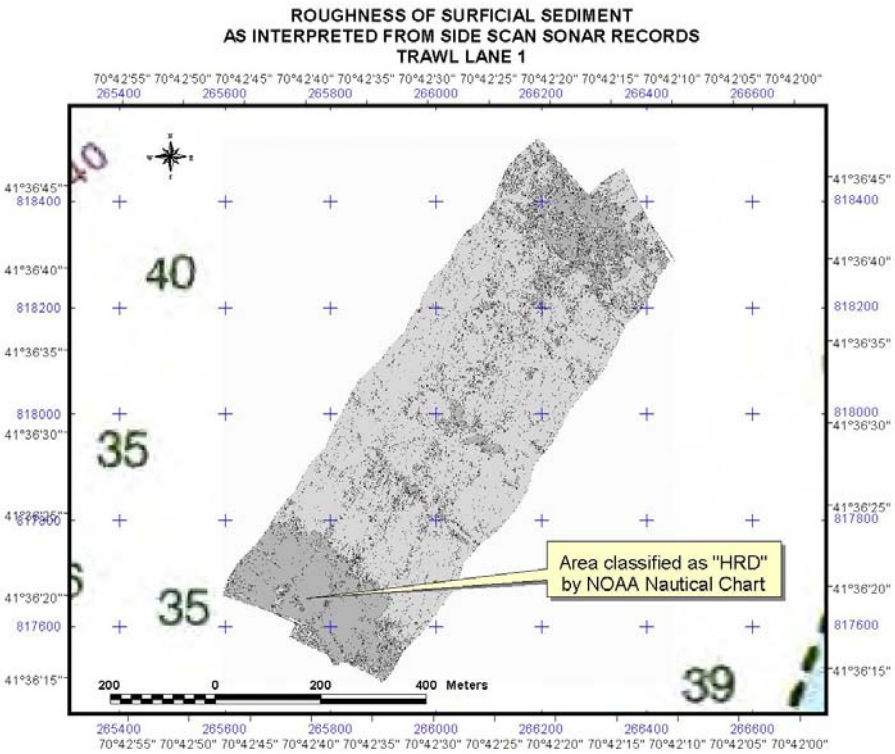
BOTTOM CLASSIFICATION SURVEY
BUZZARDS BAY DISPOSAL SITE



Roughness classifications range from light gray (smooth or fine sediment) to darker grays (rougher or coarser sediment). Classifications are based on the Slant-Range Corrected digital sonar records and have not been normalized for bottom topography. Therefore, areas with slopes causing an increased angle of incidence to the tow vehicle may be classified as rough.

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ROUGHNESS OF SURFICIAL SEDIMENT AS INTERPRETED FROM SIDE-SCAN SONAR RECORDS TRAWL LANE 1

BOTTOM CLASSIFICATION SURVEY BUZZARDS BAY DISPOSAL SITE SURVEY REPORT

1.0 INTRODUCTION

During the week of May 6, 2002, CR Environmental, Inc. (CR) of Falmouth, MA, performed a side-scan sonar and underwater video survey for The Maguire Group, Inc, and Massachusetts Coastal Zone Management (MACZM) at the Buzzards Bay Disposal Site (BBDS). The purpose of the survey operation was to provide bottom habitat data to help interpret the results of a year long fisheries trawl study performed at the BBDS by MACZM and the Massachusetts Division of Marine Fisheries (MADMF) on the F/V *Lady Jane* contracted by CR.

2.0 SURVEY VESSEL AND EQUIPMENT

2.1 Survey Vessel

The survey operation for the BBDS bottom classification survey was performed using CR Environmental's 32-ft aluminum vessel, R/V *Cyprinodon.* This vessel is equipped with a large pilothouse for the survey electronics, differential GPS, radar, a color video sounder, autopilot, a 5 Kilowatt generator, and a hydraulic winch and A-frame for the deployment of equipment.

2.2 Navigation and Bathymetry

Horizontal positioning for the survey was accomplished using a Trimble AG 132 DGPS equipped with an Omnistar Satellite Differential Receiver. Sub-meter accuracy was achieved with this system. The Coastal Oceanographics, " HYPACK" survey software acquired data from the DGPS, converted WGS84 latitude/longitude into the MA state-plane coordinates (NAD83) , and provided a helmsman display for running tracklines.

2.3 Side-scan Sonar

Side-scan sonar data was collected with an Edgetech Model 272 side-scan towfish and a topside processing computer with the Chesapeake Technology Sonar WIZ software. The system was operated on the 100 kHz frequency and data was collected out to 300 ft each side of the vessel. The side-scan system was interfaced to the DGPS and the layback, distance from the side-scan towfish to the DGPS antennae, was entered into the system.

2.4 Video Sled

Underwater video footage was collected with a light weight aluminum video sled equipped with a DeepSea Power & Light Multi-Sea Cam high resolution color camera with 250 watt lights, and a navigation overlay system. The video sled was towed just off the bottom. Video data was displayed on a topside monitor and recorded on a VCR.

3.0 SURVEY OPERATIONS

The project mobilization was conducted in West Falmouth Harbor on May 6, 2002. A few test side-scan sonar lines were run at the BBDS on May 6, but operations were suspended due to strong southwest winds and heavy sea conditions. The side-scan survey at the BBDS was performed during the morning of May 7, 2002, and video operations were planned for that afternoon. However, due to the continued strong southwest winds the decision was made to delay the video work until the winds subsided. On May 9, 2002, with northeast winds and a calmer sea state, the underwater video survey was performed.

Seven lanes (T1-T7) were trawled in and around the BBDS (see Locus Overview) over the past year. A minimum of three side-scan survey lines with 150 ft line spacings were run in the vicinity of each of these seven lanes, i.e. one survey line along the lane trawled by the F/V Lady Jane and two offset either side by 150 ft. In addition, six survey lines were run with the side-scan system in the center of the disposal site where no trawling could be conducted.

In addition to side-scan survey, 10-minute video drifts were performed on May 9, 2002, across each of the seven trawl lanes with the underwater video sled to help interpret the side-scan records and to identify the epibenthic biota at each site. Figures 1 through 7 show the location of the video drifts and digital snapshots along the drifts. The video log below lists the start and stop times of each video transect in the order that they were performed. Note there is a three minute gap in the bottom coverage at the beginning of T-7 as we had to disentangle a lobster pot.

