Underwater Habitat Survey

Anacortes Custom Plywood Benthic Study

Anacortes, Washington

Washington State Department of General Administration

Contract 32206, Work Order S07-75300-011

Prepared for:

Washington Department of Community, Trade and Economic Development
P.O. Box 42525
Olympia, WA 98504-2525

November 2007

Project No. 13676-000

Geomatrix

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1.0 INTRODUCTION

Geomatrix Consultants, Inc. (Geomatrix), was contracted by the Washington State Department of General Administration on behalf of the Washington Department of Community, Trade and Economic Development to perform an underwater survey in Fidalgo Bay, Anacortes, Washington, under Professional Services Contract 32206, Work Order S07-75300-011 (Work Order). The goal of the survey was to document the extent of eelgrass, macroalgae, and visible debris in the near-offshore area adjacent to a previously burned plywood mill located on the shoreline of Fidalgo Bay and described in the Work Order (Figure 1).

This report outlines the equipment and methods used to conduct the survey, describes field conditions and survey results, and presents a summary of relevant findings.

2.0 METHODS

Geomatrix used its proprietary underwater surveying and mapping system to map the benthic habitat at the site. The survey was conducted using a video camera suspended from a boat moving slowly along transects established within the study area (Figure 2). This section describes the methods used to establish sampling transects, the survey equipment and methods, and data management techniques.

2.1 SURVEY TRANSECTS

Prior to field work, Geomatrix defined linear transects at specified intervals (Figure 2). All transects were aligned in an east-west direction nearly perpendicular to the shoreline. During the survey, the survey vessel would follow the path of the transects as closely as possible at a speed of approximately 1 mph. Once one transect was surveyed, the survey vessel would turn and follow the next transect in the opposite direction. Each transect was to be followed until shallow water or an obstruction was encountered on the shoreline end of the transect. The offshore end of each transect was defined by the limits of the survey area.

For the purposes of this survey, the survey area was divided into two subareas (Figure 3). The northern portion of the survey area is referred to as the North Survey Area and is 15.9 acres in

size. The southern portion of the survey area is referred to as the South Survey Area and is 30.5 acres in size. Transects in the North Survey Area were spaced about 25 feet apart, and transects in the South Survey Area were spaced 75 about feet apart.

2.2 SURVEY EQUIPMENT AND METHODS

The survey system consisted of a color underwater video camera mounted to a boat. The video camera records a continuous stream of video while the boat travels the length of the transect. The camera is attached to the boat on the front of a custom-designed, underwater camera mount that aims the camera down and forward at a 45-degree angle. Fins attached to the rear of the camera mount stabilize the camera mount and keep the camera pointed forward while the survey vessel is in motion.

The altitude of the camera above the bottom is controlled remotely by the camera operator. The optimum height above the bottom varies depending on water visibility, the presence of bottom obstructions, and bottom slope. Generally, a height of about 1 meter (m) (3 feet) above the bottom has been found to be ideal for most surveys.

A differential global positioning system (DGPS) with a position accuracy of <1 m was used to document the location of the survey vessel. The DGPS antenna is mounted directly above the camera. The DGPS was also used for navigation along the preplanned transect lines. The defined transects (Figure 2) were uploaded into the DGPS and were visible on the DGPS's navigation screen.

The DGPS provided the geographic coordinates, local time, and direction of boat travel. This information from the DGPS was output as a standard data stream using the National Electrical Manufacturers Association (NEMA) format. The DGPS data were recorded at 1-second intervals and superimposed onto the video image. The video stream was then recorded as an MPEG2 video file using a computer hard drive. The DGPS data stream was also logged separately on the computer hard drive as a text file.

One separate video file was created for each transect. File names were formatted as: T-xx yyyymmdd_hhmmss.mpg, based on a combination of the transect number, year, month, day of the month, and hour, minute, second at the beginning of each transect. Time was recorded as Pacific Daylight Time in the 24-hour format. A given transect can easily be reviewed on most PCs by identifying the transect number in the figures and selecting the corresponding video file.

After completion of the survey, the DGPS data were converted from the standard NEMA format, which uses the geographic latitude/longitude coordinate system, to the State Plane Coordinate System using the Army Corps of Engineers' program CORPSCON Version 6. For this survey, all data were converted to the Washington State Plane Coordinate System, North Zone, North American Datum of 1983 (NAD83), Survey Feet. These data were then imported into an Excel spreadsheet.

