

DRAFT

March 29, 2013
File No. 18.0171599.00



Mr. Kevin P. Mooney
Department of Conservation and Recreation (DCR)
Office of Waterways
30 Shipyard Drive, Suite 200
Hingham, MA. 02043

Re: Condition Assessment Report Letter
Salisbury Beach Emergency Work
Salisbury Beach State Reservation
Salisbury, MA

372 Merrimac Street
Newburyport, MA
01985
781-278-4800
FAX 978-465-2640

www.gza.com

Dear Mr. Mooney:

GZA GeoEnvironmental, Inc., (GZA) is pleased to present this condition assessment of the beach conditions surveyed and visually inspected along Salisbury Beach, including areas within the Salisbury Beach State Reservation, in accordance with our Agreement of March 22, 2013. The work herein was performed in an expeditious manner in order to implement sand improvements. Additional survey information will be submitted at a later date.

The scope of work required a topographic survey to be performed at various locations along Salisbury Beach including; eighteen public access locations, the Beach Center, beach area between Public Access location, No.'s 7 and 8, a portion of Salisbury Beach State Reservation beachfront and along the shoreline of the Merrimack River south of the Reservation seawall. In addition, a hydrographic survey was performed within the Merrimack River from the mouth of the River, westward to the end of the Salisbury Beach State Reservation (approximately 4,000 lineal feet). The proposed hydrographic survey of the ocean area from the North Jetty, northward along the approximately 2,000 lineal feet shoreline will be performed when the weather and tides are favorable for survey.

In addition to the topographic surveys, GZA performed a visual assessment of each of the survey locations noting conditions of the access, dune and beach areas. The assessment was accomplished by walking the selected location area and noting general conditions. Inspections were supplemented by digital photographs that provide representative views of each location. Photographs are included in Attachment B and also referenced throughout the report. We have provided a summary condition assessment spreadsheet in Attachment A which prioritizes the eroded access locations needing access improvements.



Background:

It is our understanding that several severe storms this past winter have caused a large amount of erosion along Salisbury Beach including locations at the Salisbury Beach State Reservation. Some of the eroded sand has migrated south and has been deposited near the North Jetty creating a sand shoal along the bank of the Merrimack River. The Department of Conservation and Recreation (DCR) is proposing to excavate this sand and redistribute the material in several eroded public access areas along Salisbury Beach. It is further understood the following surveyed areas are prioritized for receiving possible sand:

1. Priority No. 1 – Access Ways
2. Priority No. 2 – Beach Center (outside of accessways)
3. Priority No. 3 – Between Public Access No.'s 7 and 8

Topographic Survey and Condition Assessment:

General:

On March 23, 2013 through March 27, 2013, engineers from GZA performed a topographic survey in the areas of Salisbury Beach as defined above. The topographic survey was performed using a Leica Viva CS10 Differential Global Positioning Systems (DGPS) unit that recorded horizontal and vertical positioning of the survey points obtained. The survey included, but was not limited to; shoreline features, seawall, access ways, stairs, top of dune slope, bottom of dune slope and topographic points along the beach to approximately Mean Low Water (MLW) elevation, as feasible.

The topographic survey performed was not a property line survey. Survey of the access ways was along the existing pathways delineated by the access number signs posts at the edge of the roadways, the worn path and timber walkways.

Based on the topographic survey and the visual observations performed at the time of survey, we have identified several access locations where the slope is greater than a 1V to 5H and pose a risk for people accessing the beach. In these locations, we have calculated an approximate volume of material needed to create a 1V to 5H slope from the top of the existing slope. We did not assume additional sand for the access ways to result in the top of slope matching the height of the adjacent dunes.

Sand Shoal Area:

Due to the recent storm events, a sand shoal area has formed at the southern end of the Salisbury Beach State Reservation between the east parking lot and the Merrimack River where the North Jetty intersects with the beach (see Photograph No. 1). Additional topographic and hydrographic survey work was performed in this location to better define the limits of the shoaling.

The estimate of the available sand was initially calculated by comparing two cross-sections; 1) at the eastern corner of the seawall (Station 3+00 as shown in Figure 3 in Attachment D), which represents a wider section through the sand shoal and 2) at a location approximately 540 feet west from the seawall corner at Station 3+00. This section represents a typical cross-



section of the seawall and beach area on the riverside, away from the sand shoal. We calculated the area between the two (assuming the typical wall/beach section until it intersects with the MLW elevation, and then extending it horizontally to the shoal section grade intersection). We multiplied the area by an assumed distance of 350 lineal feet. We calculated an initial volume of approximately 15,550 cubic yards. This approximate volume was conveyed to you by email and verbally on March 27, 2013. Based on several visits to the site over the past week and a half, we have noticed the sand shoal to be diminishing rapidly in size. Therefore utilization of the sand for beach improvements should be scheduled as soon as possible. Additional survey and volume calculations may be necessary for a more accurate determination on available sand, if necessary.

In addition and as requested, the volume of available sand below the elevation of the annual high tide line is estimated to be approximately 4,900 cubic yards.

Figure No. 2 is a partial site plan showing existing grade with contours of the sand shoal area. Figure No. 3 includes a cross-section drawing that is included in Attachment D.

Beach Center:

The topographic survey at the beach center included the area from Public Access No. 4 at Vermont Street northward approximately 1,500 lineal feet to the south side of the Seaglass Restaurant Building (see Figure 6 in Attachment E). The survey involved locating landside shoreline features, the top of existing dune/slope, bottom of dune/slope and grades shots along the beach to approximately MLW elevation, as feasible. There are approximately nine (9) locations along this portion of beach where the public can access from the landside roadway. These access locations are not marked but are used by the public due to the fence and railing openings on the dune and crosswalk striping on the roadway. The following is a description of these access locations:

a) Ocean Front S. Access No.'s 1 through 4:

The four access locations along Ocean Front South are openings created to access the beach over the existing dune. Based on our survey and inspection, we feel Access locations 1 through 3 do not require sand improvement for safe access, however debris and snow fencing removal is required on Access No. 3 (see Photographs 13 through 15). Access No. 4 is located on the south side of the existing abandoned building, opposite Ocean Avenue and has a large pile of stockpiled sand. It is approximately 25 feet long, 14 feet wide and approximately 5 feet high along the edge of the roadway. It appears sand has been deposited and regraded along the access way to the beach (see Photograph 16). Due to a large volume of adjacent stockpiled sand and the unfinished regrading, we recommend further regrading work to be performed, without the need for sand import at this location.

b) Ocean Front N. Access No.'s 1 through 3:

The three access locations off of Ocean Front North are openings created to access the beach over the existing dune. Access No. 1 in this area is located along the north side of the existing abandoned building. Based on survey and inspection, we feel sand improvement is required for the Access No.'s 2 and 3 locations. Both areas have an

eroded slope with a drop of over 3 feet in elevation. We have calculated sand to be placed in these locations at a 1V to 5H grade to provide safe access to the beach.

c) Beach Center Access No.'s 1 and 2:

Beach Center Access No. 1 in this area is from the northern end of Ocean Front North to the south side of the Surfside 5 Restaurant. This area was observed to have a stockpile of sand placed seaward of the jersey barriers along the edge of the roadway (see Photograph 20). For volume calculations we considered the top of the existing stockpiled sand would be regraded to equal the roadway elevation and the sand would be redistributed along the beach. Additional volume of sand would be required to maintain a 1V to 5H slope for access.

Beach Center Access No 2 is the area between the Surfside 5 Restaurant and the Seaglass Restaurant. This area was observed to have a stockpile of sand placed seaward of the jersey barriers along the edge of the roadway (see Photograph 21). For volume calculations we considered the top of the existing stockpiled sand would be regraded to equal the roadway elevation and the sand would be redistributed along the beach. Additional volume of sand would be required to maintain a 1V to 5H slope for access.

Information regarding the observed stockpiled sand is unknown. It should be further investigated prior for use in regrading work as to the ownership of the sand, the compatibility for use on the beach and its origin.

We have calculated additional sand to be placed at Beach Center No.'s 1 and 2 under the Priority 2 category. Additional sand would be placed at a 1V to 10H slope to provide improved public access in these locations.

d) Beach Center (Fronting Existing Dune):

The Beach Center between Public Access No. 4 at Vermont Street northward approximately 1,500 lineal feet to the south side of the Seaglass Restaurant Building has experienced erosion of the existing dune outside of the access locations as referenced above. We have surveyed this area and have calculated a volume of sand to be placed along the dune length from the top of eroded dune seaward at a 1V to 5H slope. The sand to be placed in this location would be considered a Priority 2 category.

Public Access Ways:

There are eighteen (18) public access ways along Salisbury Beach; four (4) located within the Salisbury Beach State Reservation and the remaining fourteen (14) located north along the beach to the Salisbury, MA/Seabrook, NH border. The condition assessment spreadsheet (Attachment A) prioritizes the eroded access locations needing access improvements based on our survey and inspection.

a) Reservation Access Locations No.'s 1 through 4:





Reservation Access No. 1 is comprised of an elevated timber walkway structure with a ramp and stair structure providing access to the beach. At the time of survey and inspection, the stair was buried and the top of the ramp railing was exposed (see Photograph 5). We have considered the need for additional sand for improvement in this area to cover the existing exposed structure.

Reservation Access No 2 is a timber stair structure that is severely deteriorated and damaged (see Photograph 6). We have not considered sand improvement for this location.

Reservation Access No.'s 3 and 4 are elevated timber walkway structures with a ramp and stair structures providing access to the beach. Both of these structures are buried below the existing sand. Portions of the structures are visible adjacent to the existing access path. The slope at each location is steeper than the recommended 1V to 5H slope and we have therefore considered the need for additional sand for improvement in these locations to flatten the slope to the beach.

b) Public Access Locations No.'s 1 through 14:

Based on our site observations and from survey data and calculation of existing slope of each access way, we feel that the following public access locations do not require sand improvement for access at this time:

- Public Access No. 1 (Atlantic Ave) – (see Photograph 9)
- Public Access No. 3 (Fowler Street) – (see Photograph 11)
- Public Access No. 6 (176 North End Blvd) – (see Photograph 23)
- Public Access No. 7 (Sullivan Way) – under construction
- Public Access No. 8 (14th St E) – (see Photograph 24) - closed due to stairway structural issues
- Public Access No. 9 (Sea Crest, 13th St) – (see Photograph 25)
- Public Access No. 10 (9th St. E) – (see Photograph 26)
- Public Access No. 11 (7th St E) – (see Photograph 27)
- Public Access No. 12 (Brookline Street) – (see Photograph 28)
- Public Access No. 13 (Beacon Street) – (see Photograph 29)
- Public Access No. 14 (Bay State Rd.) – (see Photograph 30)

Public Access No.'s 2, 4 and 5 require sand improvements to create an access slope condition that is at least 1V to 5H. We have calculated sand to be placed in these locations at a 1V to 5H grade to provide safe access to the beach.

Beach Area between Access No.'s 7 and 8:

The length of beach area between Public Access No.'s 7 and 8 was included in the survey limits. The dune between the two access locations was observed to be eroded with the dune adjacent to Access No. 8 severely eroded, and the timber stairway was undermined, with the bottoms of the timber support posts exposed. Helical anchor supports appear to provide the major support for the stair structure. The timber stairway was closed for access due to the timber transitional walkway from the dune to the stair structure having failed (see Photograph 24). At the time of the inspection, Access No. 7 was being utilized by a contractor to haul in sand for dune repairs to several residences along the beach.

