

Department of Environmental Protection
Bureau of Land & Water Quality
17 State House Station
Augusta, Maine 04333
Telephone: 207-287-7688

FOR DEP USE
ATS # _____
L- _____
Total Fees: _____
Date: Received _____

APPLICATION FOR A NATURAL RESOURCES PROTECTION ACT PERMIT

→ PLEASE TYPE OR PRINT IN BLACK INK ONLY

1. Name of Applicant: Town of Casco		5. Name of Agent: Mike Morse; Morse Environmental Consulting, LLC	
2. Applicant's Mailing Address: 635 Meadow Road, Casco, ME 04015		6. Agent's Mailing Address: 16 Liberty Road, Falmouth, ME 04105	
3. Applicant's Daytime Phone #: 207-627-4515		7. Agent's Daytime Phone #: 207-558-0842	
4. Applicant's Email Address (Required from either applicant or agent):		8. Agent's Email Address: mike@morseenvironmental.com	
9. Location of Activity: (Nearest Road, Street, Rt.#) Town beach- Mayberry Hill Road		10. Town: Casco	11. County: Cumberland
12. Type of Resource: (Check all that apply)	☐ River, stream or brook ☒ Great Pond ☐ Coastal Wetland ☐ Freshwater Wetland ☐ Wetland Special Significance ☐ Significant Wildlife Habitat ☐ Fragile Mountain		13. Name of Resource: Pleasant Lake
	14. Amount of Impact: (Sq.Ft.) Tier 1 ☐ 0 - 4,999 sq ft. ☐ 5,000-9,999 sq ft ☐ 10,000-14,999 sq ft		Fill: NONE Dredging/Veg Removal/Other: None
15. Type of Wetland: (Check all that apply)	☐ Forested ☐ Scrub Shrub ☐ Emergent ☐ Wet Meadow ☐ Peatland ☐ Open Water ☐ Other _____	FOR FRESHWATER WETLANDS Tier 2 ☐ 15,000 – 43,560 sq. ft.	
		Tier 3 ☐ > 43,560 sq. ft. or smaller than 43,560 sq. ft., not eligible for Tier 1	
16. Brief Activity Description:		Town beach erosion mitigation/ facility improvement project. Proposing to remove soil to reduce slope of land adjacent to beach; construct retaining wall approx. 20' from NHWL.	
17. Size of Lot or Parcel & UTM Locations:		☒ ~3,000 square feet, or ☐ _____ acres UTM Northing: _____ UTM Easting: _____	
18. Title, Right or Interest:		☒ own ☐ lease ☐ purchase option ☐ written agreement	
19. Deed Reference Numbers:		20. Map and Lot Numbers:	Map #: 43 Lot #: 28
21. DEP Staff Previously Contacted: None		22. Part of a larger project:	☐ Yes ☒ No
23. Resubmission of Application?:		After-the-Fact:	
☐ Yes → ☒ No	If yes, previous application #	☐ Yes ☒ No	
24. Written Notice of Violation?:		25. Previous Wetland Alteration:	
☐ Yes → ☒ No	If yes, name of DEP enforcement staff involved:	☐ Yes ☒ No	
26. Detailed Directions to the Project Site:		The address location is 18 Mayberry Hill Road, Casco. The beach property is located at the southerly end of Pleasant Lake, just east of the intersection with Route 121.	
27. TIER 1		TIER 2/3 AND INDIVIDUAL PERMITS	
☐ Title, right or interest documentation ☐ Topographic Map ☐ Narrative Project Description ☐ Plan or Drawing (8 1/2" x 11") ☐ Photos of Area ☐ Statement of Avoidance & Minimization ☐ Statement/Copy of cover letter to MHPC		☐ Title, right or interest documentation ☒ Topographic Map ☒ Copy of Public Notice/Public Information Meeting Documentation ☐ Wetlands Delineation Report (Attachment 1) that contains the information listed under Site Conditions ☒ Alternatives Analysis (Attachment 2) including description of how wetland impacts were Avoided/Minimized ☒ Erosion Control/Construction Plan ☐ Functional Assessment (Attachment 3), if required ☐ Compensation Plan (Attachment 4), if required ☒ Appendix A and others, if required ☐ Statement/Copy of cover letter to MHPC ☐ Description of Previously Mined Peatland, if required	
28. FEES Amount Enclosed: \$356			

CERTIFICATIONS AND SIGNATURES LOCATED ON PAGE 2

IMPORTANT: IF THE SIGNATURE BELOW IS NOT THE APPLICANT'S SIGNATURE, ATTACH LETTER OF AGENT AUTHORIZATION SIGNED BY THE APPLICANT.