The video operator reviewed the video files to identify the presence of eelgrass, macroalgae, and visible debris. The operator recorded observations of eelgrass, algae, or debris in the corresponding lines in the spreadsheet. Eelgrass coverage was visually estimated as none (0 percent coverage), low (1 to 25 percent coverage), medium (25 to 75 percent coverage), or high (>75 percent coverage).

The spreadsheet data were imported into AutoCAD® and color-coded maps superimposed onto aerial photographs of the survey area were produced to display the extent and/or density of eelgrass, macroalgae, and visible debris.

3.0 RESULTS

The survey was conducted on July 28 and 29, 2007. The actual track of the survey vessel is shown on Figure 3. The weather on both days was excellent for conducting the survey, with very light wind and an overcast sky. A copy of the video data is provided on digital video disks (DVDs) as an attachment to this report. The video files were not edited and are exact copies of the field data files. The video files have been verified to play on PCs using Windows XP with Windows Media Player 9.

Visibility in the water was estimated to be less than 3 feet. This limited visibility required the camera to be kept closer to the bottom than preferred. In areas of eelgrass the camera had to be lifted above the top of the eelgrass to prevent entanglement of the camera on the plants. The bottom conditions usually could not be verified in the eelgrass beds due to the height of the camera and the poor visibility.

The southern portion of the South Survey Area was fairly shallow, so the field crew surveyed Transects T-67 through T-90 (Figure 3) on the first day (July 28, 2007) to take advantage of the high tide in the afternoon. These transects were spaced 75 feet apart. After completing this set of transects, transects in the North Study Area were surveyed starting with T-66 and working north, ending on the first day with T-58.

The remaining transects, T-1 through T-57 (Figure 3), were surveyed on July 29, 2007. Two additional transects were added during the survey to better delineate the extent of eelgrass (Figure 3). T-91 ran on a winding course from north to south along the inner boundary of the eelgrass bed in the South Survey Area. This transect was added to provide better definition of the shore-side boundary of the eelgrass bed. The edge of the eelgrass was not seen on several transects that were offshore of the former plywood mill (Figure 4). Transect T-92 was added to investigate the area just north of the abandoned finger pier to determine the eastern limit of the eelgrass.

Three primary patches of eelgrass were found during the survey (Figure 4). In the North Study Area, the main patch of eelgrass extended from Transect T-1 to T-40 and covered approximately 7.6 acres. The eelgrass in this area was exceptionally tall, with an estimated height of up to 6 feet. A second, small patch of eelgrass covering approximately 0.6 acre was observed in the southern portion of the North Survey Area approximately 400 feet offshore of the former plywood mill (Transects T-92 and T-53 to T-59). The total eelgrass coverage in the North Survey area was 8.2 acres of the 15.9-acre survey area (52 percent coverage). The third eelgrass bed extended from Transect T-69 to T-90 in the South Survey Area and occurred on approximately 23.3 acres of the 30.5-acre survey area (75 percent coverage).

All three eelgrass beds extended outside of the survey area to the east. There were other isolated patches of eelgrass; however, the majority of the eelgrass occurred in eelgrass beds that were nearly contiguous.

The shore-side edge of the eelgrass bed observed in Transects T-1 through T-35 was apparently defined by an elevation change or by the limit of reflected wave energy along the channel and seawall of the Fidalgo Marina (Figure 5). No clear reason for the lack of eelgrass in the nearshore areas was apparent on Transects T-36 to T-70. Between Transects T-70 and T-75, it appeared likely that wood debris is impacting the eelgrass nearest to the shore (Figure 6). On Transects T-76 through T-90, the shore-side edge of the eelgrass appeared to be defined by shallow water.

Figure 6 shows the locations where visible debris laying on the bottom was observed in relation to the mapped eelgrass beds. Small amounts of metal debris were observed in the vicinity of the abandoned pier structures (Transects T-60 through T-70). This metal debris consisted of pipes, cable, an iron “I” beam, and a concrete ledge.