Based on our conversation, if additional sand is available from the sand shoal after redistribution to the access ways and the Beach Center, the excess would be placed between Public Access No.'s 7 and 8. Sand would be placed approximately 2 feet high above the bottom of the eroded dune and extend out onto the beach at a 1V to 10H slope.

Seawall:

Along the Merrimack River, the Salisbury Beach State Reservation is protected by an existing pre-cast concrete seawall and stone mound revetment. The wall is approximately 2,062 lineal feet long, with an approximate 90 foot long section of the wall on the ocean side and approximately 1,972 feet along the Merrimack River.

The main seawall/foreshore structure consists of 5-foot high, pre-cast concrete blocks that are generally 7 foot long and weigh approximately 10 tons. According to available drawings, the seawall blocks bear on an approximate 4-inch thick reinforced concrete leveling slab. According to the prior contract drawings, the concrete units are placed on a 6 foot high stone mound revetment that in combination with the blocks provides foreshore protection to the Reservation's parking lot and campground area from the Merrimack River.

Prior rehabilitation work has taken place in 2001 and 2002 after sinkholes were found behind the wall. The repair work involved removal of the seawall blocks, resetting of the stone mound revetment, using supplemental stone to deepen the toe of the mound, installation of new concrete leveling pad, installation of filter fabric behind the wall, and miscellaneous concrete repairs including filling of voids in the stone mound revetment. Sinkhole repair work was also reportedly performed on or around 2007.

A visual inspection of the wall was performed on March 23, 2013. For the 2,062 lineal feet of seawall, it was observed that there was approximately 1,100 lineal feet of exposed concrete seawall leveling slab/stone mound. Of the approximate 1,100 lineal feet, approximately 600 lineal feet of the top of stone mound was observed to have voids between the stones and concrete wall base (see Photographs 2 and 3). Several voids were approximately 18 inches high by over 3 foot deep. Landside sinkholes were observed within these void locations and landside of the wall joints (see Photograph 4). In addition, several concrete seawall sections were observed to have spalled and deteriorated concrete.

Based on the visible inspection of the seawall and the riverside and landside conditions, we do not feel that sand filling along the wall will be required at this time. While sand filling of the sinkholes and voids could be performed, we feel sand filling on the river side, due to exposure and beach slope would erode. It is our opinion that more extensive structural improvements, such as resetting of the stones, concrete filling and installation of sand and filter fabric on the landside, would more appropriately address the existing conditions of the seawall.

Hydrographic Survey:

The hydrographic survey was performed from our 20 foot survey vessel using an Odom Hydrotrac single-frequency echo sounder, Raven Invicta 310 DGPS unit for horizontal positioning and Hypack 2012 acquisition and processing software. Tide readings were obtained by using an In-Situ Level Troll 500 datalogger.





The hydrographic survey was performed on March 24, 2013 which included the survey in the mouth of the Merrimack River between the North and South Jetty from eastern end of the jetties westward to a line between the “jog” of the north jetty and the “jog” of the south jetty (approximately 1,000 lineal feet), and the Merrimack River from the line between the “jog” in the North Jetty to the “jog” in the South Jetty westward to the end of the land mass at the Salisbury Beach State Reservation (approximately 3,000 lineal feet).

Additional hydrographic survey was performed in the vicinity of the sand shoal area to ensure sufficient coverage in this area for use in volume calculations. Data from the hydrographic survey is currently being reduced and will be provided under a separate cover.

Summary and Recommendations:

In summary, we have identified ten (10) public access locations that will require some sand filling improvements to safely be utilized for public access. We have calculated an approximate volume of sand to be redistributed from the sand shoal area to each of the access locations needing improvements as referenced above. The volume of sand was calculated by creating a 1 to 5 (1 vertical to 5 horizontal) slope from the top of the existing dune/eroded slope until it meets the existing beach grade. The width of the each area to receive the sand varies (from 8 foot wide to 15 foot wide) per access location.

The available sand for redistribution is calculated at approximately 15,550 cubic yards. Based on the condition assessment of each survey location and the need to provide access improvements for the public to safely access the beach we have summarized the areas to receive the sand as follows:

1. Priority No. 1 – Access Locations:

<u>Location</u>	<u>Approximate Volume</u>
Reservation Access No. 1	80 CYs
Reservation Access No. 3	150 CYs
Reservation Access No. 4	90 CYs
Public Access No. 2 (Murray St)	10 CYs
Public Access No. 4 (Vermont St.)	20 CYs
Ocean Front North No. 2	40 CYs
Ocean Front North No. 3	40 CYs
Beach Center No. 1	130 CYs
Beach Center No. 2	200 CYs
Public Access No. 5 (Central Ave.)	<u>30 CYs</u>
Total	790 CYs

2. Priority No. 2 – Beach Center (outside of access areas):

<u>Location</u>	<u>Approximate Volume</u>
Beach Center (outside of access ways)	5,000 CYs

Additional Sand for 1V to 10H at Beach Center No. 1 and 2	1,300 CYs
Total	6,300 CYs

3. Priority No. 3 – Between Public Access No. 7 and 8:

<u>Location</u>	<u>Approximate Volume</u>
Between Public Access No.'s. 7 and 8	9,000 CYs

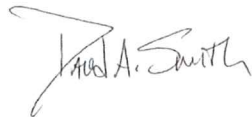
The total for the three priority area above equals 16,090 CYs. This amount is slightly over the amount of sand available by approximately 540 cubic yards.

Based on the volumes considered for improvements and the available volume of sand available, it appears that sand can be placed at Priority No. 1 and 2 locations with the remainder to be placed in the area between Public Access No.'s 7 and 8. It is our understanding, the Public Access Ways, the Beach Center and the area between Public Access No.'s 7 and 8, in that priority order, would receive sand based on the availability and need.

We understand DCR will be soliciting bids from contractors within the next few days to perform the sand redistribution work. Work will be performed under an emergency authorization with a deadline to finish the work is April 9, 2013. GZA is available to assist DCR with construction services including monitoring and interim surveys, as needed.

If you have any questions on the submitted information contain in this report letter or require any additional information, please call me at 781-278-4806 or email me at david.smith@gza.com for further information. It was a pleasure performing this emergency work for DCR and we appreciate the opportunity working with you on this waterfront assignment. The topographic survey plan of the seawall, access locations not included in the attachments and the hydrographic survey, including backup data associated with the surveys (tide reading logs, depth sounder rolls, benchmark data and control points) will be submitted under a separate cover.

Very truly yours,
GZA GEOENVIRONMENTAL, INC.



David A. Smith
Project Manager



David B. Vine, P.E.
Principal-in-Charge



Anders Bjarngard, P.E.
Consultant/Reviewer



Attachments:



Attachment A – Public Access Condition Assessment Spreadsheet

Attachment B – Photographs

Attachment C – Figure No. 1 - Aerial Plan Showing Access Ways

Attachment D – Figure No. 2 - Sand Shoal – Plan

Figure No. 3 - Sand Shoal – Section

Attachment E – Figure No. 4 - Reservation Access No. 1, 3 and 4 (Plan and Sections)

Figure No. 5 – Public Access No. 2 (Plan and Sections)

Figure No. 6 – Public Access No. 4 to Beach Center No. 2 (Plan and Sections)

Figure No. 7 – Public Access No. 5 (Plan and Sections)

Figure No. 8 – Beach Center and Public Access between No.'s 7 and 8
(Sections)

Mr. Kevin P. Mooney/DCR
File No. 18.0171599.00

March 29, 2013



Attachment A:
Public Access Condition Assessment

ATTACHMENT A- CONDITION ASSESSMENT

Location	Dates Surveyed	Condition*			Approx. Existing Slope (V:H)	Priority No.	Approx. Volume (CY) [†]	Description/Comments
		#1	#2	#3				
Sand Shoal	3/23 - 3/24						12,000	
Reservation Seawall	3/23 - 3/24			X			N/A	
Reservation Access	R-1	3/23 - 3/24		X	1V:5H	1	80	
	R-2	3/23 - 3/24	X		N/A		N/A	Timber stairs inaccessible - deteriorated and damaged.
	R-3	3/23 - 3/24		X	1V:2H	1	150	
	R-4	3/23 - 3/24		X	1V:2H	1	90	
Public Access	#1	3/25 - 3/26		X	1V:5H		N/A	Dune eroded north and south of access
	#2	3/25 - 3/26		X	1V:4H	1	10	Minor dune erosion north and south of access
	#3	3/25 - 3/26		X	1V:5H		N/A	Minor dune erosion north and south of access
	#4	3/25 - 3/26		X	1V:2H	1	20	Irregular slope at access
Ocean Front South Dune Crossing	#1	3/25 - 3/26		X	1V:6H		N/A	
	#2	3/25 - 3/26		X	1V:6H		N/A	
	#3	3/25 - 3/26		X	1V:6H		N/A	Fencing and debris removal needed
	#4	3/25 - 3/26		X	N/A		N/A	Stockpiled and deposited sand needs to be regraded
Ocean Front North Dune Crossing	#1	3/25 - 3/26		X	1V:6H		N/A	
	#2	3/25 - 3/26	X		1V:0.1H	1	40	Severely eroded slope with debris
	#3	3/25 - 3/26	X		1V:0.5H	1	40	Severely eroded slope with debris
Ocean Front N. and S. Full Length	3/25 - 3/26	X	X		Varies	2	5,000	
Beach Center	#1	3/25 - 3/26	X		1V:1.5H	1	130 [‡]	Regrading of existing deposited sand will be required
						2	750	
	#2	3/25 - 3/26	X		1V:2.5H	1	200 [‡]	
						2	550	
Public Access	#5	3/25 - 3/26	X		1V:1.5H	1	30	SE corner of adjacent parking lot undermined
	#6	3/25 - 3/26		X	1V:6H		N/A	Erosion north and south of access. Timber walkway repairs needed.
	#7	3/25 - 3/26			N/A		N/A	Access currently under construction - no inspection
	#8	3/25 - 3/26	X		N/A		N/A	Timber stairway inaccessible due to damage
	#9	3/25 - 3/26		X	N/A		N/A	Timber stairway, erosion north and south of stair
	#10	3/25 - 3/26		X	N/A		N/A	Timber stairway, erosion north and south of stair. Irregular timber walkway
	#11	3/25 - 3/26		X	1V:8H		N/A	
	#12	3/25 - 3/26		X	1V:13H		N/A	
	#13	3/25 - 3/26		X	1V:14H		N/A	
	#14	3/25 - 3/26		X	1V:12H		N/A	
Between Public Acces No. 7 and 8	3/25 - 3/26		X		Varies	3	9,000	
							Priority 1 Total Needed (CY)	790
							Priority 2 Total Needed (CY)	6,300
							Priority 3 Total Needed (CY)	9,000

*Condition Assessments

- Condition No. 1: Access not usable or a significant risk for use due to erosion. Immediate need for improvement.
 Condition No. 2: Access usable however limited improvements are necessary for continued safe use.
 Condition No. 3: No improvement required.

[†] Volume calculated as maintaining an approximate 1V:5H slope at a width determined by the existing opening and/or snow fence or railing limits.