By signing below the applicant (or authorized agent), certifies that he or she has read and understood the following :

DEP SIGNATORY REQUIREMENT

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor a permit be issued.

CORPS SIGNATORY REQUIREMENT

USC Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry shall be fined not more than \$10,000 or imprisoned not more than five years or both. I authorize the Corps to enter the property that is subject to this application, at reasonable hours, including buildings, structures or conveyances on the property, to determine the accuracy of any information provided herein.

DEP SIGNATORY REQUIREMENT

"I certify under penalty of law that I have personally examined the information submitted in this document and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the information is true, accurate, and complete. I authorize the Department to enter the property that is the subject of this application, at reasonable hours, including buildings, structures or conveyances on the property, to determine the accuracy of any information provided herein. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Further, I hereby authorize the DEP to send me an electronically signed decision on the license I am applying for with this application by emailing the decision to the address located on the front page of this application (see #4 for the applicant and #8 for the agent)."

Michael J. Morse

Digitally signed by Michael J.
Morse
Date: 2021.11.16 17:21:01 -05'00'

Date: _____

SIGNATURE OF AGENT/APPLICANT

NOTE: Any changes in activity plans must be submitted to the DEP and the Corps in writing and must be approved by both agencies prior to implementation. Failure to do so may result in enforcement action and/or the removal of the unapproved changes to the activity.

Property Card: 18 MAYBERRY HILL RD

Town of Casco, ME



Parcel Information	
Parcel ID: 43-28 Vision ID: 2236 Owner: TOWN OF CASCO Co-Owner: Mailing Address: 635 MEADOW RD CASCO, ME 04015	Map: 0043 Lot: -0028 Use Description: MUNICIPAL MDL-00 Zone: Land Area in Acres: 0
Sale History	Assessed Value
Book/Page: Sale Date: 12:00:00 AM Sale Price:	Land: \$0 Buildings: \$0 Total Exemptions: \$0 Total: \$0

Building Details: Building # 1		
NO PHOTO AVAILABLE	Model:	Int Wall Desc 1:
	Living Area:	Int Wall Desc 2:
	Appr. Year Built:	Ext Wall Desc 1:
	Style:	Ext Wall Desc 2:
	Stories:	Roof Cover:
	Occupancy:	Roof Structure:
	No. Total Rooms:	Heat Type:
	No. Bedrooms:	Heat Fuel:
	No. Baths:	A/C Type:
	No. Half Baths:	



www.cai-tech.com

Data shown on this report is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this report.



Michael Morse
Principal
mike@morseenvironmental.com
(207) 558-0842

22 Free Street, Ste 403
Portland, Maine 04101

April 8, 2022

Via Email

Jennifer McGill
Licensing Project Manager
Bureau of Land Resources
Maine Department of Environmental Protection
312 Canco Road
Portland, Maine 04103
Jennifer.g.mcgill@maine.gov

RE: Town of Casco- Town Beach Erosion Mitigation Project

Dear Jennifer:

Thank you for discussing your project review comments related to the above-referenced project earlier this week. Pursuant to our recent conversation I have revised the application accordingly:

- 1) The application proposed the placement of washed sand as the base material between the proposed retaining wall and the lake shoreline. The application has been revised to eliminate this sand and instead will utilize the placement of 4" minimum loam, covered by grass sod treatment.
- 2) The application proposed a mulched footpath leading from the picnic area to the shallow graded area adjacent to the beach. The application has been revised to incorporate infiltration steps or infiltration terraces on the sloped portion of this footpath. The footpath will be no wider than 4' in width. Due to the shallow slope and anticipated on-site manipulation of final grading, infiltration steps/terraces will be installed in locations as deemed appropriate during construction to provide maximum erosion protection and to ensure the creation of a safe accessway.
- 3) After an on-site review on April 1, 2022, Amanda Pratt from your office recommended alternative designs to the project. You requested that we incorporate these requests and our response into the application's Alternatives Analysis, which we have done (please see attached). Generally, Ms. Pratt's recommendations were well intended, but they do not acknowledge the significant intensity and volume of use at this small municipal facility. We have incorporated her recommendation to install infiltration steps, however, and we appreciate her recommendation in this regard.