Most of the wood debris observed was located in the vicinity of the former plywood mill extending along the shoreline from Transects T-60 to T-76. Patches of wood debris were also observed near the collapsed finger pier that extends offshore near Transects T-64, T-65, T-66, and T-92. The wood debris consisted of pieces of bark, an occasional log, and lumber. The lumber debris was more common in the areas near the abandoned piers. With the exception of the concrete structure, all of the debris appeared small enough to be easily dredged out with a bucket dredge.

Because of poor visibility and/or macroalgae covering the bottom, the presence of wood debris could not be verified over large portions of the survey area. However, because heavy deposits of wood debris are likely to affect the distribution of eelgrass (eelgrass does not appear to colonize areas of heavy wood deposits), it is likely that the amount of wood debris within the eelgrass beds is low. *It is important to keep in mind that while this survey can confirm the presence of wood debris, it cannot detect obscured debris or wood debris that is buried in the sediment.*

In the North Survey Area, macroalgae were observed mixed in with the eelgrass. The amount of macroalgae diminished in the southern portion of the site (Figure 7). The macroalgae beds appeared to consist primarily of brown *Laminaria* sp. In the nearshore areas of the site, *Ulva* sp. became more common. *Ulva* sp. coverage was not included on the figures.

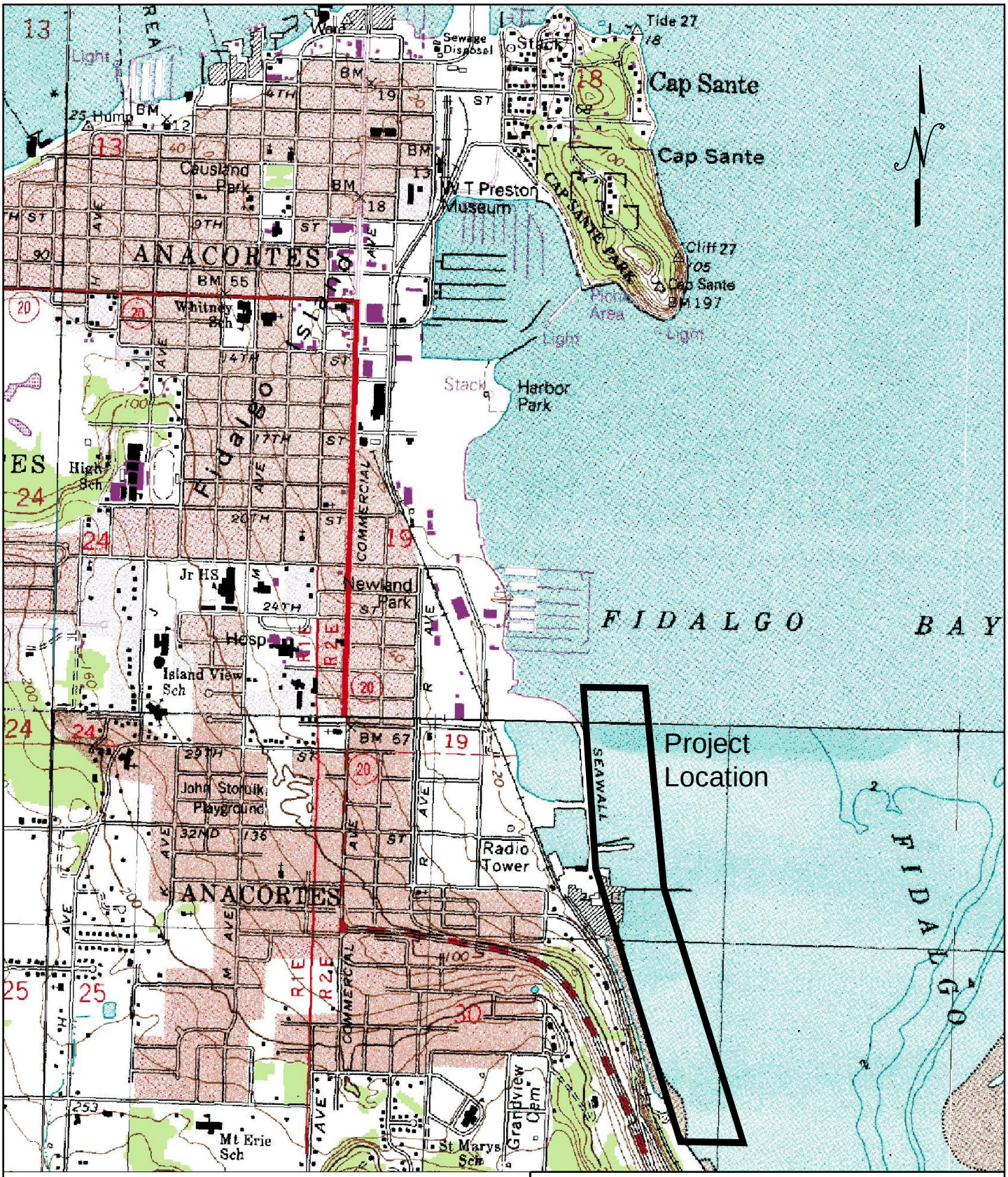
4.0 SUMMARY AND CONCLUSIONS

An underwater video survey was conducted on July 28–29, 2007, in the nearshore area of Fidalgo Bay directly offshore from the former Custom Plywood facility. The survey identified the following features:

- Three eelgrass beds covering 7.6 acres in Transects T-1–T-40; 0.6 acres in Transects T-53–T-59; and 23.3 acres in Transects T-69–T-90;
- Overall eelgrass coverage of 52 percent in the North Survey Area and 75 percent in the South Survey Area;
- Scattered areas of visible debris, concentrated in the vicinity just offshore from the former Custom Plywood site and in the vicinity of the abandoned pier;
- Large amounts of macroalgae in the North Survey Area, primarily *Laminaria* sp. with *Ulva* sp. in the nearshore areas; and
- Only very limited amounts of macroalgae in the South Survey Area.

The presence of wood debris in the nearshore area apparently limits the shoreward extent of eelgrass from Transect T-70 to T-75. Visual surveys identified no clear explanation for the absence of eelgrass in the nearshore area between Transects T-36 and T-70. Poor visibility limited the ability to observe large portions of the bottom. However, because eelgrass generally does not colonize areas with extensive wood debris, it is likely that the amount of wood debris within the eelgrass beds is low.