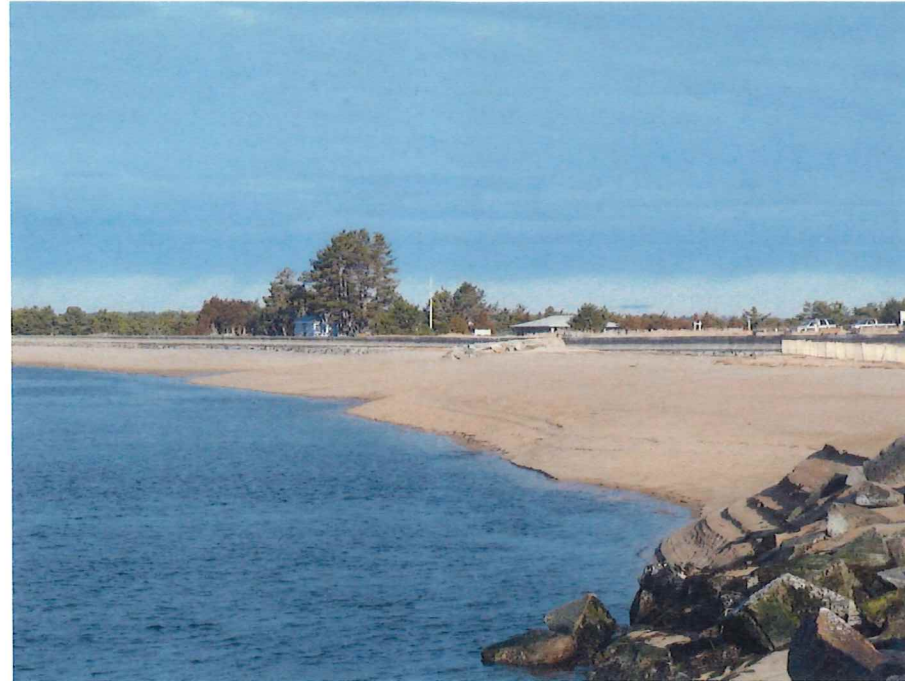
[‡] Volume calculated as the difference of sand needed to maintain 1V:5H slope and the approximate sand available from regrading.

Mr. Kevin P. Mooney/DCR
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Attachment B:
Photographs



PHOTOGRAPH 1
Sand Shoal area



PHOTOGRAPH 2
Typical photograph of concrete seawall and stone mound
(Note: voids between stone mound and concrete leveling course)



PHOTOGRAPH 3
Void between concrete seawall and stone mound.



PHOTOGRAPH 4
Sinkholes along landside of seawall.



PHOTOGRAPH 5
Reservation Access No. 1



PHOTOGRAPH 6
Reservation Access No. 2



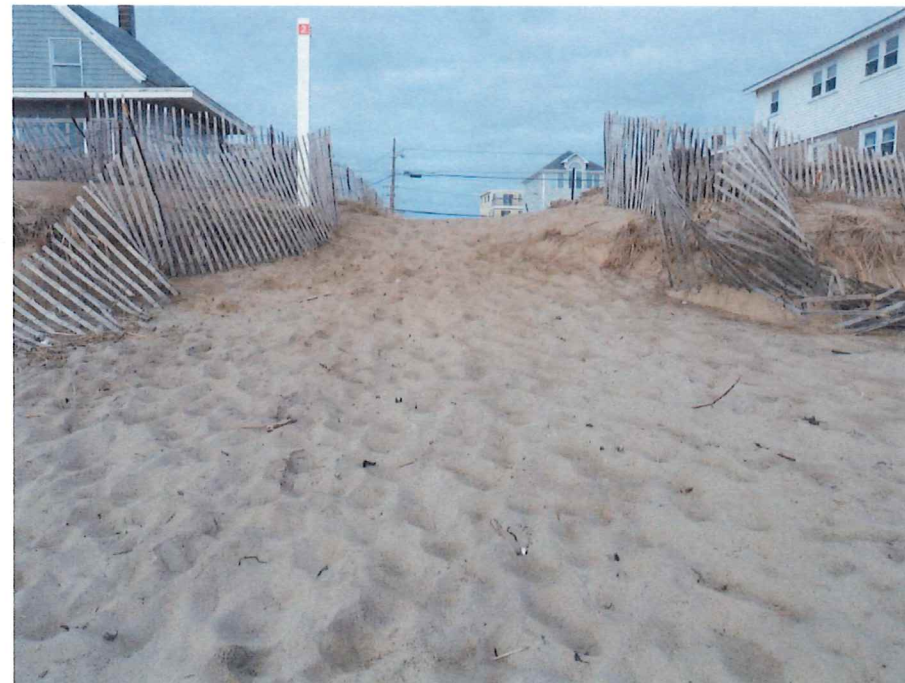
PHOTOGRAPH 7
Reservation Access No. 3



PHOTOGRAPH 8
Reservation Access No. 4



PHOTOGRAPH 9
Salisbury Beach Public Access No. 1 (Atlantic Ave)



PHOTOGRAPH 10
Salisbury Beach Public Access No. 2 (Murray Street)



PHOTOGRAPH 11
Salisbury Beach Public Access No. 3 (Fowler Street)



PHOTOGRAPH 12
Salisbury Beach Public Access No. 4 (Vermont Street).



PHOTOGRAPH 13
Ocean Front S. Dune Crossing No. 1



PHOTOGRAPH 14
Ocean Front S. Dune Crossing No. 2



PHOTOGRAPH 15
Ocean Front S. Dune Crossing No. 3



PHOTOGRAPH 16
Ocean Front S. Dune Crossing No. 4 (South side of building)



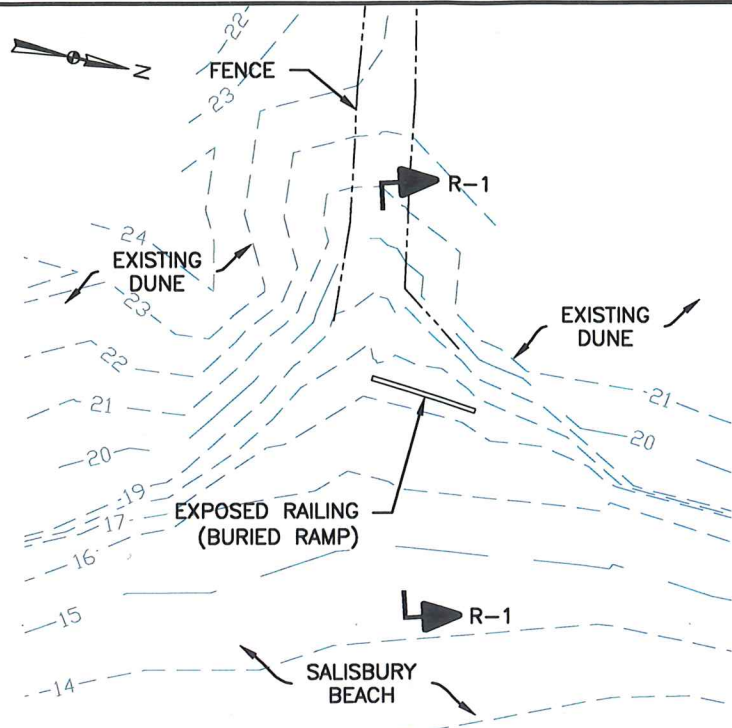
PHOTOGRAPH 17

Ocean Front N. Dune Crossing No. 1 (North side of building)

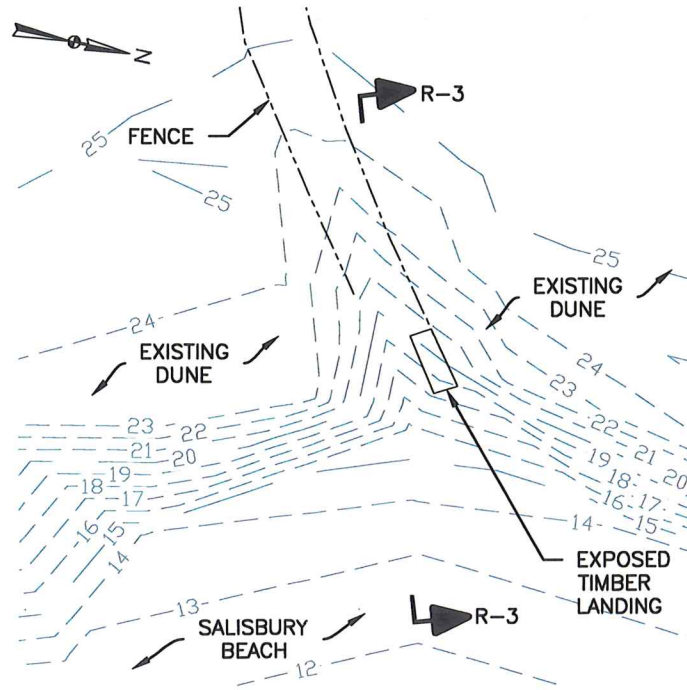


PHOTOGRAPH 18

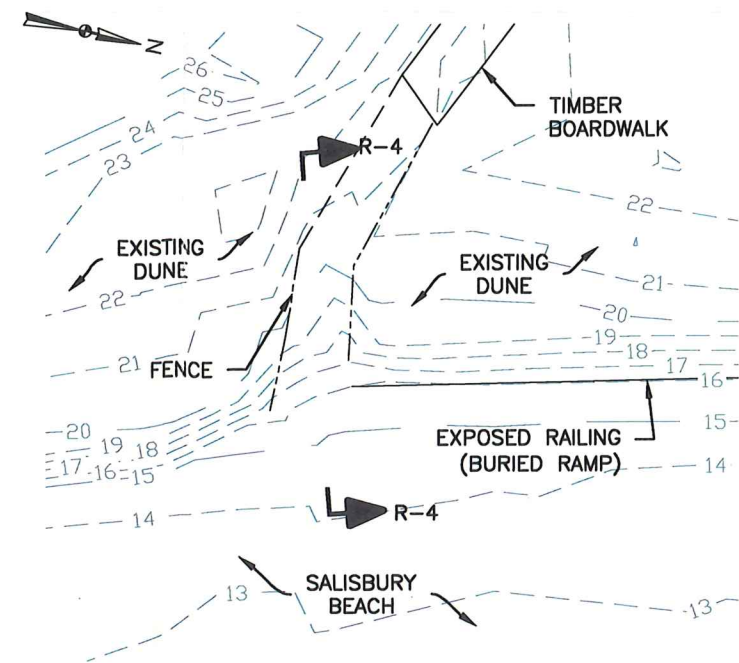
Ocean Front N. Dune Crossing No. 2 (Opposite Commodore Pizza)



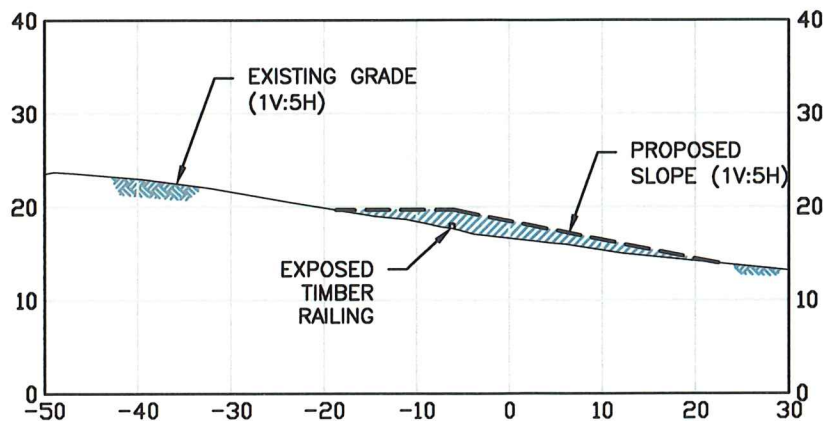
RESERVATION ACCESS R-1 - PLAN VIEW
SCALE: 1"=20'