T-2 0000-10:26
T-3 10:28-20:28
T-4 20:30-30:29
T-5 30:30-40:59
T-6 41:00-52:30
T-7 55:40-1:08:47
T-1 1:09:00-1:20:03

4.0 DATA PROCESSING AND ANALYSIS

Side-scan data was processed using the Chesapeake Technology Sonar Web software. The geo-referenced digital side-scan mosaics were created for each site and exported to Arc View GIS. Figures 1 through 8 are the side-scan mosaics for the surveyed trawl lanes and central BBDS location plotted on 11” x 17” paper for the report. To allow examination of the side-scan data in greater detail, CR furnished the digital side-scan mosaic data to Tony Wilbur at MACZM in May, and will furnish CZM with full-scale plots of the side-scan mosaics later this month.

Videotape footage was replayed and DAZZLE Multimedia software used to produce six digital screen captures at each transect. These digital snapshots are shown on Figures 9 through 15. The video drift positions were recorded and edited using the HYPACK software and Lat/Long positions assigned to the video screen captures. The start and end points of the video drifts as well as the location of the screen captures are shown on the side-scan mosaics. The unedited videotape footage and three selected video clips along each drift transect accompany this report.

5.0 DISCUSSION AND PRELIMINARY OBSERVATIONS

In general the side-scan sonar mosaics of the trawl lanes revealed a bottom ranging from soft mud to a muddy sand. In the soft bottom areas, the underwater video sled kicks up a characteristic mud cloud when it comes in contact with the bottom. Harder dredged material shows as dark patchy records at a few of the trawled transects and is the dominant bottom type at the center of the disposal site where no trawling could be conducted. A few small rocks and scours are also depicted on the side-scan records.

Evidence of the experimental trawl activity is clearly seen on the side-scan sonar records of all the trawled sites. The underwater video confirms the soft mud bottom at some transects and a harder muddy sand bottom elsewhere. Hummocks, feeding depressions, mounds, worm holes, burrows, patches of algae and a brown 'mat' can also be seen on the underwater video footage. Trawl marks were only seen at one of the underwater video transects probably due to the large patches of red algae that obscure the scours and depressions. At a few transects, parchment tube worms and a second unidentified worm were abundant. With the exception of these worms, few macroinvertebrtates were observed and only one fish was recorded during the survey.

Below are some general observations from the side-scan and video data collected at each of the trawl lane sites.

5.1 T-1

The side-scan data at T-1 shows a soft mud bottom in the center of the trawl lane and a harder mud/sand bottom at the southern and northern ends of the transect (Figure 1). The southern hard bottom area is labeled as "HRD" on the NOAA Nautical Chart for Buzzards Bay. The video at T-1 shows a sparse mud bottom with patches of brown 'mat' and a few isolated patches of red algae and parchment worm tubes (Figure 9).

5.2 T-2

The side-scan data at T-2 shows a harder mud/sand bottom with evidence of dredged material (Figure 2). The dredged material is not detected on the underwater video. The dredged material is probably covered by a veneer of soft sediment. Some bottom scours were detected on the underwater video that could be trawl door marks. The video also shows some large patches of red algae, feeding depressions, mounds, worm holes and burrows (Figure 10).

5.3 T-3

The side-scan mosaic for T-3 shows a mud/sand bottom with a small amount of harder dredged material (Figure 3). Similar to T-2, the underwater video showed feeding depressions, burrows, and worm holes with some patches of algae and some parchment worm tubes. A live quahog was also observed at the start of the video drift (Figure 11).

5.4 T-4

A softer mud bottom was observed at T-4 based on the side-scan data (Figure 4) and underwater video. Very large areas of red algae were observed on the video drift at this trawl lane, as well as numerous parchment worm tubes and many of the unidentified white worms (Figure 12).

5.5 T-5

The T-5 side-scan mosaic (Figure 5) and video show harder mud/sand bottom with some large burrows and worm holes and some patches of algae and a few worm tubes (Figure 13). A horseshoe crab and whelk were also observed on the video drift.

5.6 T-6

T-6 on the eastern edge of BBDS appears to be the soft mud bottom as indicated by the extremely light side-scan records (Figure 6). Here there are numerous worm holes, and large burrows that are possible juvenile lobster burrows. Also observed were large patches of algae with numerous glass shrimp and a few parchment worm tubes. A flounder, the only fish observed on the underwater video footage was observed at this transect (Figure 14).

5.7 T-7

The side-scan sonar mosaic at T-7 shows a harder mud/sand bottom at the southeast corner of the transect transitioning to a mud bottom (Figure 7). The softer bottom is confirmed by the underwater video footage. The video shows numerous burrows and worm holes with a few parchment worm tubes. The bottom was generally flat with some patches of brown ‘mat’ and a few isolated patches of algae. A live quahog and spider crab were observed at this transect (Figure 15).

5.8 BBDS Center

The side-scan mosaic for the center of the BBDS shows a generally hard bottom with numerous deposits of dredged material (Figure 8). The harder dredged material reflects the acoustic energy from the side-scan system and appears dark on the records. A few of these small mounds cast acoustic shadows that appear white on the records. No video data was collected at this site due to the risk of hanging up the video sled on the potential bottom obstructions and harder bottom.