Figures



Map Courtesy of USGS

APPROXIMATE SCALE IN FEET

0 750 1500 3000

PROJECT VICINITY OF EELGRASS VIDEO SURVEY

Anacortes Custom Plywood Benthic Study
Anacortes, Washington

By: GSM	Date: 8-24-07	Contract # 32206
Geomatrix		Figure 1

Project Vicinity.dwg

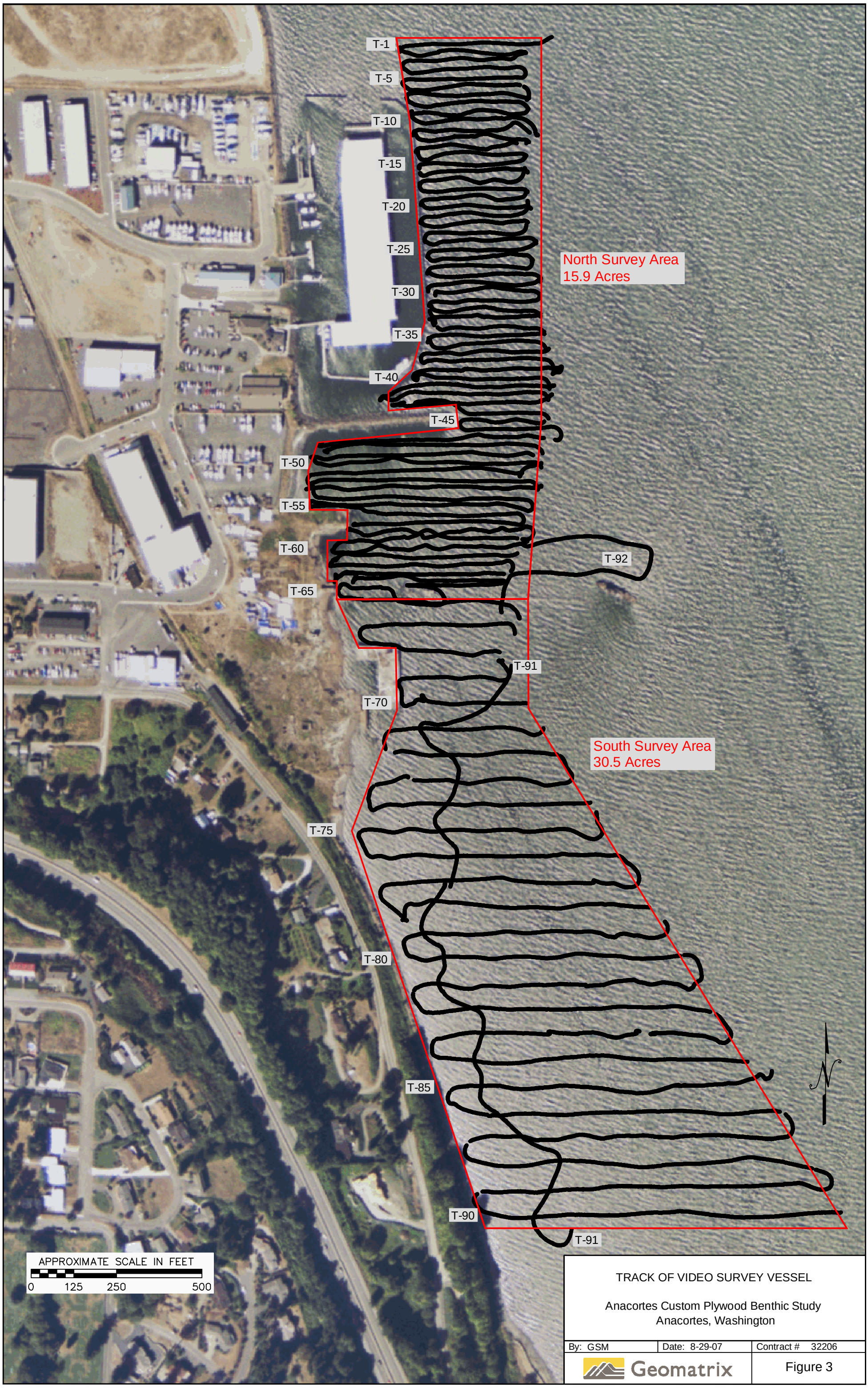
PROPOSED VIDEO SURVEY TRANSECTS

Anacortes Custom Plywood Benthic Study
Anacortes, Washington

By: GSM	Date: 8-29-07	Contract # 32206
Geomatrix		Figure 2

GSA Anacortes Eelgrass Survey.dwg

Aerial Photo Courtesy of WSDOT



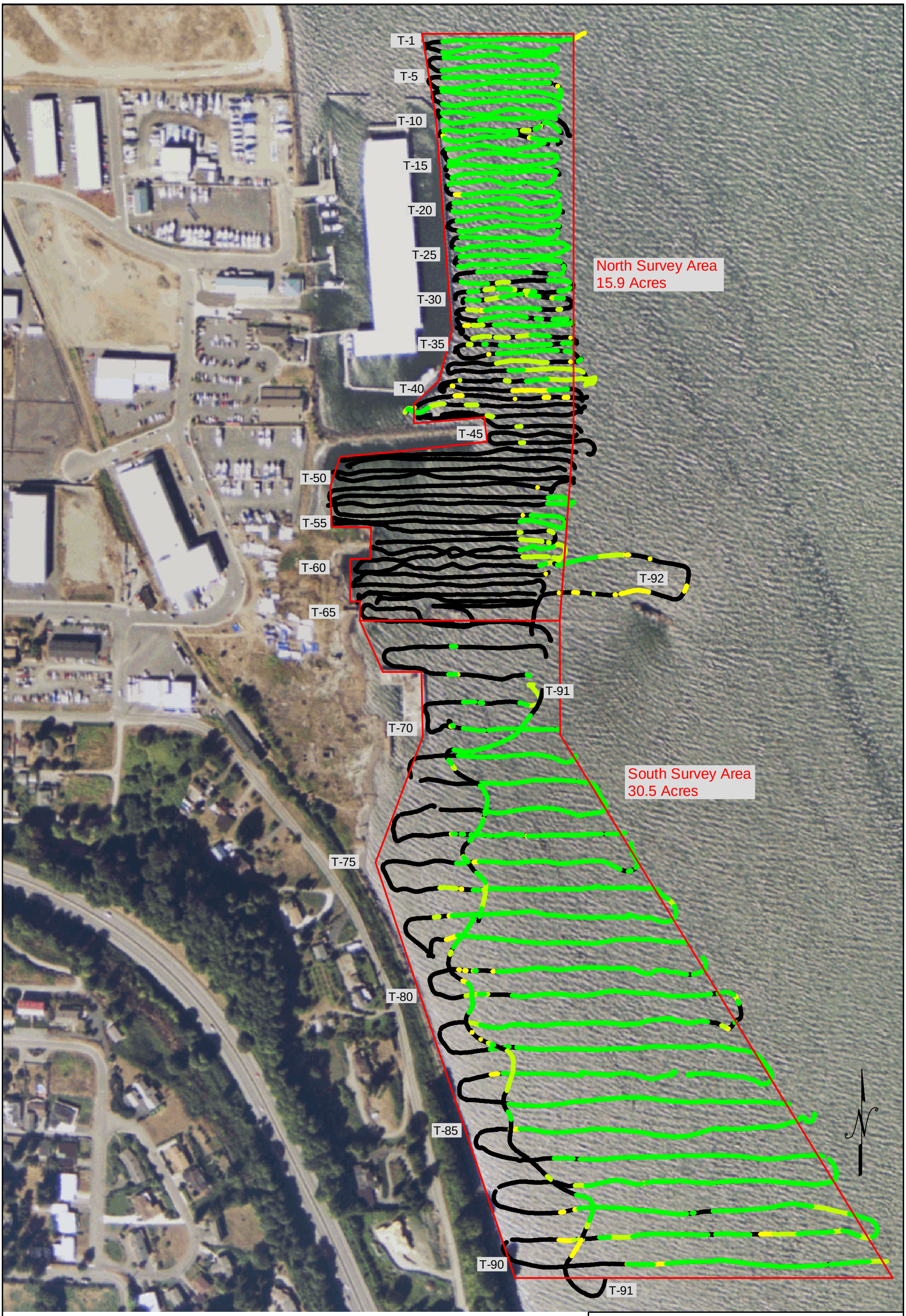
TRACK OF VIDEO SURVEY VESSEL