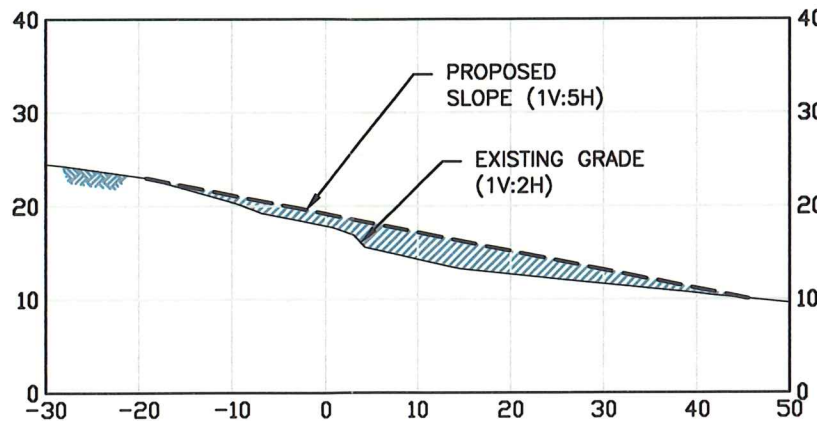
RESERVATION ACCESS R-3 - PLAN VIEW
SCALE: 1"=20'



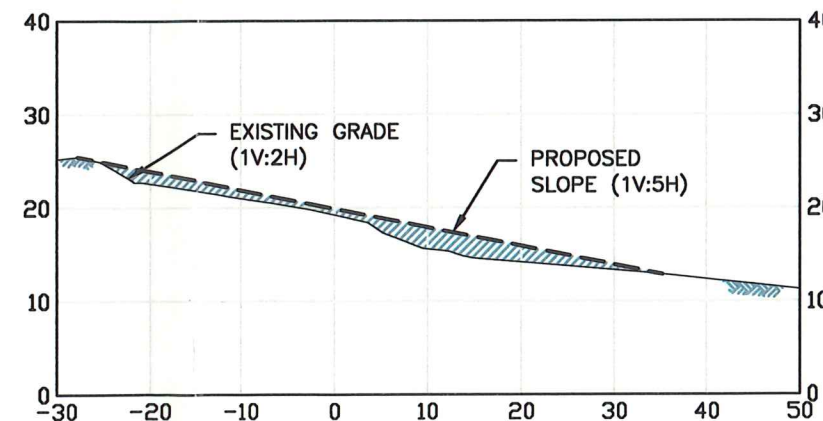
RESERVATION ACCESS R-4 - PLAN VIEW
SCALE: 1"=20'



PROPOSED SAND IMPROVEMENTS
RESERVATION ACCESS R-1 - SECTION
SCALE: 1"=20'



PROPOSED SAND IMPROVEMENTS
RESERVATION ACCESS R-3 - SECTION
SCALE: 1"=20'



PROPOSED SAND IMPROVEMENTS
RESERVATION ACCESS R-4 - SECTION
SCALE: 1"=20'

RESERVATION ACCESS LOCATIONS - PLAN AND SECTIONS
SCALE: 1"=20'

NOTES:

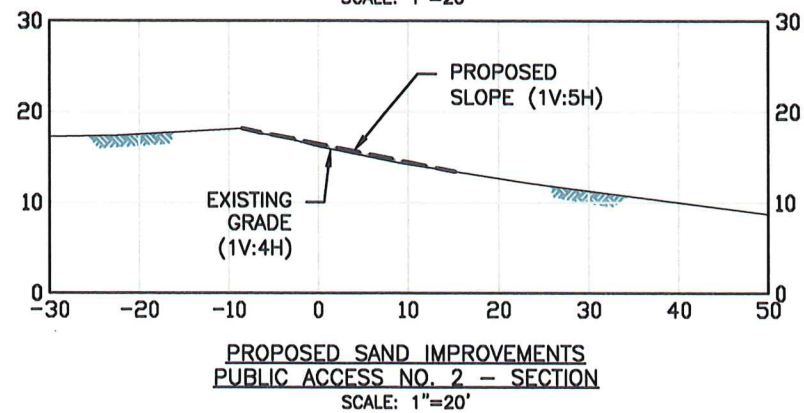
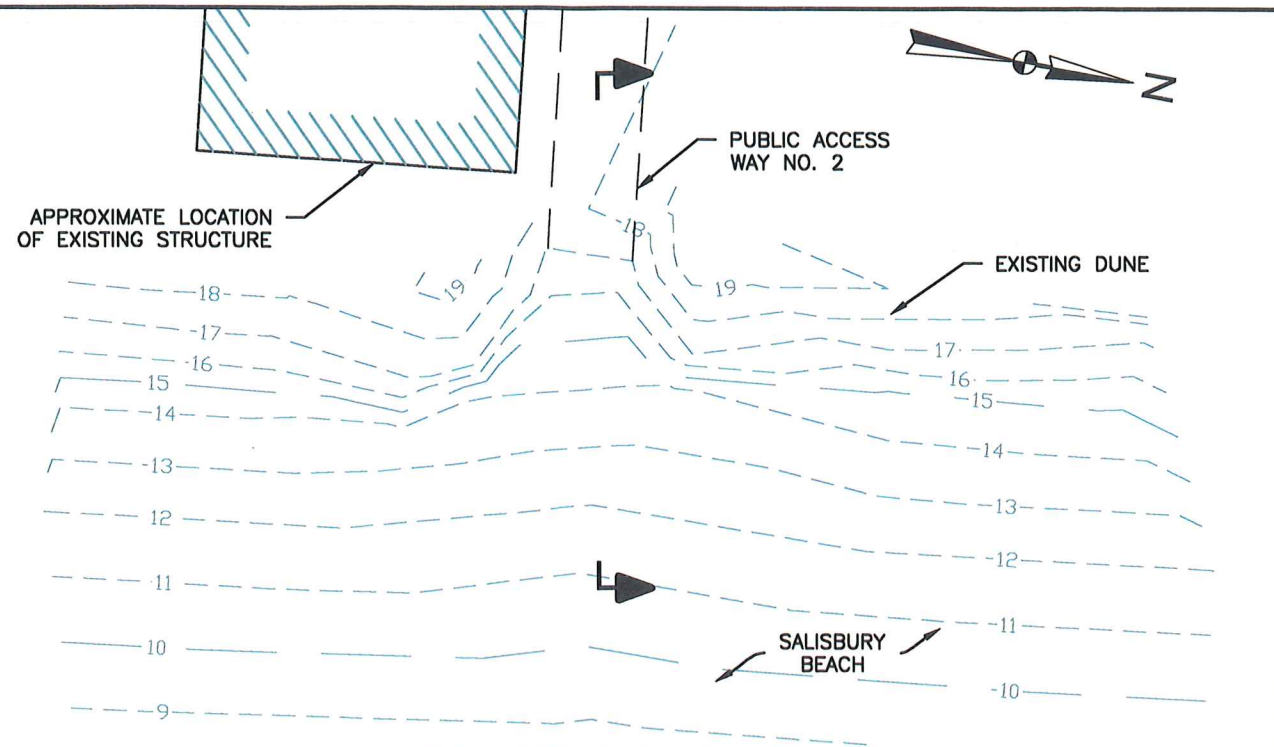
- DATUM: MLLW=-4.39, MLW=4.09, NAVD88=0.0, MHW=3.91.
- SITE BENCHMARK: T.B.M. RAMP (2009) - DRILL HOLE IN GRANITE CURB AT SALISBURY BOAT RAMP SET BY U.S. ARMY CORPS OF ENGINEERS: NEW ENGLAND DIVISION, EL. 9.73 NAVD88.
- TOPOGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC. ON MARCH 23 AND 24, 2013 AND REPRESENTS CONDITIONS AT THE TIME OF SURVEY.
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RFR 504 - SALISBURY BEACH EMERGENCY WORK SALISBURY BEACH RESERVATION SALISBURY, MASSACHUSETTS			
ATTACHMENT E: PLAN AND SECTIONS: RESERVATION ACCESS R-1, R-3 & R-4			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: MASS DCR, OFFICE OF WATERWAYS 30 SHIPYARD DRIVE, SUITE 200 HINGHAM, MA	
PROJ MGR: DAS	REVIEWED BY: ABB	CHECKED BY: DBV	FIGURE 4
DESIGNED BY: DAS	DRAWN BY: JJZ	SCALE: AS SHOWN	
DATE: MARCH 2013	PROJECT NO: 18.0171599.00	REVISION NO.	
			SHEET NO. 4 OF 8

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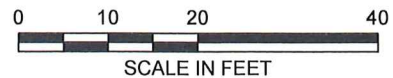


PUBLIC ACCESS NO. 2 - PLAN AND SECTIONS
SCALE: 1"=20'

NOTES:

- DATUM: MLLW=-4.39, MLW=4.09, NAVD88=0.0, MHW=3.91.
- SITE BENCHMARK: T.B.M. RAMP (2009) - DRILL HOLE IN GRANITE CURB AT SALISBURY BOAT RAMP SET BY U.S. ARMY CORPS OF ENGINEERS: NEW ENGLAND DIVISION, EL. 9.73 NAVD88.
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NO.	ISSUE/DESCRIPTION	BY	DATE

RFR 504 - SALISBURY BEACH EMERGENCY WORK
SALISBURY BEACH RESERVATION
SALISBURY, MASSACHUSETTS

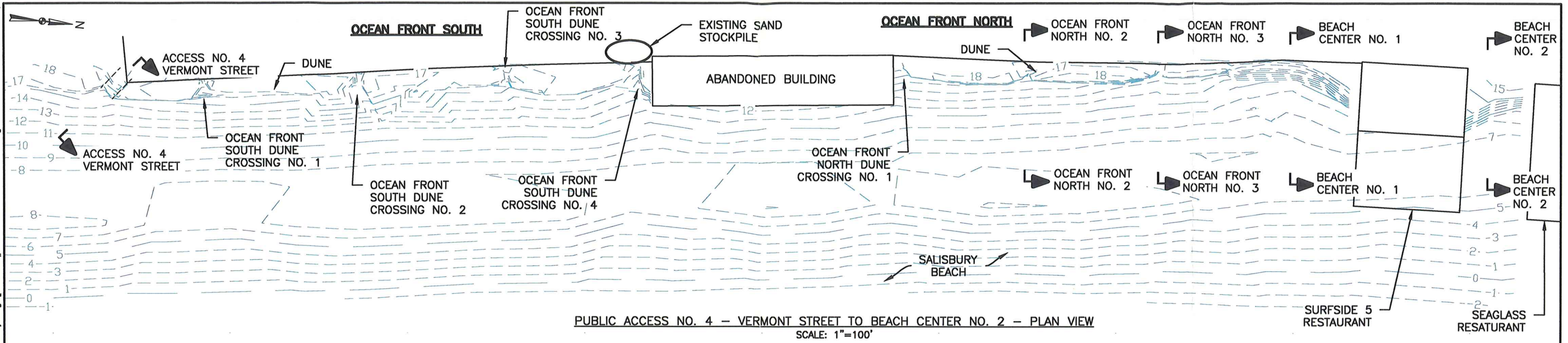
PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
MASS DCR, OFFICE OF WATERWAYS
30 SHIPYARD DRIVE, SUITE 200
HINGHAM, MA