- 4) You have requested additional time to review the project and draft DEP's approval order and therefore have requested that we consider placing the project on hold. Town officials are amenable to the project being placed on hold to allow the Department up to two additional weeks beyond the Department's deadline and may be amenable to extend this further if that becomes necessary. As such, we request that the project be placed on hold for a maximum of two weeks.

Please do not hesitate to contact me with any further questions or comments that you may have.

Sincerely,

A handwritten signature in blue ink, appearing to read 'M. Morse', with a long horizontal flourish extending to the right.

Michael Morse

Morse Environmental Consulting, LLC

www.morseenvironmental.com
mike@morseenvironmental.com
207-558-0842

Town of Casco

Town Beach Erosion Mitigation and Improvement

18 Mayberry Hill Road, Casco

Pleasant Lake

DEP NRPA- Individual Permit Attachments

Attachment 1- Activity Description

The Town of Casco owns a modest sized lot located at 18 Mayberry Hill Road, identified on Town tax maps as Map 43, Lot 28. The property has been used and maintained as a public beach/recreation area and boat launch for many years. A portion of the property at the shoreline is a typical sand beach. The area located immediately behind and adjacent to the sand beach is a sparsely vegetated and partially bare eroding soil. With the assistance and recommendations of the Cumberland County Soil & Water Conservation District, a project was undertaken by the Town in 2011/2012 to stabilize the eroding and bare soil by planting grass and other vegetation, and reducing stormwater runoff. However, due to the high intensity and concentrated use of the recreation area, these stabilization efforts have largely failed and soil erosion toward and into the lake continues. This project proposes to re-grade the Town's public beach area adjacent to Pleasant Lake, reestablish grass vegetation on side slopes, establish a primary walking path to the beach area if necessary, place ~~washed sand fill~~ at the primary high-intensity beach use area at the base of the side slopes, and install an approximately 56 foot long retaining wall to provide stabilization of an existing sidewalk and roadway. The proposed project is depicted on the attached plans.

Rev: 4" loam & sod

A lower intensity use area at the westerly end of the property is well stabilized with a good catch of grass vegetation, and this area will be preserved. A picnic/recreation area to the east of the beach has previously been treated with mulch to enhance soil stability. Application of additional mulch within the picnic area is proposed as part of this project.

No grading or fill will occur below the NHWL as proposed in this project. The project will be located entirely less than 75 feet of the NHWL. The removal of a small existing wooden retaining wall located at the shoreline will also be removed. The primary project components are further described as follows:

Regrading- the project proposes to remove soil in order to regrade the site to primarily slope toward the center of the project area in an east-west direction at approximately a 10% grade slope (10:1 H:V) to enable grass sod planting. The site will continue to slope toward the lake as well. Regrading will define the high-intensity public beach use area. The regrading is designed to affect an upland area approximately 70 feet in length (parallel to the shoreline at the proposed retaining wall) by a varying width of approximately 20 feet to 40 feet. These

dimensions vary due to natural shoreline curvature. The total area of regrading is estimated to be approximately 1,750 square feet.

The high-intensity use public beach area will be approximately 30 feet in length and 25 feet in width (~750 square feet), and will be treated with a minimum of 6 inches of washed sand. From the proposed retaining wall, this area will be graded to an approximately 12:1 (H:V) slope, or approximately 8.5% grade slope.

Several past attempts to maintain vegetation in the primary public beach area has proven to be unsuccessful. It is likely that soil compaction and frequent trampling action of the vegetation exceeds the capacity to utilize vegetation as a soil stabilization Best Management Practice (BMP). The proposal to use washed sand embraces this reality and provides a viable alternative. Washed sand that is designed to not erode into the lake will be cleaner than the topsoil that is presently eroding into the lake. Rainwater hitting the sand area should simply absorb into the sand. This proposal converts a chronic soil erosion condition that cannot be mitigated by vegetative growth as a result of use, to a shallower sloping grade with a surface that absorbs rainwater.

Vegetation/ Footpath- The regraded slopes will be vegetated with grass sod to more quickly establish a durable vegetated surface. While recreational use of the grass slopes is expected, it is also anticipated that the grass slopes will not be used as intensely as current conditions. The proposal includes a 6-foot wide footpath extending from the picnic area to the beach area to focus foot traffic onto the footpath and off of the grass slope. If the grass within the footpath fails to persist then the footpath should be mulched to maintain soil stability.