6.0 CONCLUSIONS

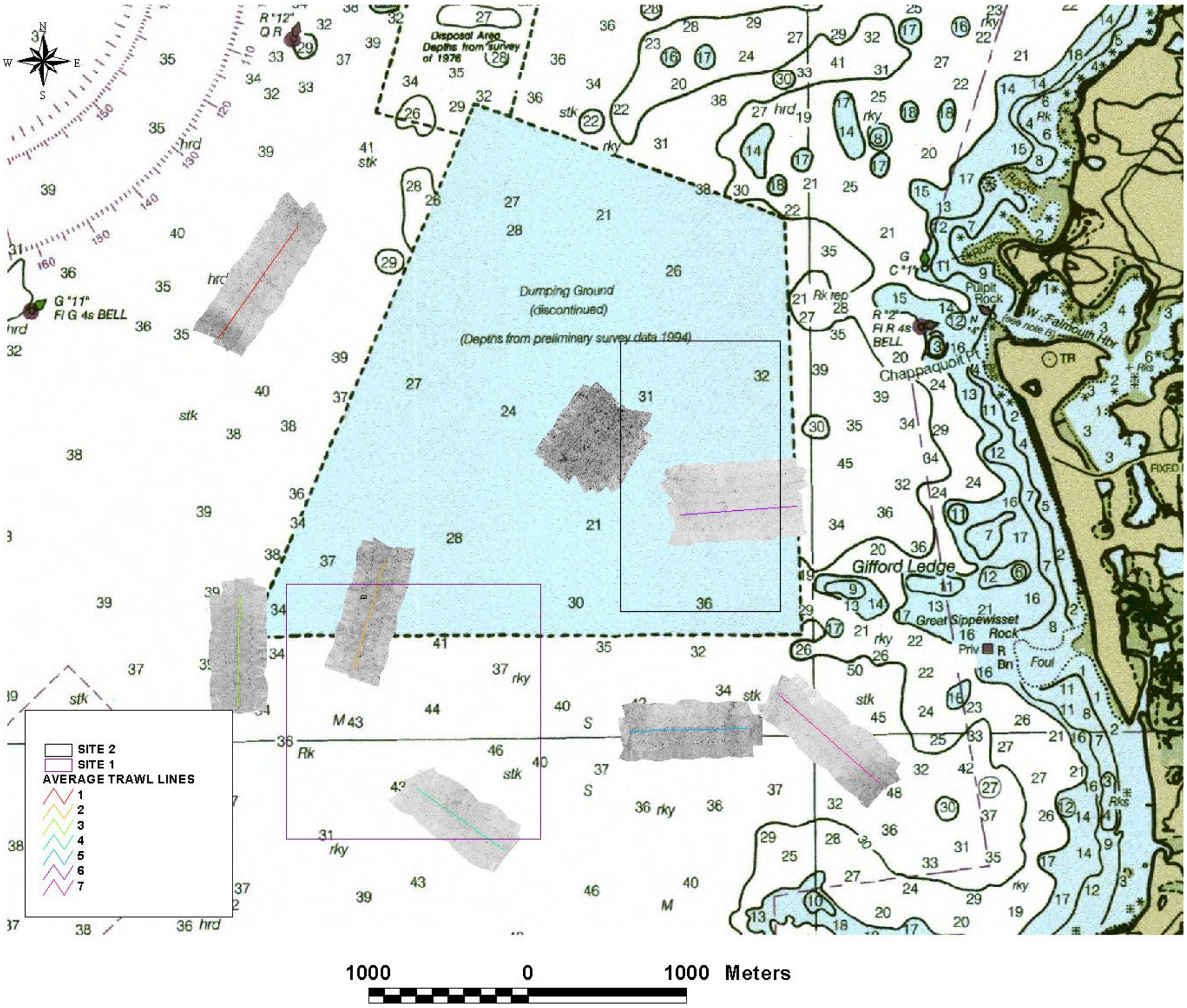
Although the side-scan data was collected during rough sea conditions, the data quality still permitted an accurate characterization of the bottom at the seven trawled transects and the BBDS center. The strong correlation between the underwater video footage and the side-scan sonar bottom classification maps show these to be effective tools for bottom habitat mapping.

7.0 DELIVERABLES

MACZM has been furnished the side-scan data in Arc View format electronically. Small plots of the side-scan mosaics are provided with this report. Full size figures will be provided to MACZM later in June. In addition, accompanying this report is a CD with the report text, digital side-scan data, video screen captures, and 21 selected MPEG video clips. The original unedited videotape from the underwater video sled survey is also enclosed.

As an additional service CR scientists used JASC Paint Shop Pro and the side-scan sonar data to produce simple automated bottom classification maps showing areas of smooth or fine sediment and rougher or coarser sediment for each of the trawled areas. These were provided digitally to the client. An example for trawl lane 1is provided in Appendix A.

OVERVIEW OF SIDE SCAN SONAR SURVEYS
BUZZARDS BAY DISPOSAL SITE



Notes:

1. Side scan sonar and video surveys conducted by CR Environmental, Inc. between May 6 and 9, 2002.
2. Grids: Geographic WGS-84 and Massachusetts State Plane, NAD 83, meters.
3. Sonar data collected using 100-kHz & 100-meter range.