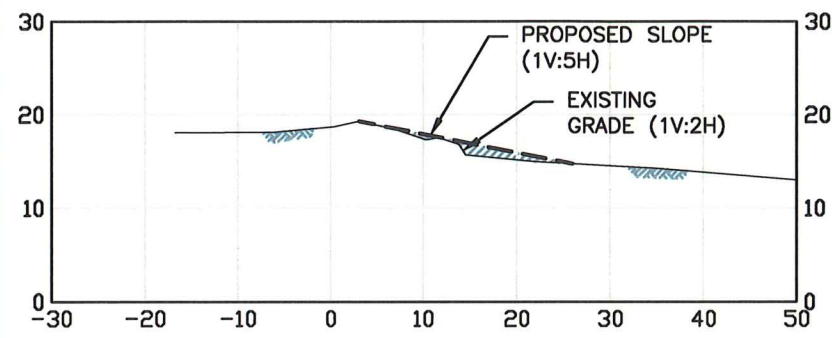
ATTACHMENT E:
PLAN AND SECTION
PUBLIC ACCESS NO. 2 - MURRAY STREET

PROJ MGR: DAS	DESIGNED BY: DAS	DATE: MARCH 2013	REVIEWED BY: ABB	DRAWN BY: JJZ	PROJECT NO. 18.0171599.00	CHECKED BY: DBV	SCALE: AS SHOWN	REVISION NO.	FIGURE 5
								SHEET NO. 5 OF 8	

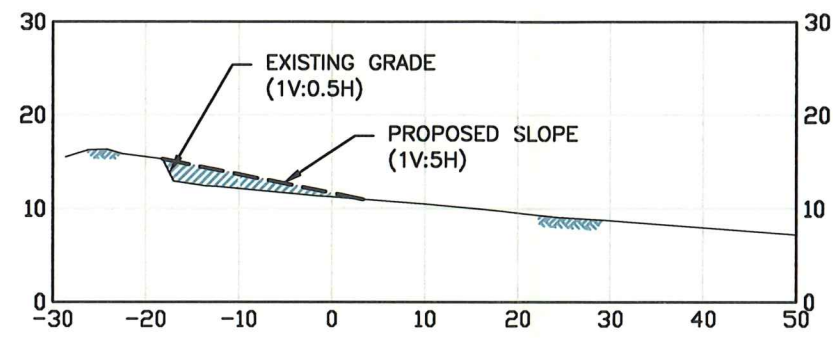
© 2011 GZA GeoEnvironmental, Inc. GZA-j: 171500.s\18.0171599.00 Salisbury Beach Emergency Survey Work\Figures-CAD\Site Plan (CURRENT).dwg [Access #4 to Beach Center Access] March 29, 2013 - 4:39pm joshi



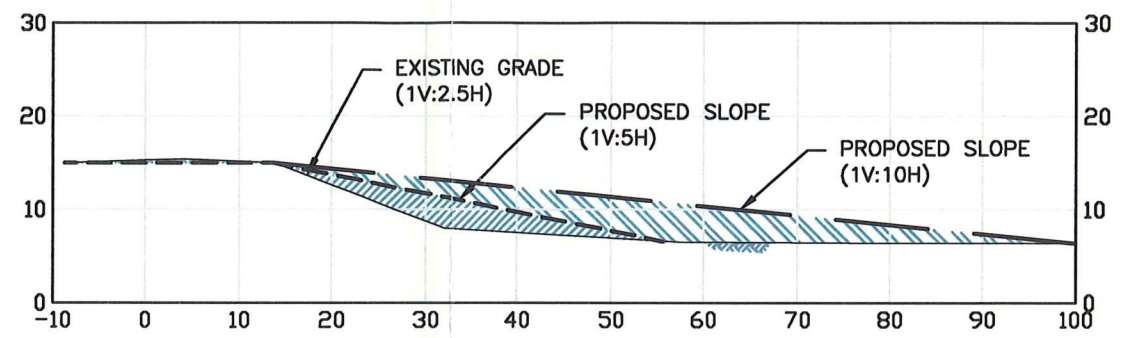
PUBLIC ACCESS NO. 4 - VERMONT STREET TO BEACH CENTER NO. 2 - PLAN VIEW
SCALE: 1"=100'



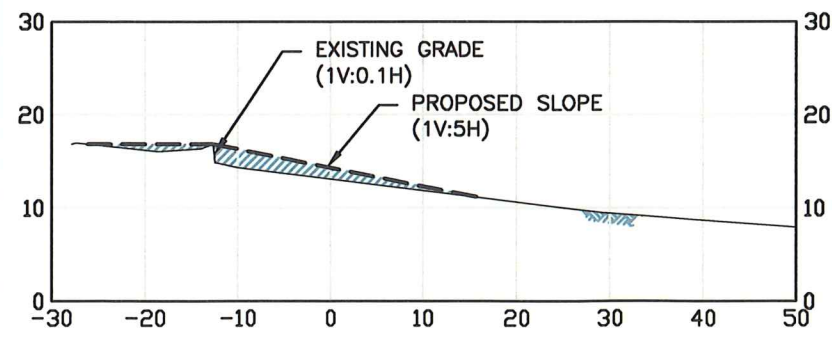
ACCESS NO. 4 - VERMONT STREET
SCALE: 1"=20'



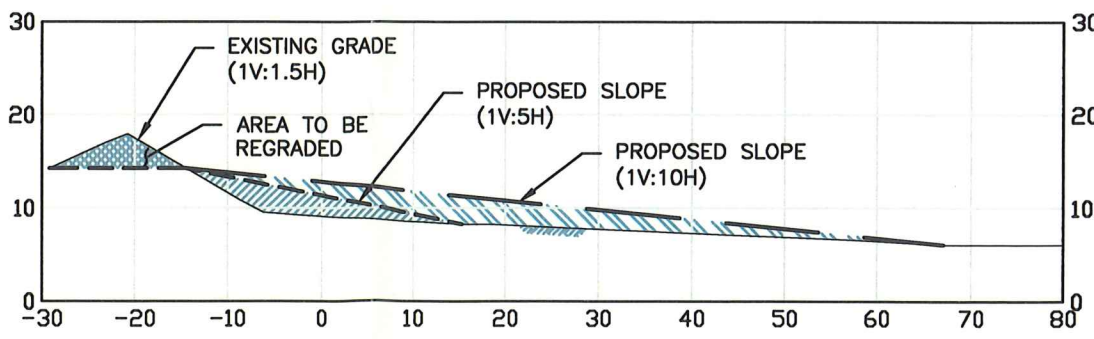
OCEAN FRONT NORTH DUNE CROSSING NO. 3
SCALE: 1"=20'



BEACH CENTER NO. 2
SCALE: 1"=20'



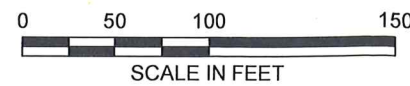
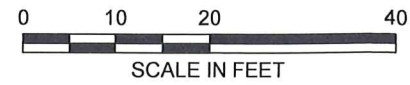
OCEAN FRONT NORTH DUNE CROSSING NO. 2
SCALE: 1"=20'



BEACH CENTER NO. 1
SCALE: 1"=20'

PROPOSED SAND IMPROVEMENTS - SECTIONS
SCALE: 1"=20'

DRAFT



- NOTES:**
- DATUM: MLLW=-4.39, MLW=4.09, NAVD88=0.0, MHW=3.91.
 - SITE BENCHMARK: T.B.M. RAMP (2009) - DRILL HOLE IN GRANITE CURB AT SALISBURY BOAT RAMP SET BY U.S. ARMY CORPS OF ENGINEERS: NEW ENGLAND DIVISION, EL. 9.73 NAVD88.
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RFR 504 - SALISBURY BEACH EMERGENCY WORK SALISBURY BEACH RESERVATION SALISBURY, MASSACHUSETTS			
ATTACHMENT E: PLAN AND SECTIONS: PUBLIC ACCESS NO. 4 THROUGH BEACH CENTER NO.2			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: MASS DCR, OFFICE OF WATERWAYS 30 SHIPYARD DRIVE, SUITE 200 HINGHAM, MA	
PROJ MGR: DAS	REVIEWED BY: ABB	CHECKED BY: DBV	FIGURE
DESIGNED BY: DAS	DRAWN BY: JJZ	SCALE: AS SHOWN	6
DATE: MARCH 2013	PROJECT NO: 18.0171599.00	REVISION NO.	
			SHEET NO. 6 OF 8



PHOTOGRAPH 19
Ocean Front N. Dune Crossing No. 3 (Opposite Upper Deck)



PHOTOGRAPH 20
Beach Center No. 1 (south of Surfside 5).



PHOTOGRAPH 21

Beach Center No. 2 (between Surfside 5 and Seaglass Restaurants).



PHOTOGRAPH 22

Salisbury Beach Public Access No. 5 (Central Ave.)



PHOTOGRAPH 23

Salisbury Beach Public Access No. 6 (176 North End Blvd.)
(Note: Access No. 7 was under construction)



PHOTOGRAPH 24

Salisbury Beach Public Access No. 8 (14th Street E.)



PHOTOGRAPH 25
Salisbury Beach Public Access No. 9 (Sea Crest 13th Street)



PHOTOGRAPH 26
Salisbury Beach Public Access No. 10 (9th Street E.)



PHOTOGRAPH 27
Salisbury Beach Public Access No. 11 (7th Street E.)