Retaining Wall- To support the grading and beach area slope reduction a low retaining wall is necessary to provide the structural reinforcement required for the adjacent safety fencing, sidewalk, and roadway. The retaining wall is proposed to be constructed with a precast concrete block system and will be approximately 56 feet in length. The wall will be an approximate total height of 3.25 feet, although only approximately 2.5 feet of the wall will be above the proposed finished grade at its maximum height. The base of the wall will be approximately 2 feet above the NHWL elevation, and will be located approximately 18 feet from the NHWL at the closest point. The wall has been designed by a Professional Engineer consistent with manufacturer specifications.

Project Timing: The applicant proposes to construct the project during the early spring of 2022 in order to allow sufficient time for the grass sod to take root before summer usage of the facility occurs.

Attachment 2- Alternatives Analysis

The purpose of the project is to stabilize a chronically eroding area immediately adjacent to Pleasant Lake with a practical solution.

Alternative 1: Do nothing. Soil erosion into Pleasant Lake will continue to occur.

Alternative 2: Propose to plant the area with grass or other vegetation. This alternative would utilize a BMP previously attempted without success. Whereas the beach/recreational area is of such modest size, proposing to plant a natural tree, shrub, and ground cover vegetation buffer is not an option. The recreational area is vital to the Casco community and is a significant resource to the Town. Eliminating the recreational use of this area, in part or in whole, is not possible without a significant community impact. Planting of grass has failed to provide long-term soil stabilization.

Alternative 3: Install riprap on the slope. While installing riprap would likely eliminate the soil erosion problem at the site, this is not a viable option for reasons provided in the 'Alternative 2' discussion above. Riprap would similarly eliminate recreational use of the facility and is not a viable alternative.

Alternative 4: Install a geo-cell soil stabilization grid product and plant grass within the cells. Such products are intended for driveway and parking area applications, or on steep slopes that are not intended for high-intensity recreational use. Such products would not improve the survivability of grass at the facility over existing conditions. Grass would continue to be trampled by facility users and would fail to survive or thrive.

Alternative 5: Plant grass within the shallow sloped high intensity beach use area instead of use of washed sand. This option was considered but was deemed to not be particularly viable; again, due to the high usage that the facility experiences during the growing season. Much of the vegetation would either fail to survive resulting in non-vegetated soils, or the vegetation would otherwise be ineffective at retarding soil erosion.

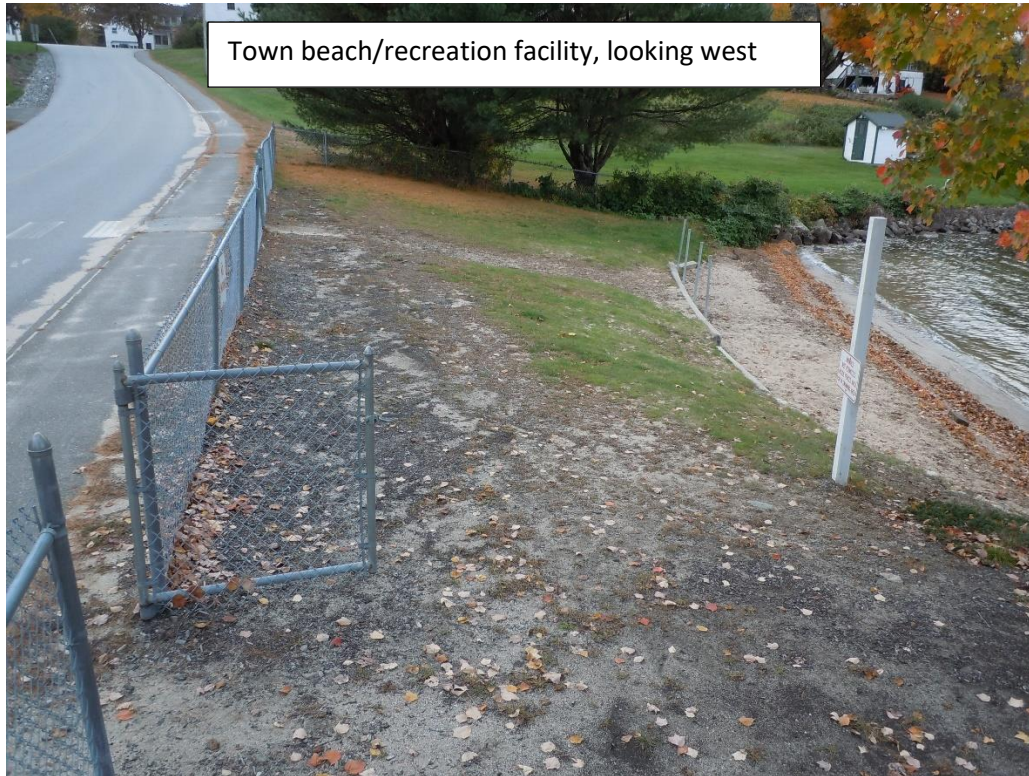
Alternative 6 (4/8/2022): Amanda Pratt, MDEP 319 Program Staff, inspected the site on April 1, 2022, and made several recommendations. Her recommendations include not regrading the site as proposed and placing bark mulch and installing infiltration steps to provide stabilized shoreline access (and to capture sediment and stormwater). Ms. Pratt's recommendations also include construction of terraces and planting of vegetation (e.g. shrubs) behind the terraces, in addition to planting vegetation along the NHWL. A similar alternative was initially discussed with Town officials prior to proceeding with the current application. However, the volume of beach users and the intensity of use on such a modestly sized public beach property precludes the planting of vegetation that reduces the usable area of the property. An initial project at the site included environmentally 'softer' approaches to soil stability, including placement of straw wattles, or similar, at the shoreline edge and various vegetation plantings. These BMP's simply could not survive the intensity of use of the property despite the Town's efforts to maintain