FIGURE 1

SIDE SCAN SONAR MOSAIC AND VIDEO DRIFT SURVEY
TRAWL LANE 1
BUZZARDS BAY DISPOSAL SITE

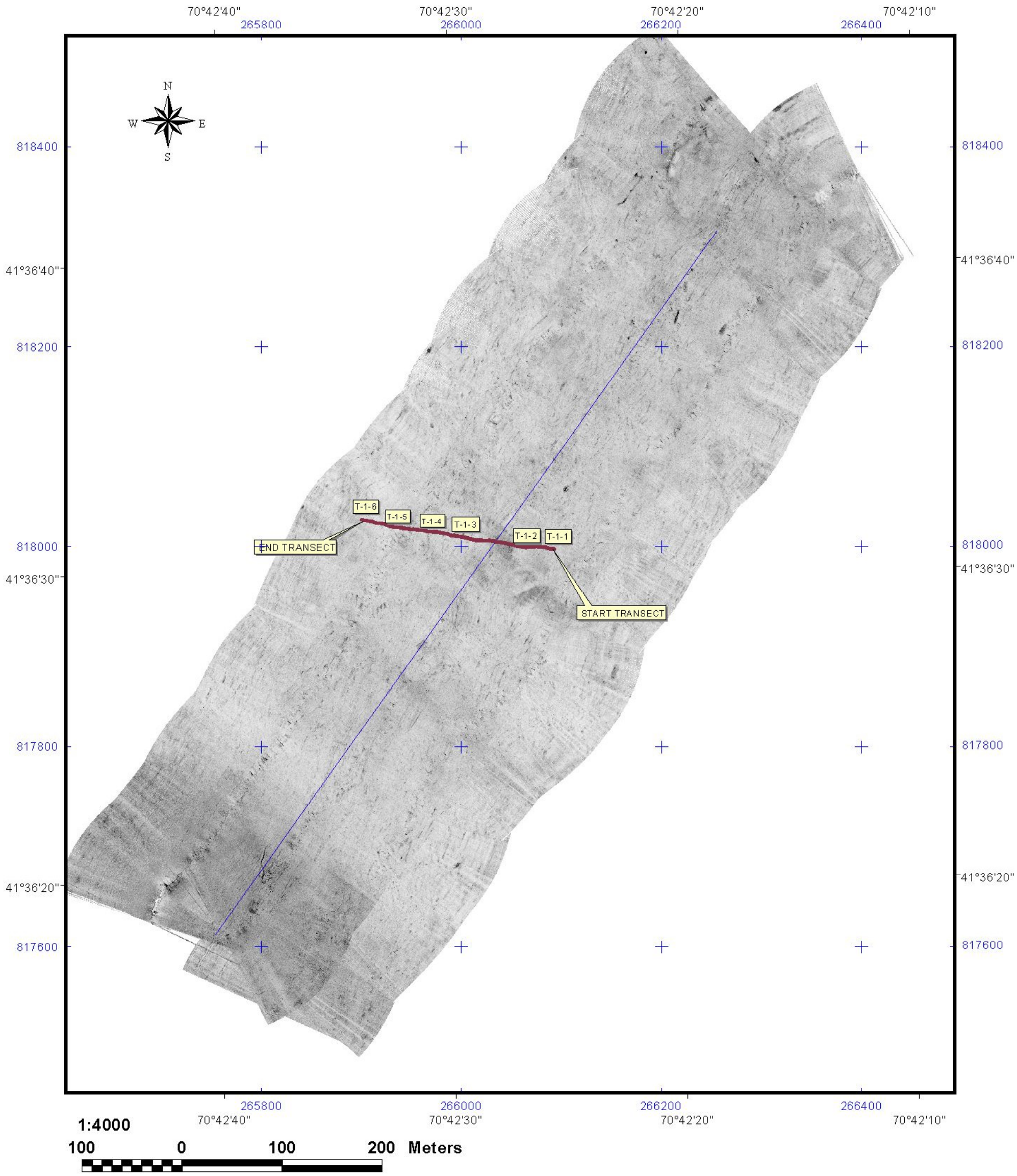


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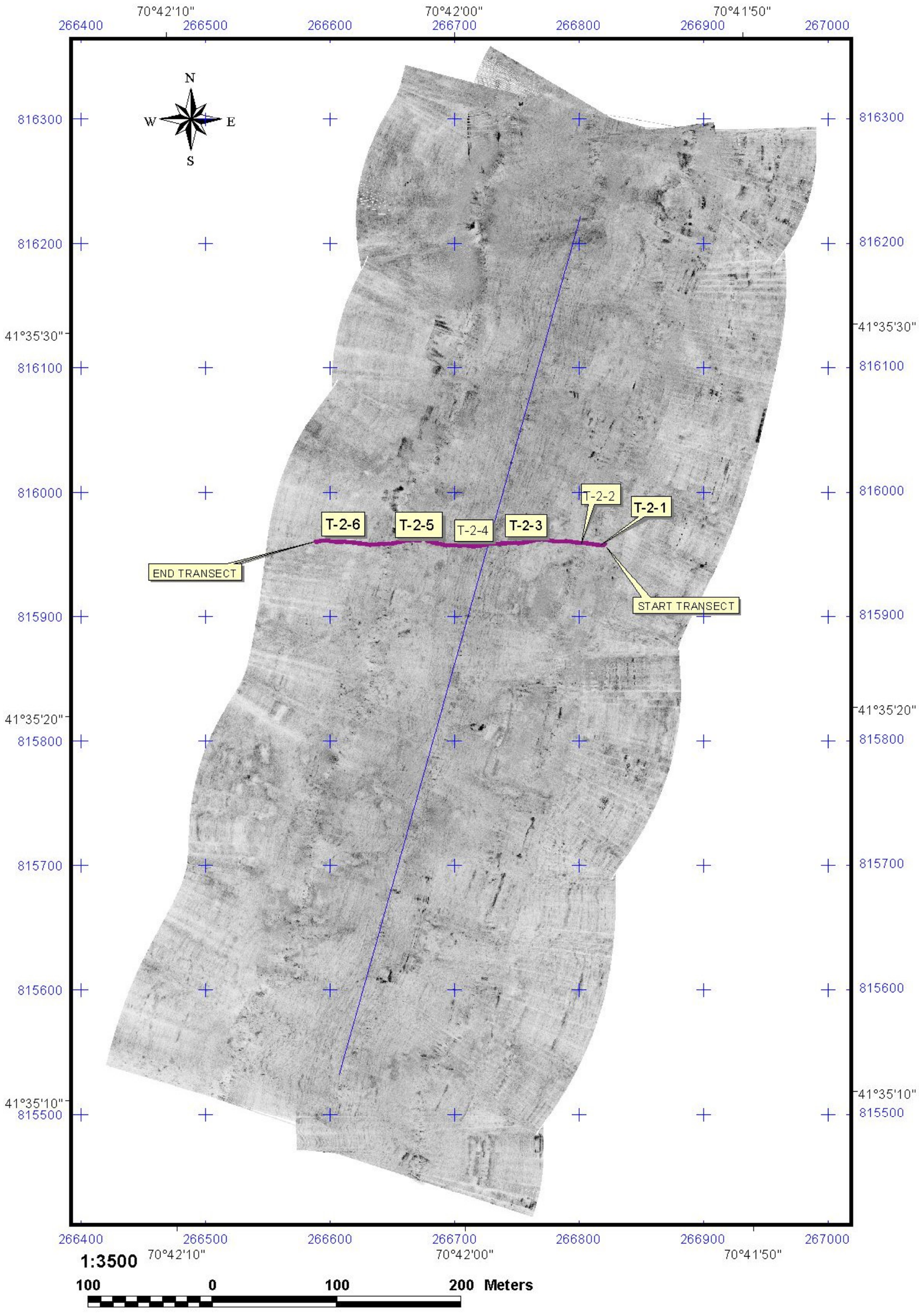
FIGURE 2

SIDE SCAN SONAR MOSAIC AND VIDEO DRIFT SURVEY
TRAWL LANE 2
BUZZARDS BAY DISPOSAL SITE



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3. Sonar data collected using 100-kHz & 100-meter range.