PHOTOGRAPH 28
Salisbury Beach Public Access No. 12 (Brookline Street)



PHOTOGRAPH 29
Salisbury Beach Public Access No. 13 (Beacon Street)

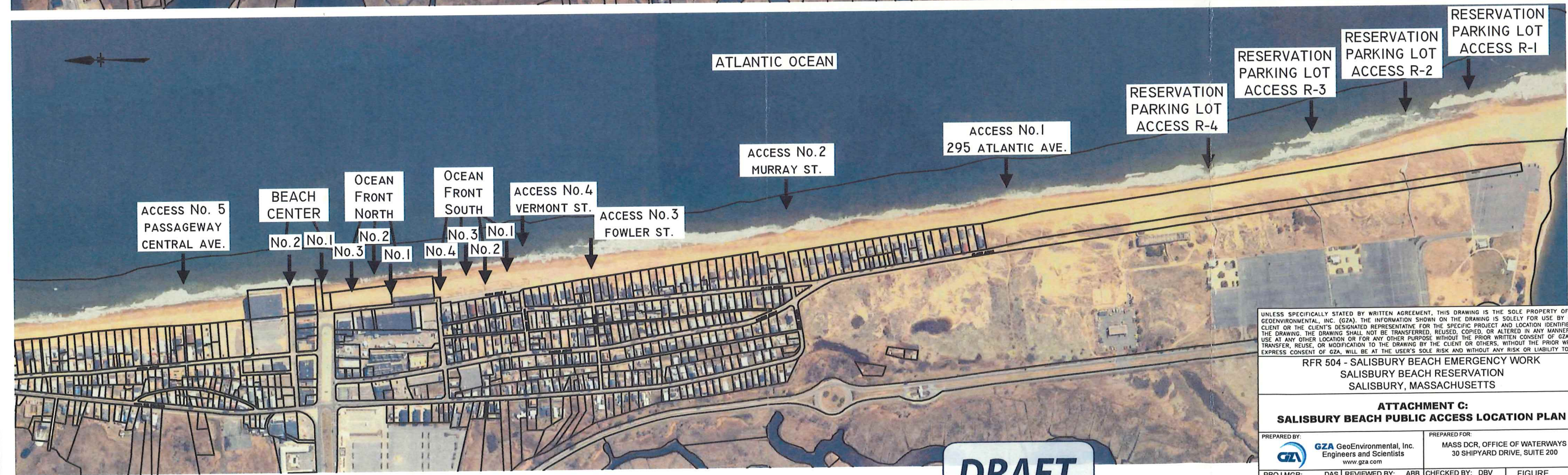
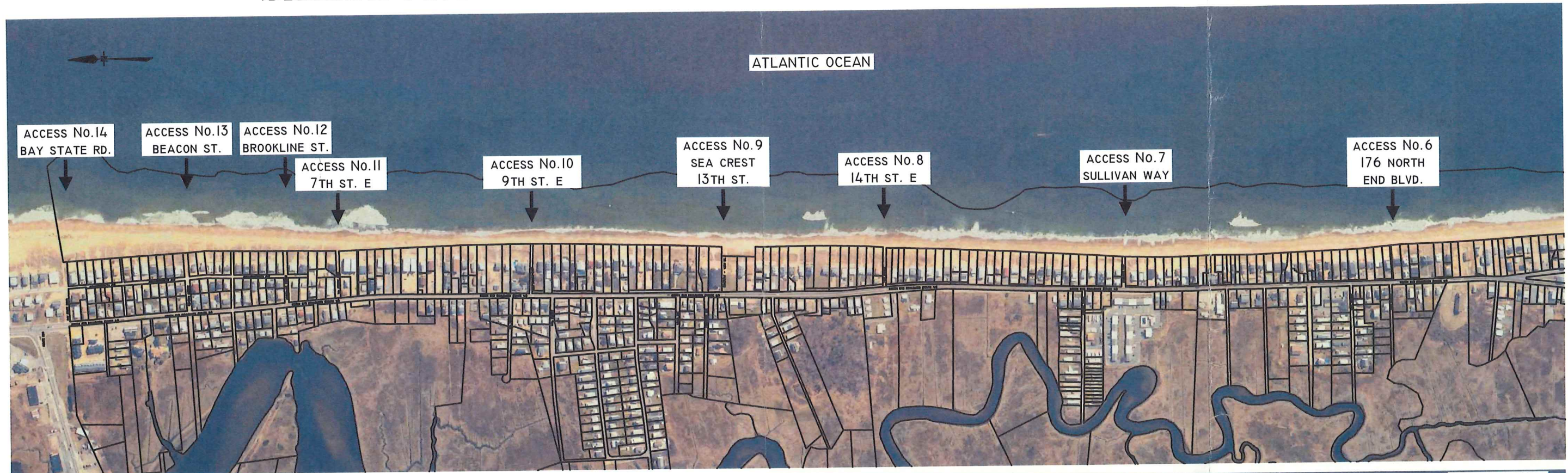


PHOTOGRAPH 30
Salisbury Beach Public Access No. 14 (Bay State Rd.)



Attachment C:
Figure No. 1 – Aerial Plan Showing Access Ways

SALISBURY BEACH PUBLIC ACCESS LOCATION PLAN



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RFR 504 - SALISBURY BEACH EMERGENCY WORK
SALISBURY BEACH RESERVATION
SALISBURY, MASSACHUSETTS

**ATTACHMENT C:
SALISBURY BEACH PUBLIC ACCESS LOCATION PLAN**

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: MASS DCR, OFFICE OF WATERWAYS 30 SHIPYARD DRIVE, SUITE 200	
PROJ MGR: DAS DESIGNED BY: DAS DATE: MARCH 2013	REVIEWED BY: ABB DRAWN BY: JJZ PROJECT NO. 18.0171599.00	CHECKED BY: DBV SCALE: AS SHOWN REVISION NO.	FIGURE 1 SHEET NO. 1 OF 8

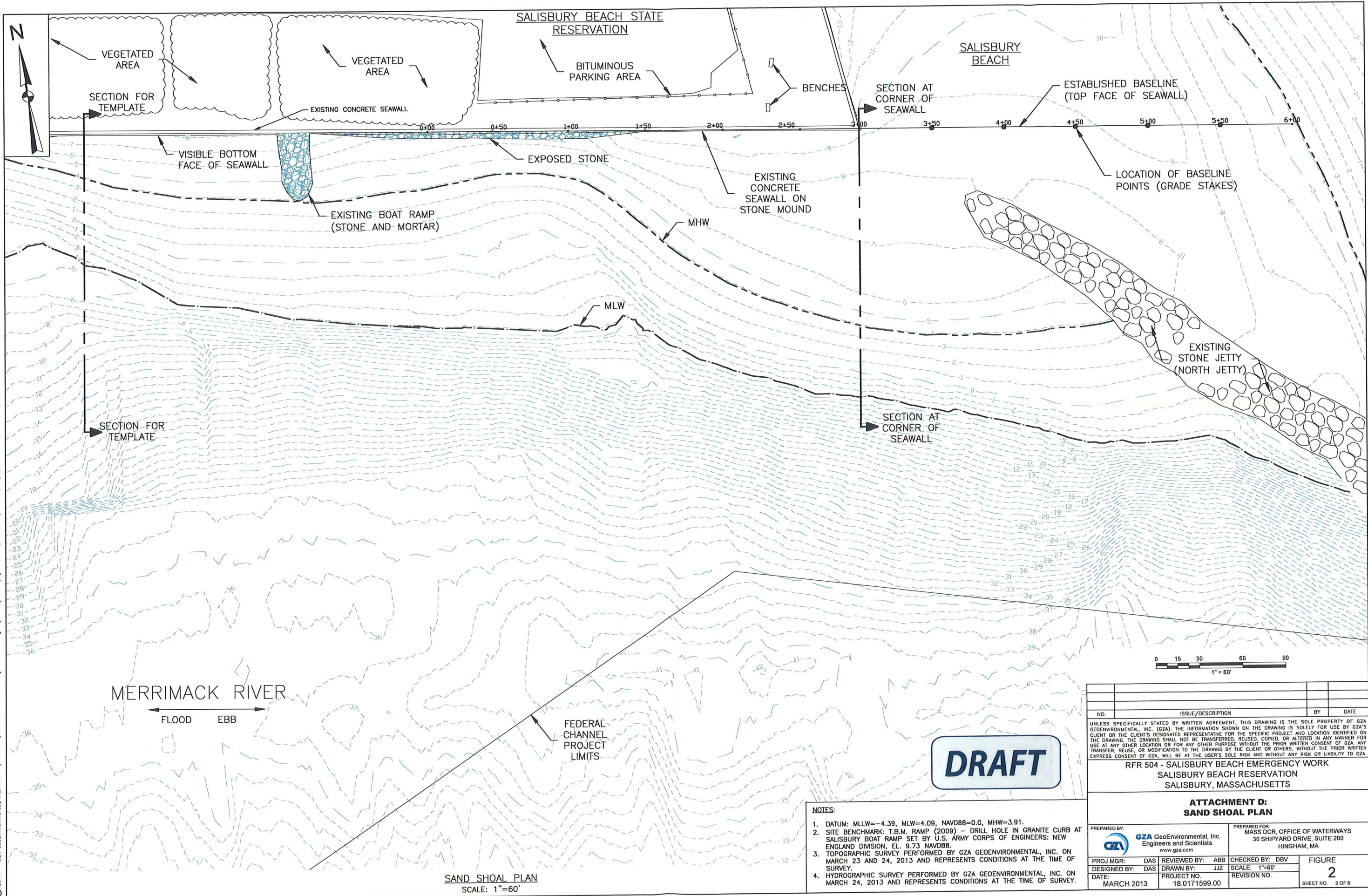
DRAFT



NOTE:
AERIAL IMAGE FROM MASS GIS ORTHOPHOTO DATED 2005

© 2011 - GZA GeoEnvironmental, Inc. GZA-171599-00 Salisbury Beach Emergency Survey Work\Figures-CAD\Site CAD Files\Access Points Overview.dwg [Layout] March 29, 2013 - 3:30pm jashua.zelli

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- NOTES:**
- DATUM: MLLW=-4.39, MLW=4.09, NAVD88=0.0, MHW=3.91.
 - SITE BENCHMARK: T.B.M. RAMP (2009) - DRILL HOLE IN GRANITE CURB AT SALISBURY BOAT RAMP SET BY U.S. ARMY CORPS OF ENGINEERS: NEW ENGLAND DIVISION, EL. 9.73 NAVD88.
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 - HYDROGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC. ON MARCH 24, 2013 AND REPRESENTS CONDITIONS AT THE TIME OF SURVEY.

SAND SHOAL PLAN
SCALE: 1"=60'

NO.	ISSUE/DESCRIPTION	BY	DATE

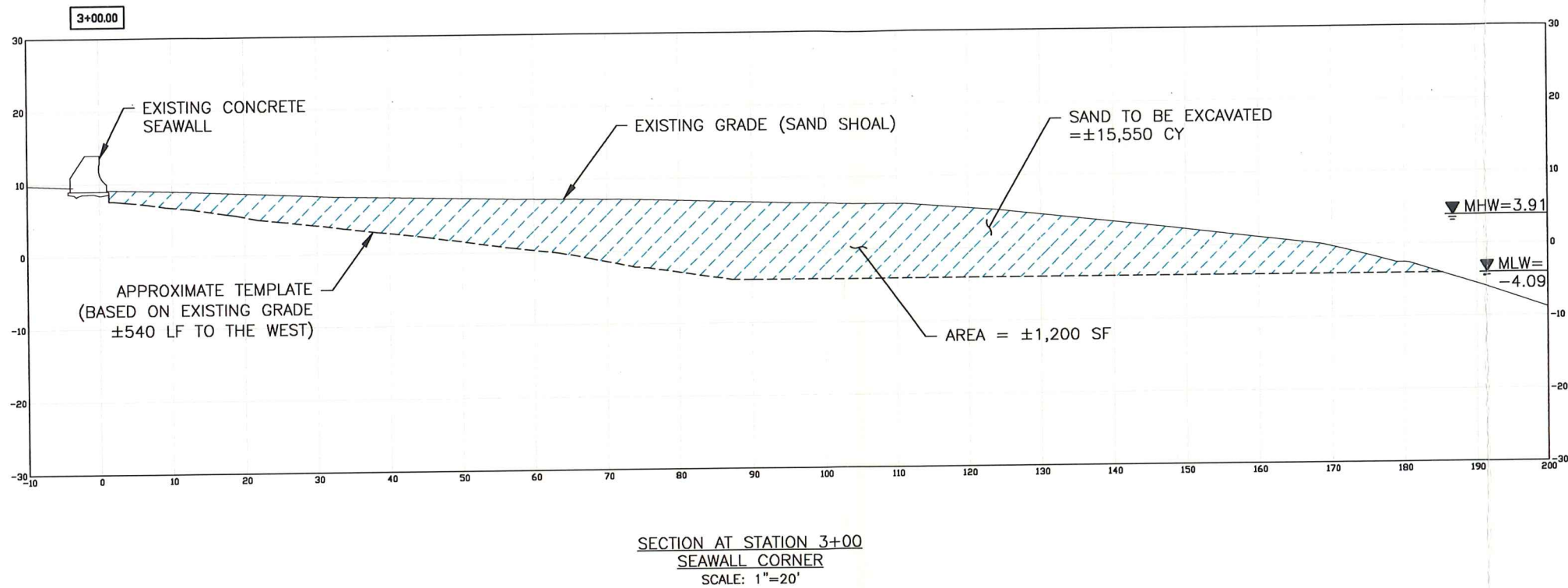
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RFR 504 - SALISBURY BEACH EMERGENCY WORK
SALISBURY BEACH RESERVATION
SALISBURY, MASSACHUSETTS