Anacortes Custom Plywood Benthic Study
Anacortes, Washington

By: GSM	Date: 8-29-07	Contract # 32206
Geomatrix		Figure 3

GSA Anacortes Eelgrass Survey.dwg

Aerial Photo Courtesy of WSDOT



APPROXIMATE SCALE IN FEET

0 125 250 500

LEGEND

- None
- Low 1 to 25%
- Medium 25 to 75 %
- High > 75%

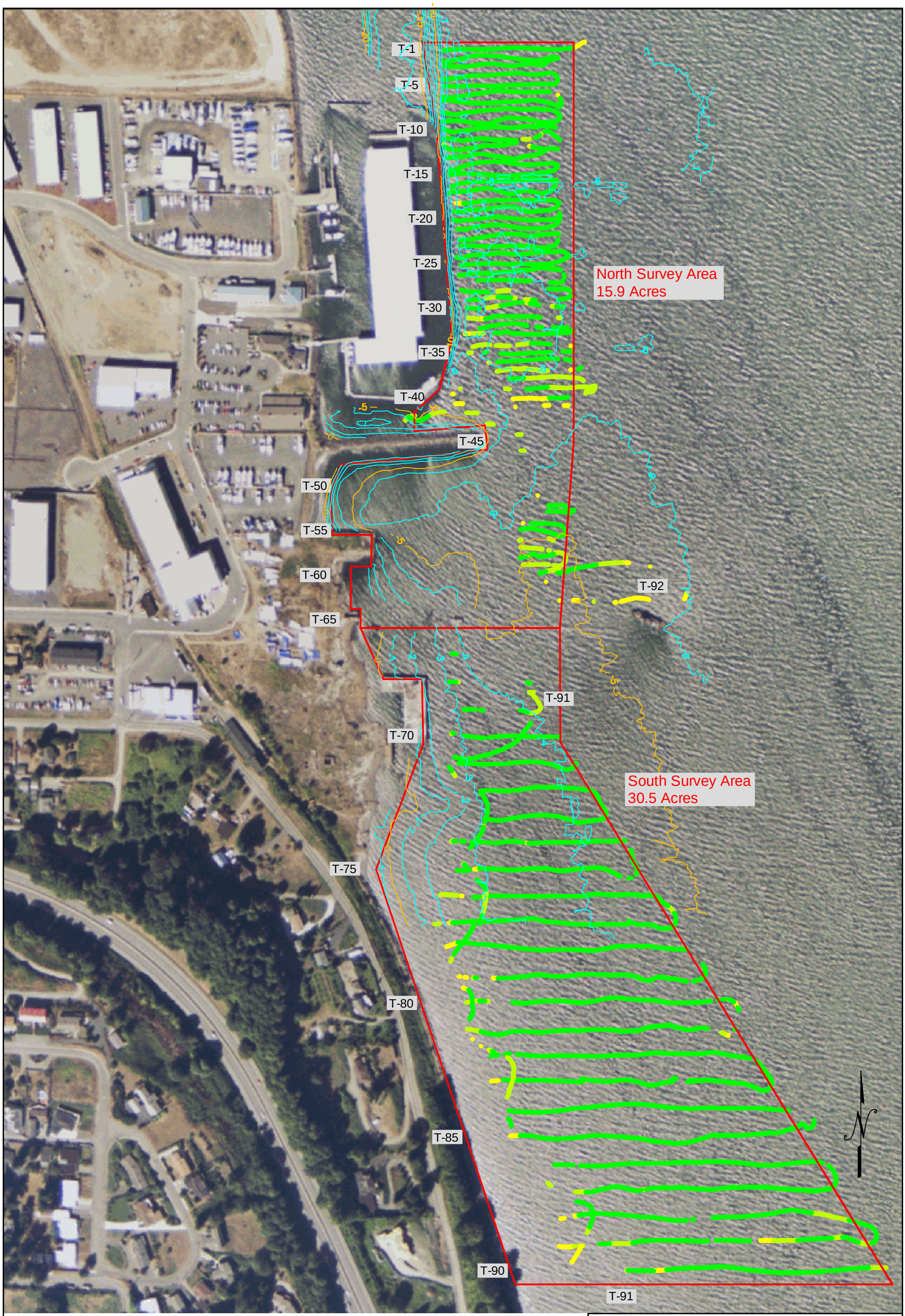
EXTENTS OF EELGRASS BEDS

Anacortes Custom Plywood Benthic Study
Anacortes, Washington

By: GSM	Date: 8-29-07	Contract # 32206
Geomatrix		Figure 4

GSA Anacortes Eelgrass Survey.dwg

Aerial Photo Courtesy of WSDOT



APPROXIMATE SCALE IN FEET

0 125 250 500