FIGURE 3

SIDE SCAN SONAR MOSAIC AND VIDEO DRIFT SURVEY
TRAWL LANE 3
BUZZARDS BAY DISPOSAL SITE

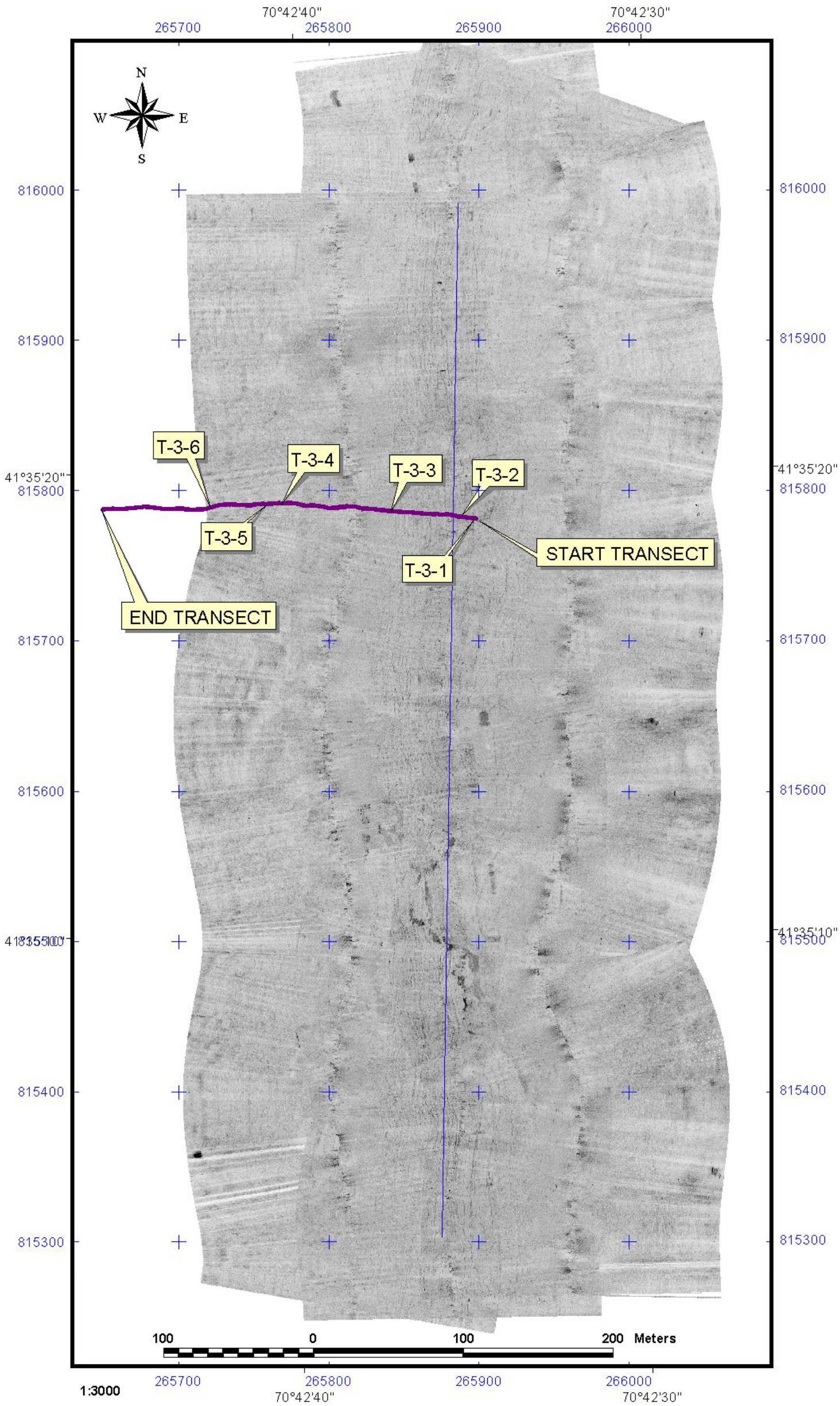

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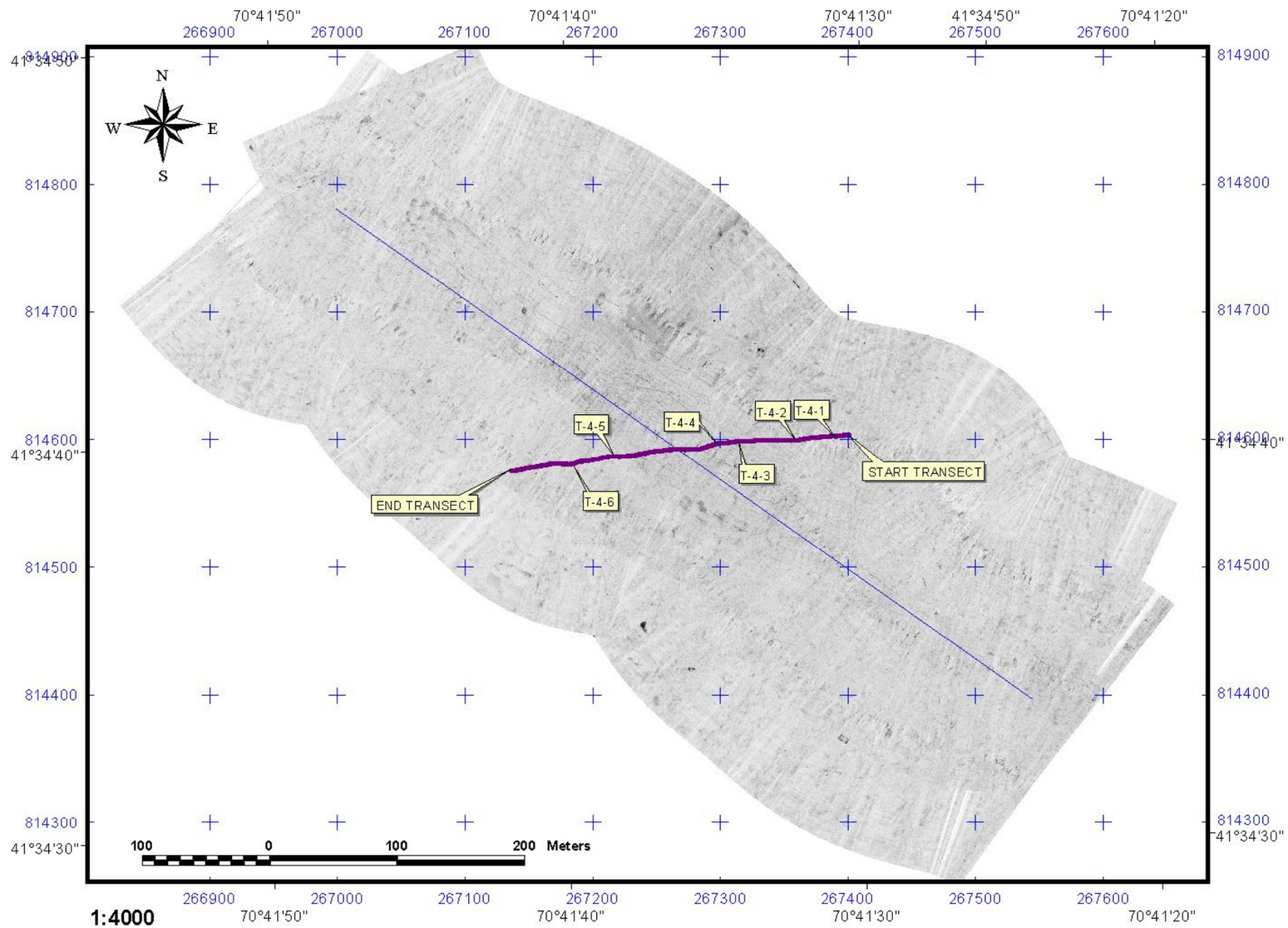
FIGURE 4

SIDE SCAN SONAR MOSAIC AND VIDEO DRIFT SURVEY
TRAWL LANE 4
BUZZARDS BAY DISPOSAL SITE



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3. Sonar data collected using 100-kHz & 100-meter range.