ATTACHMENT D:
SAND SHOAL PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	PREPARED FOR: MASS DCR, OFFICE OF WATERWAYS 30 SHIPYARD DRIVE, SUITE 200 HINGHAM, MA		
PROJ MGR: DAS	REVIEWED BY: ABB	CHECKED BY: DBV	FIGURE
DESIGNED BY: DAS	DRAWN BY: JJZ	SCALE: 1"=60'	2
DATE: MARCH 2013	PROJECT NO: 18.0171599.00	REVISION NO.	SHEET NO. 2 OF 8

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NOTES:

1. DATUM: MLLW=-4.39, MLW=4.09, NAVD88=0.0, MHW=3.91.
2. SITE BENCHMARK: T.B.M. RAMP (2009) - DRILL HOLE IN GRANITE CURB AT SALISBURY BOAT RAMP SET BY U.S. ARMY CORPS OF ENGINEERS: NEW ENGLAND DIVISION, EL. 9.73 NAVD88.
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4. HYDROGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC. ON MARCH 24, 2013 AND REPRESENTS CONDITIONS AT THE TIME OF SURVEY.

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RFR 504 - SALISBURY BEACH EMERGENCY WORK
SALISBURY BEACH RESERVATION
SALISBURY, MASSACHUSETTS

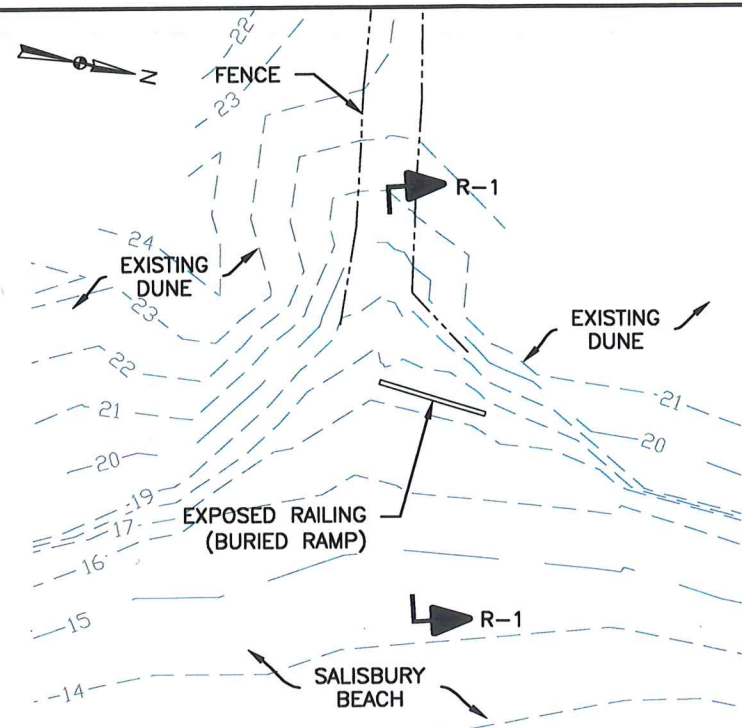
ATTACHMENT D:
SAND SHOAL SECTION

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	PREPARED FOR: MASS DCR, OFFICE OF WATERWAYS 30 SHIPYARD DRIVE, SUITE 200 HINGHAM, MA
PROJ MGR: DAS DESIGNED BY: DAS DATE: MARCH 2013	REVIEWED BY: ABB DRAWN BY: JJZ PROJECT NO.: 18.0171599.00
CHECKED BY: DBV SCALE: 1"=20' REVISION NO.	FIGURE <div style="text-align: center; font-weight: bold; font-size: 18px;">3</div> SHEET NO. 3 OF 8

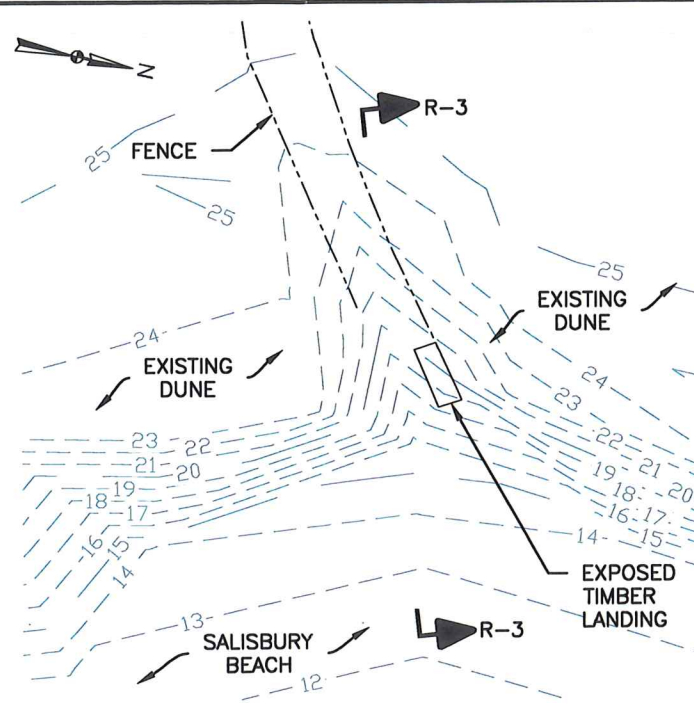


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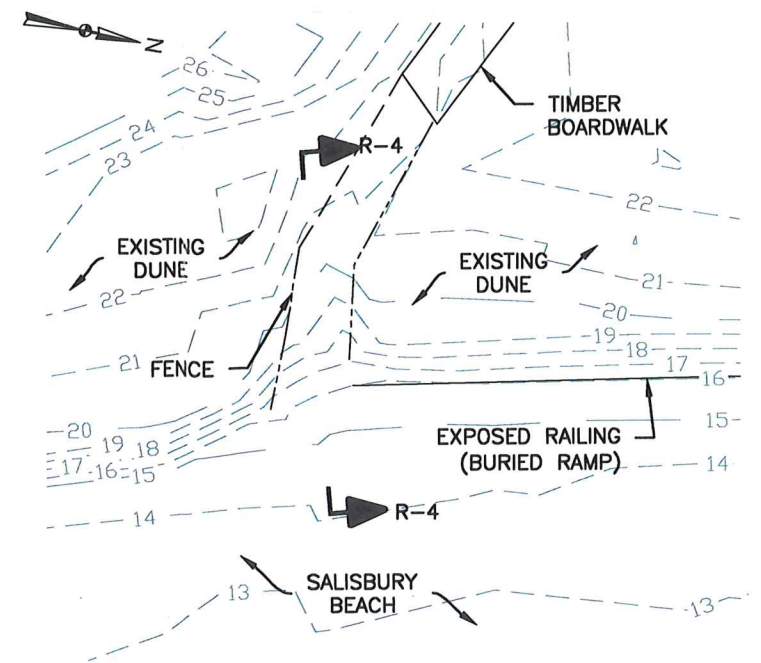
- Figure No. 4 – Reservation Access No. 1, 3 and 4 (Plan and Sections)
- Figure No. 5 – Public Access No. 2 (Plan and Section)
- Figure No. 6 – Public Access No. 4 to Beach Center No. 2 (Plan and Section)
- Figure No. 7 – Public Access No. 5 (Plan and Section)
- Figure No. 8 – Beach Center and Public Access between No.'s 7 and 8 (Sections)



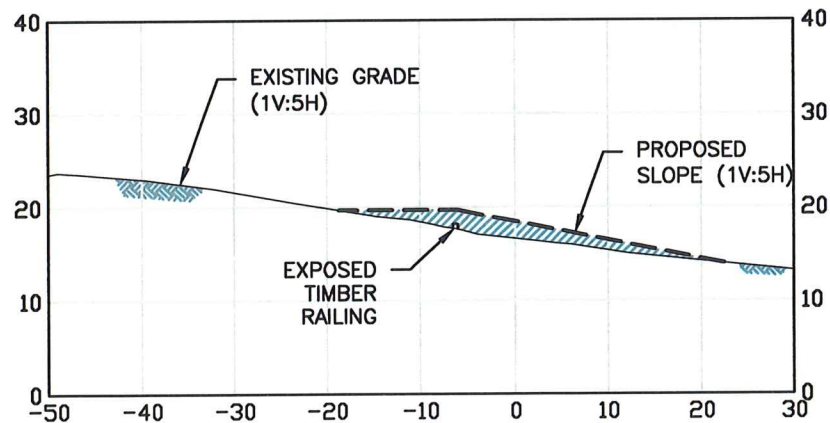
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SCALE: 1"=20'



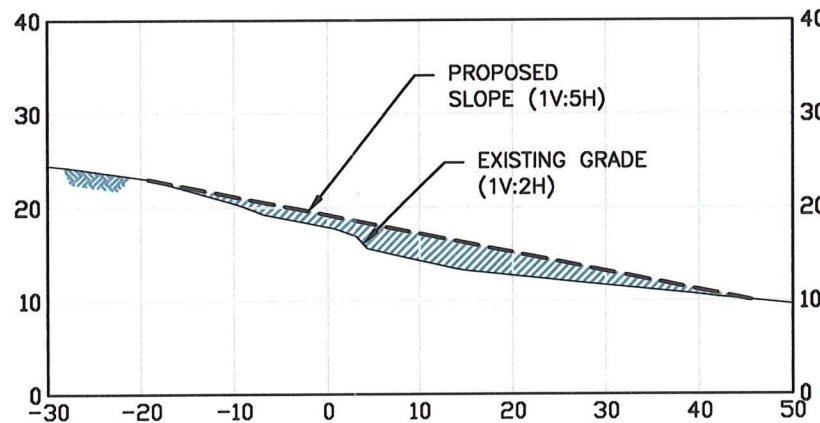
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SCALE: 1"=20'



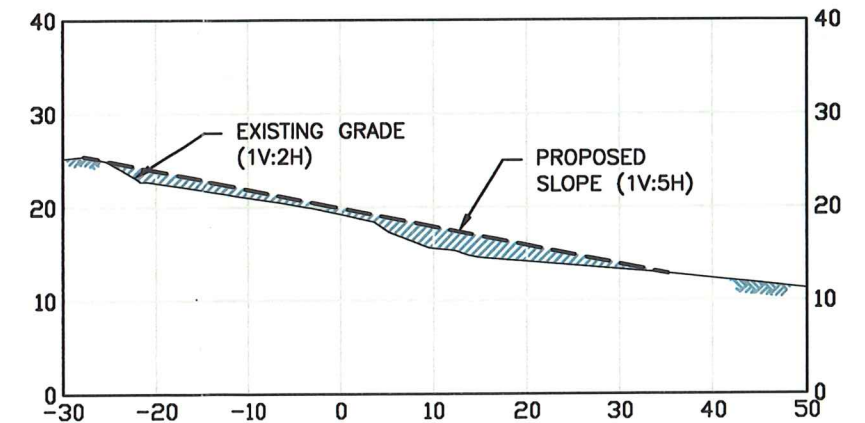
RESERVATION ACCESS R-4 - PLAN VIEW
SCALE: 1"=20'