Bathymetry Datum: MLLW
CRA Northwest, January 2006

LEGEND

- Low 1 to 25%
- Medium 25 to 75 %
- High > 75%

BATHYMETRY AND EXTENTS OF EELGRASS BEDS

Anacortes Custom Plywood Benthic Study
Anacortes, Washington

By: GSM	Date: 8-29-07	Contract # 32206
Geomatrix		Figure 5

GSA Anacortes Eelgrass Survey.dwg

Aerial Photo Courtesy of WSDOT

T-1
T-5
T-10
T-15
T-20
T-25
T-30
T-35
T-40
T-45
T-50
T-55
T-60
T-65
T-70
T-75
T-80
T-85
T-90
T-91
T-92

North Survey Area
15.9 Acres

South Survey Area
30.5 Acres

pipe
object
cable
concrete object
pipes
steel_bar
steel_beam
steel_pipe

APPROXIMATE SCALE IN FEET
0 125 250 500

LEGEND
- Visible Wood Debris
- Other Debris

Eelgrass
- Low 1 to 25%
- Medium 25 to 75 %
- High > 75%

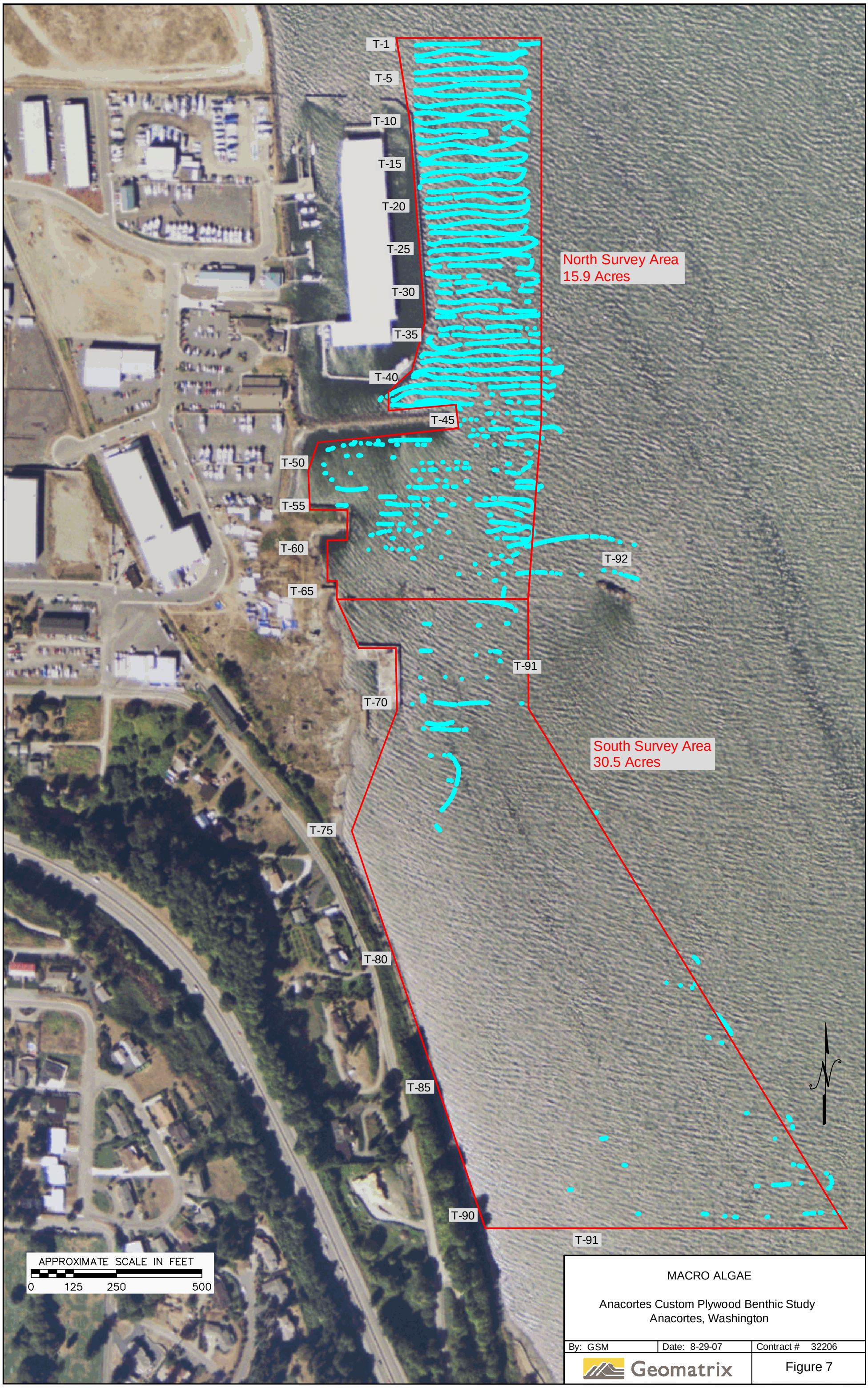
OBSERVED DEBRIS AND EXTENTS OF EELGRASS BEDS

Anacortes Custom Plywood Benthic Study
Anacortes, WA

By: GSM	Date: 8-29-07	Contract # 32206
Geomatrix		Figure 6

GSA Anacortes Eelgrass Survey.dwg

Aerial Photo Courtesy of WSDOT



MACRO ALGAE

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Anacortes, Washington

By: GSM	Date: 8-29-07	Contract # 32206
Geomatrix		Figure 7

GSA Anacortes Eelgrass Survey.dwg

Aerial Photo Courtesy of WSDOT