FIGURE 5

SIDE SCAN SONAR MOSAIC AND VIDEO DRIFT SURVEY
TRAWL LANE 5
BUZZARDS BAY DISPOSAL SITE

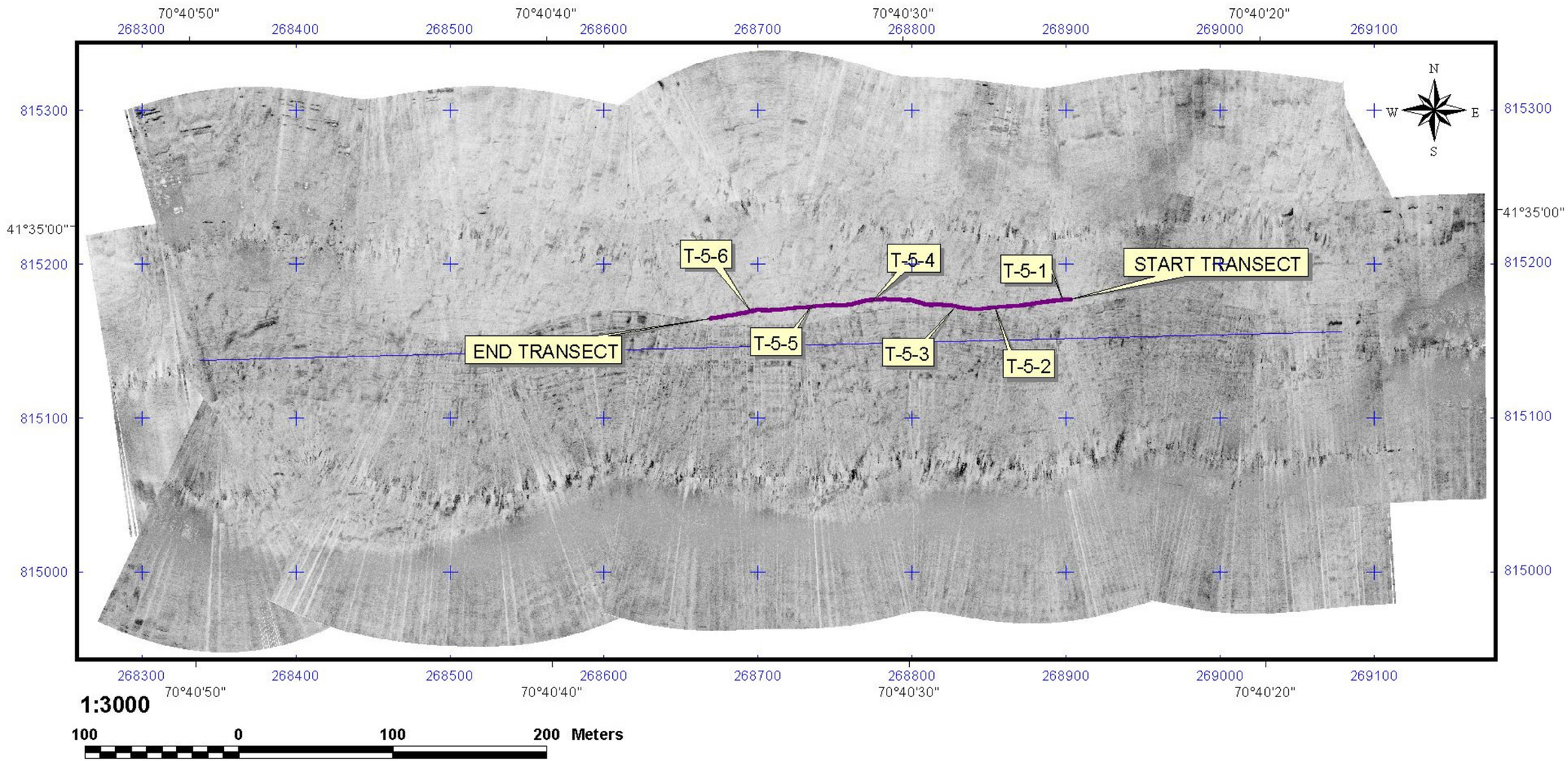

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FIGURE 6

SIDE SCAN SONAR MOSAIC AND VIDEO DRIFT SURVEY
TRAWL LANE 6
BUZZARDS BAY DISPOSAL SITE

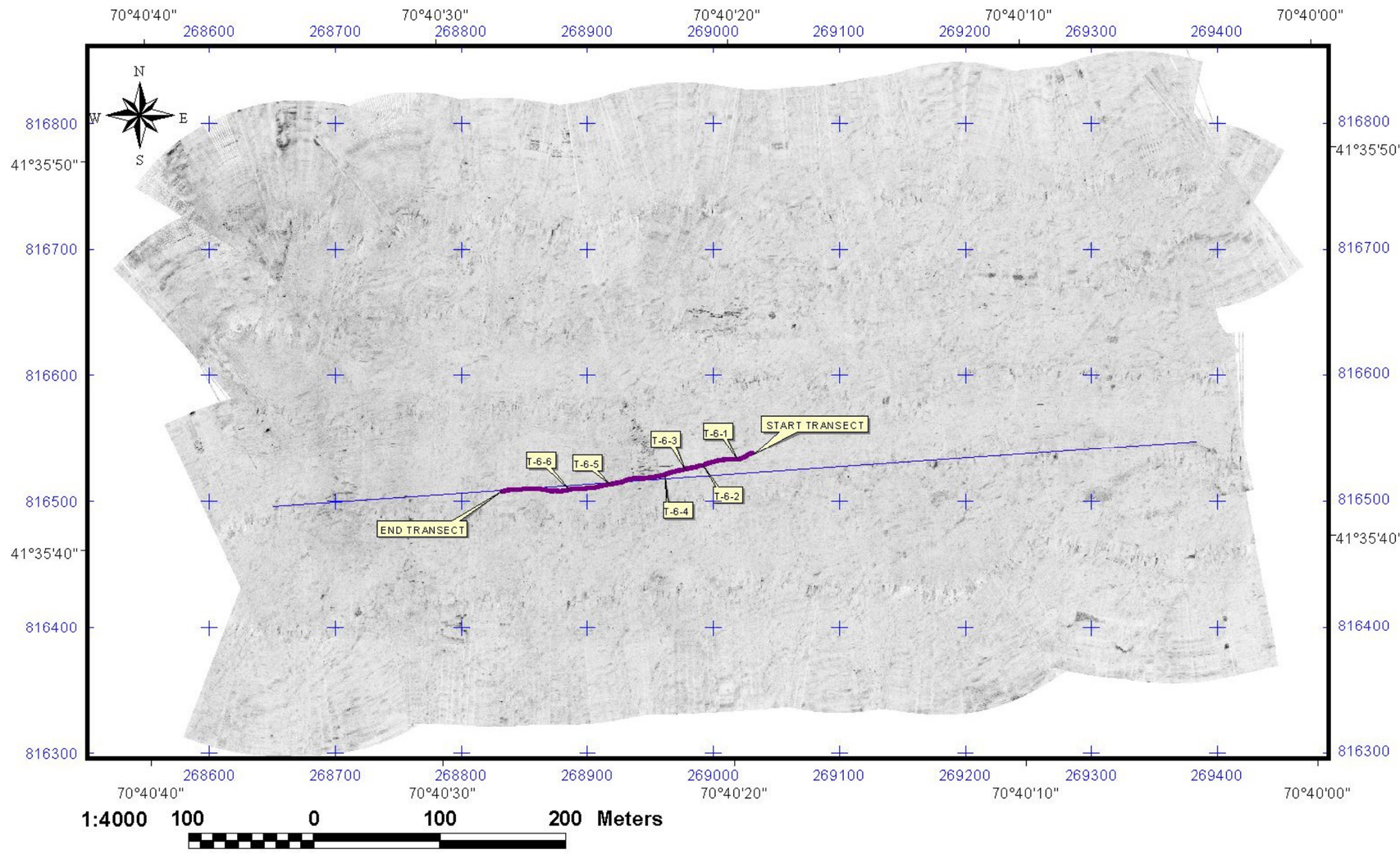

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FIGURE 7

SIDE SCAN SONAR MOSAIC AND VIDEO DRIFT SURVEY
TRAWL LANE 7
BUZZARDS BAY DISPOSAL SITE

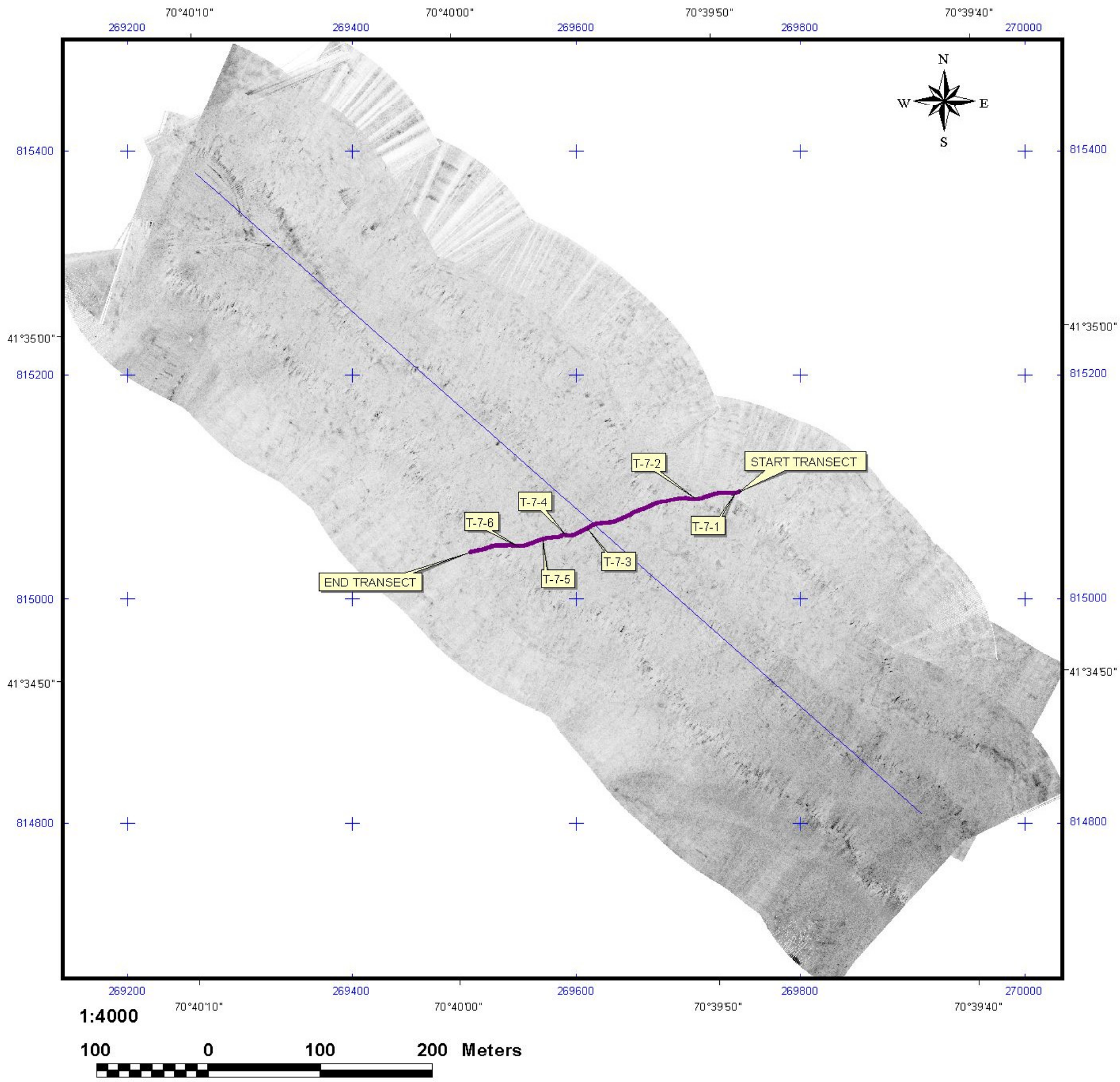

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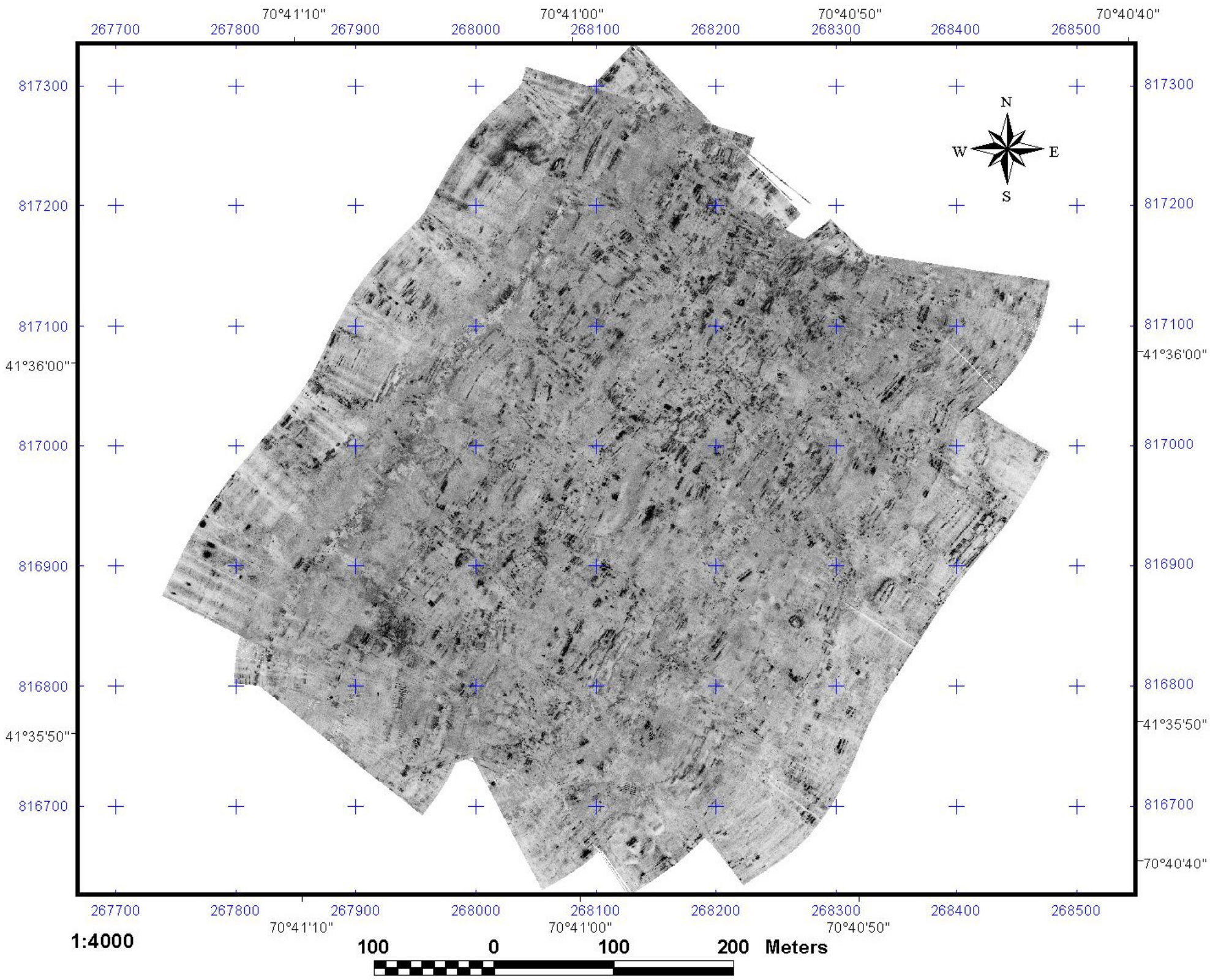
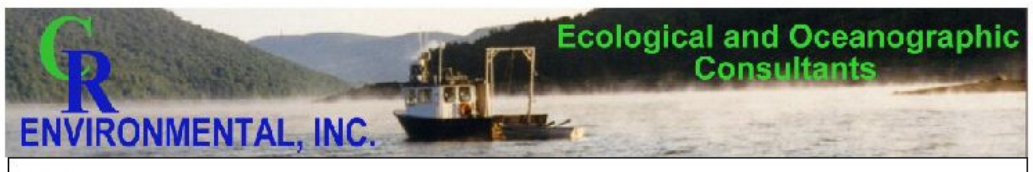
FIGURE 8

SIDE SCAN SONAR MOSAIC
CENTRAL DUMP LOCATION INDICATED ON NAUTICAL CHART
