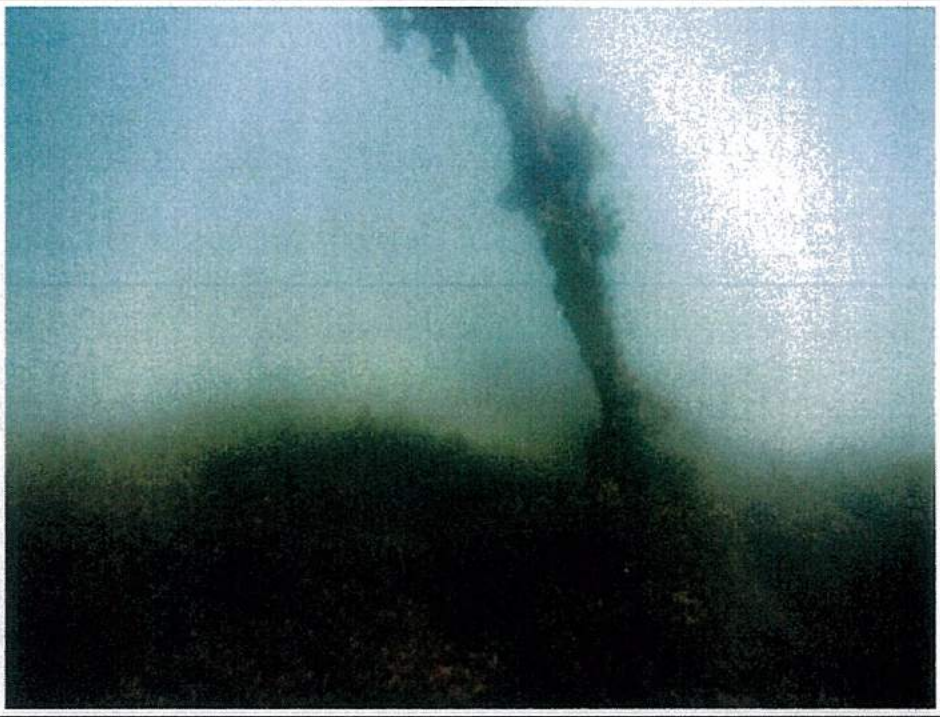
1A: Mooring Block 1 North Orientation
1B: Mooring Block 1 West Orientation

Date
November 2016

Photo Plate
1

ARC Environmental Services

2A



2B

2A: Mooring Block 2 East Orientation
2B: Mooring Block 2 South Orientation

Date
November 2016

Photo Plate
2

ARC Environmental Services

3A

3B

3A: Mooring Block 3 North Orientation
3B: Mooring Block 3 South Orientation

Date
November 2016

Photo Plate
3

ARC Environmental Services

4A

4B

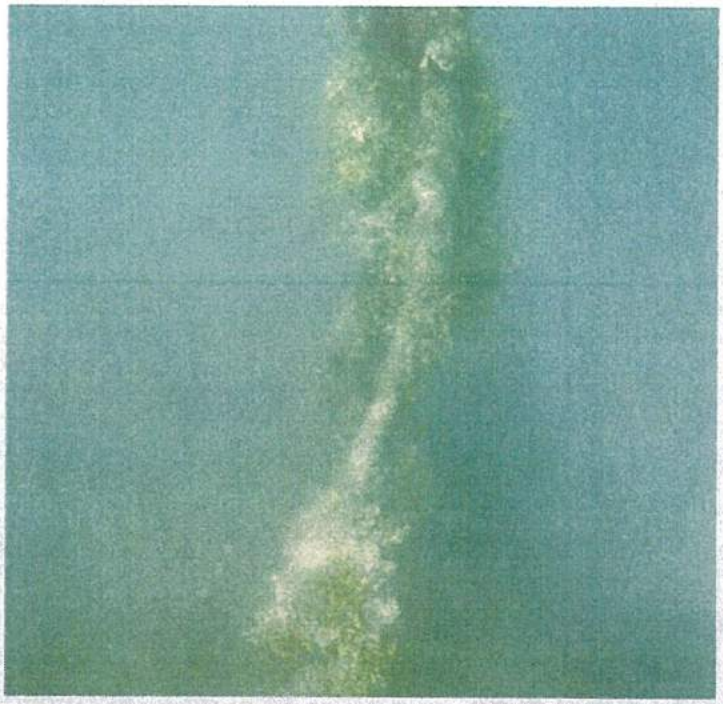
4A: Mooring Block 4 East Orientation
4B: Mooring Block 4 South Orientation

Date
November 2016

Photo Plate
4

ARC Environmental Services

5A



5B

5A: Algal growth on rope.
5B: Close up photo.

Date
November 2016

Photo Plate
5

ARC Environmental Services