PROPOSED SAND IMPROVEMENTS
RESERVATION ACCESS R-1 - SECTION
SCALE: 1"=20'



PROPOSED SAND IMPROVEMENTS
RESERVATION ACCESS R-3 - SECTION
SCALE: 1"=20'



PROPOSED SAND IMPROVEMENTS
RESERVATION ACCESS R-4 - SECTION
SCALE: 1"=20'

RESERVATION ACCESS LOCATIONS - PLAN AND SECTIONS
SCALE: 1"=20'

NOTES:

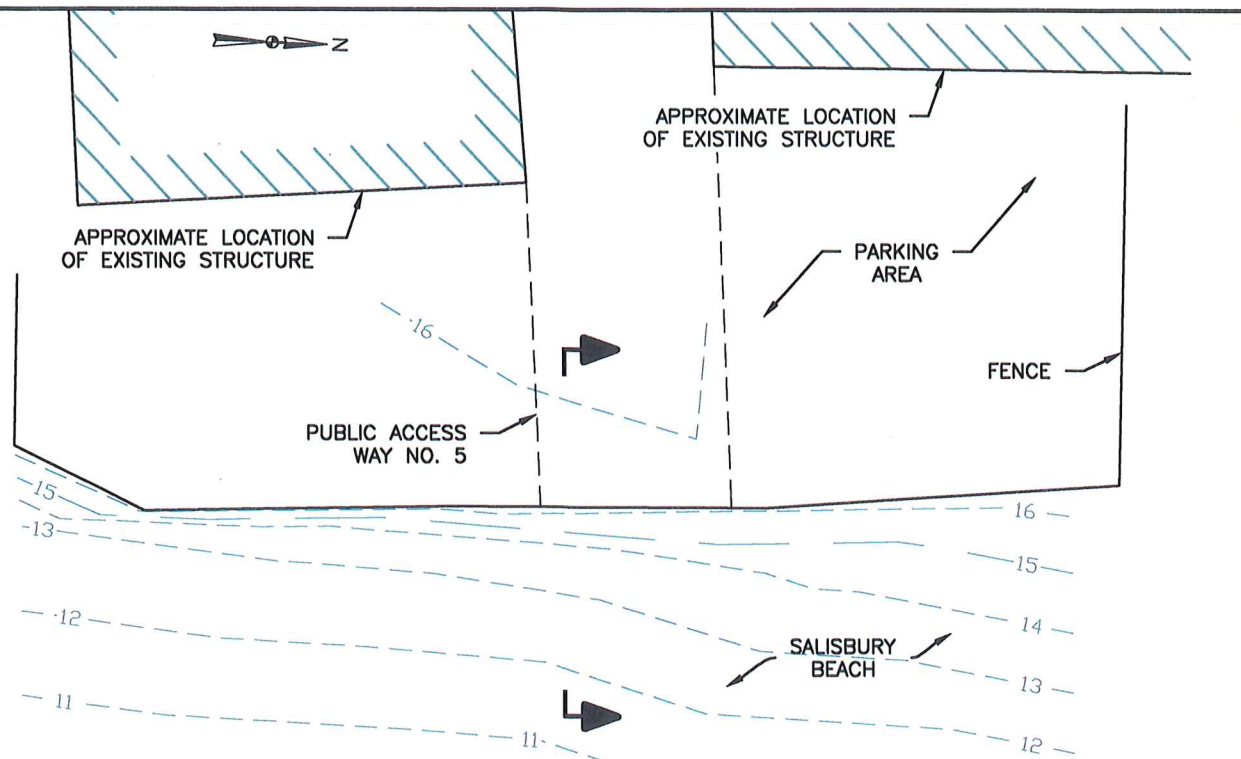
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- SITE BENCHMARK: T.B.M. RAMP (2009) - DRILL HOLE IN GRANITE CURB AT SALISBURY BOAT RAMP SET BY U.S. ARMY CORPS OF ENGINEERS: NEW ENGLAND DIVISION, EL. 9.73 NAVD88.
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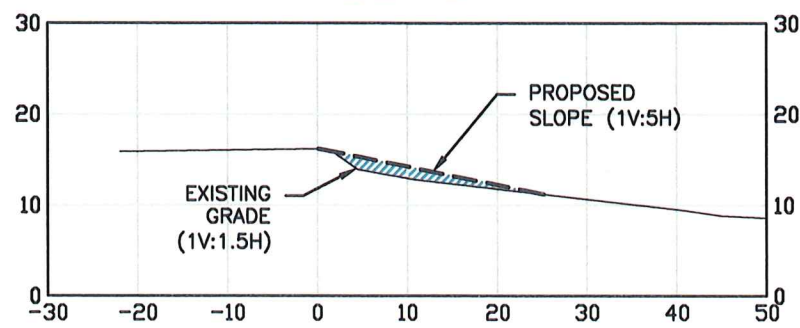


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RFR 504 - SALISBURY BEACH EMERGENCY WORK SALISBURY BEACH RESERVATION SALISBURY, MASSACHUSETTS			
ATTACHMENT E: PLAN AND SECTIONS: RESERVATION ACCESS R-1, R-3 & R-4			
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: MASS DCR, OFFICE OF WATERWAYS 30 SHIPYARD DRIVE, SUITE 200 HINGHAM, MA	
PROJ MGR: DAS	REVIEWED BY: ABB	CHECKED BY: DBV	FIGURE 4 SHEET NO. 4 OF 8
DESIGNED BY: DAS	DRAWN BY: JJZ	SCALE: AS SHOWN	
DATE: MARCH 2013	PROJECT NO: 18.0171599.00	REVISION NO.	

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PUBLIC ACCESS NO. 5 - PLAN VIEW
SCALE: 1"=20'



PROPOSED SAND IMPROVEMENTS
PUBLIC ACCESS NO. 5 - SECTION
SCALE: 1"=20'

PUBLIC ACCESS NO. 5 - PLAN AND SECTIONS
SCALE: 1"=20'

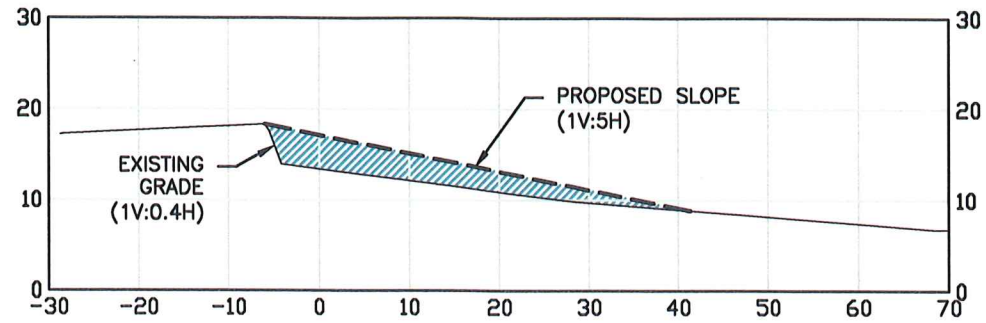
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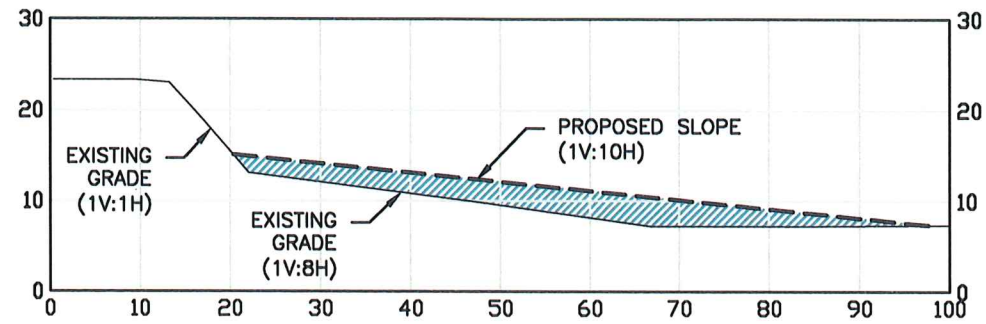
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RFR 504 - SALISBURY BEACH EMERGENCY WORK SALISBURY BEACH RESERVATION SALISBURY, MASSACHUSETTS		PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	PREPARED FOR: MASS DCR, OFFICE OF WATERWAYS 30 SHIPYARD DRIVE, SUITE 200 HINGHAM, MA
ATTACHMENT E:	PROJ MGR: DAS REVIEWED BY: ABB DESIGNED BY: DAS DRAWN BY: JZ DATE: MARCH 2013 PROJECT NO. 18.0171599.00	CHECKED BY: DBV SCALE: AS SHOWN REVISION NO.	FIGURE 7 SHEET NO. 7 OF 8
PUBLIC ACCESS NO. 5 - PASSAGEWAY CENTRAL AVENUE			



ADDITIONAL SAND PLACEMENT
 BEACH CENTER (OUTSIDE OF ACCESS AREAS) - SECTION
 SCALE: 1"=20'



ADDITIONAL SAND PLACEMENT
 PUBLIC ACCESS NO. 7 TO PUBLIC ACCESS NO. 8 - SECTION
 SCALE: 1"=20'

ADDITIONAL SAND PLACEMENT SECTIONS
 SCALE: 1"=20'

NOTES:

1. DATUM: MLLW=-4.39, MLW=4.09, NAVD88=0.0, MHW=3.91.
2. SITE BENCHMARK: T.B.M. RAMP (2009) - DRILL HOLE IN GRANITE CURB AT SALISBURY BOAT RAMP SET BY U.S. ARMY CORPS OF ENGINEERS: NEW ENGLAND DIVISION, EL. 9.73 NAVD88.
3. TOPOGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC. ON MARCH 25 AND 26, 2013 AND REPRESENTS CONDITIONS AT THE TIME OF SURVEY.
4. THE SURVEY WAS PERFORMED FOR GENERAL SITE CHARACTERISTICS AND WAS NOT A PROPERTY BOUNDARY SURVEY.

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NO.	ISSUE/DESCRIPTION	BY	DATE

RFR 504 - SALISBURY BEACH EMERGENCY WORK
 SALISBURY BEACH RESERVATION
 SALISBURY, MASSACHUSETTS

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PREPARED FOR:
 MASS DCR, OFFICE OF WATERWAYS
 30 SHIPYARD DRIVE, SUITE 200
 HINGHAM, MA

**ATTACHMENT E:
 ADDITIONAL SAND PLACEMENT SECTIONS**

PROJ MGR: DAS	DESIGNED BY: DAS	DATE: MARCH 2013	REVIEWED BY: ABB	DRAWN BY: JJZ	PROJECT NO. 18.0171599.00	CHECKED BY: DBV	SCALE: AS SHOWN	REVISION NO.	FIGURE 8
								SHEET NO. 8 OF 8	