BUZZARDS BAY DISPOSAL SITE





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3. Sonar data collected using 100-kHz & 100-meter range.

T-1-1 Patch of Red Algae

T-1-2 Worm Tube

T-1-3 Mud Bottom patches of Brown 'Mat'

T-1-4 Large Burrow

T-1-5 Flat mud bottom

T-1-6 Mud bottom

FIGURE 9 BBDS SCREEN CAPTURES VIDEO DRIFT – TRAWL LANE 1

T-2-1 Possible trawl mark

T-2-2 Trawl door mark

T-2-3 Depression and burrows

T-2-4 Worm tube

T-2-5 Mounds worm holes

T-2-6 Patches of Brown 'Mat'

FIGURE 10 BBDS SCREEN CAPTURES VIDEO DRIFT – TRAWL LANE 2

T-3-1 Quahog

T-3-2 Worm holes

T-3-3 Red Algae

T-3-4 Large burrows

T-3-5 Worm tubes

T-3-6 Brown patches

FIGURE 11 BBDS SCREEN CAPTURES VIDEO DRIFT – TRAWL LANE 3

T-4-1 Red Algae patches

T-4-2 Worm tubes

T-4-3 Unidentified white worms

T-4-4 Many worm tubes

T-4-5 Algae patches

T-4-6 Unidentified white worms

FIGURE 12 BBDS SCREEN CAPTURES VIDEO DRIFT – TRAWL LANE 4

T-5-1 Few worm tubes

T-5-2 Depression with algae

T-5-3 Large burrows

T-5-4 Horseshoe crab

T-5-5 Worm tubes

T-5-6 Whelk

FIGURE 13 BBDS SCREEN CAPTURES VIDEO DRIFT – TRAWL LANE 5

T-6-1 Many burrows and worm holes

T-6-2 Flounder

T-6-3 Many grass shrimp

T-6-4 Large burrow

T-6-5 Green algae

T-6-6 Red Algae

FIGURE 14 BBDS SCREEN CAPTURES VIDEO DRIFT – TRAWL LANE 6

T-7-1 Live quahog

T-7-2 Patches of algae

T-7-3 Spider crab

T-7-4 Open bottom

T-7-5 Red Algae patches

T-7-6 Mud bottom with algae

FIGURE 15 BBDS SCREEN CAPTURES VIDEO DRIFT – TRAWL LANE 7