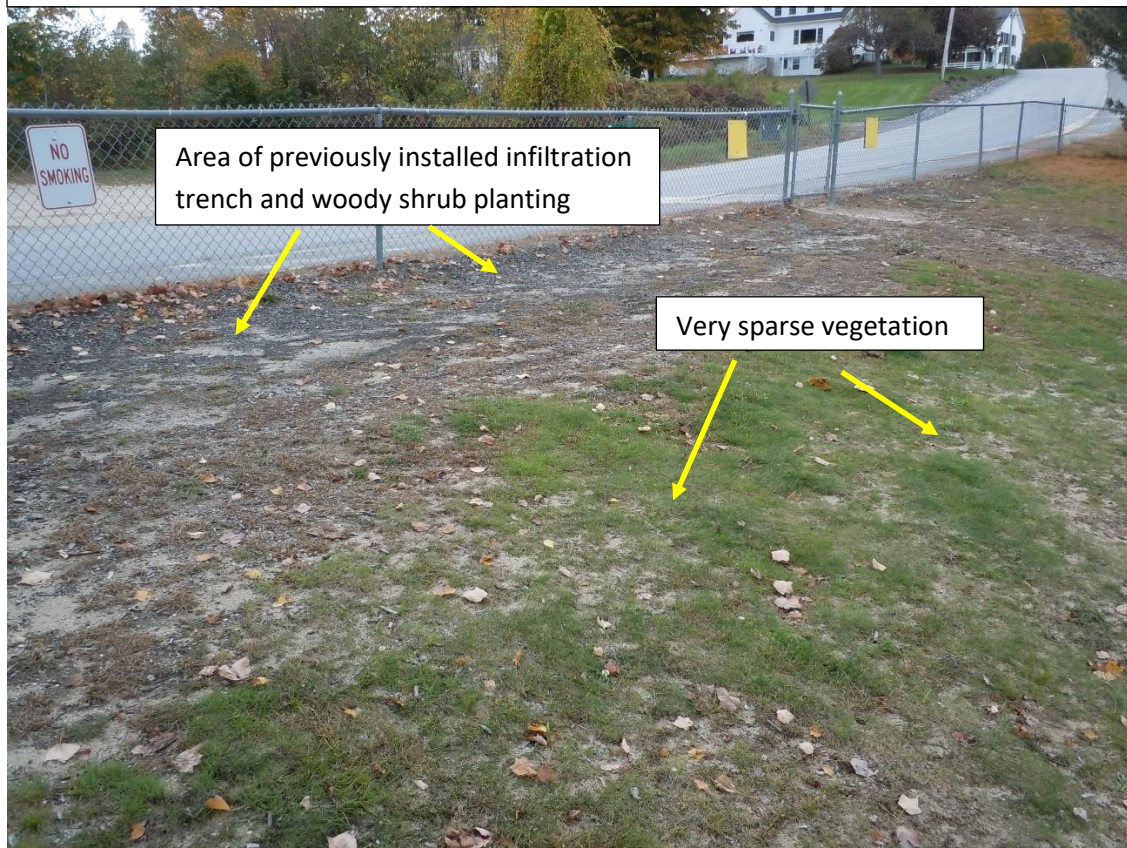
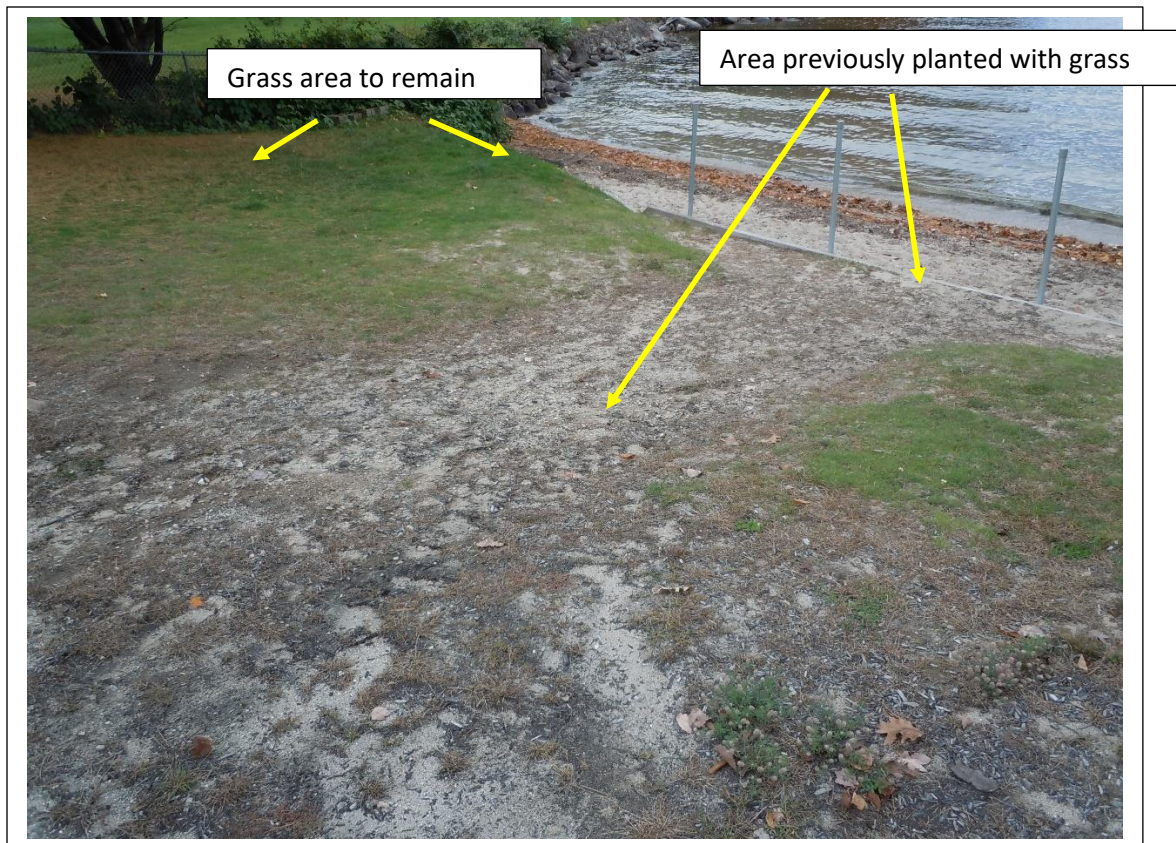
them. Shrubs that had been planted initially were replaced several times with a similar lack of success. Eliminating any portion of the existing property from use is a non-option due to the very small facility size, and regrading a portion of the facility to establish a shallower sloped and broader size primary use area should spread beach users out and reduce the likelihood of a single primary water access point. Per Ms. Pratt's recommendations, we are proposing to include infiltration steps/terracing on the proposed slope leading from the picnic area to the lower area instead of the originally proposed mulched footpath. While effectively there is no watershed that will contribute surface water to the infiltration steps/terraces, the steps or terraces will provide a stable structural surface for foot traffic. The Overview Plan has been modified accordingly.

Attachment 3- Location Map



Attachment 4- Color Photographs





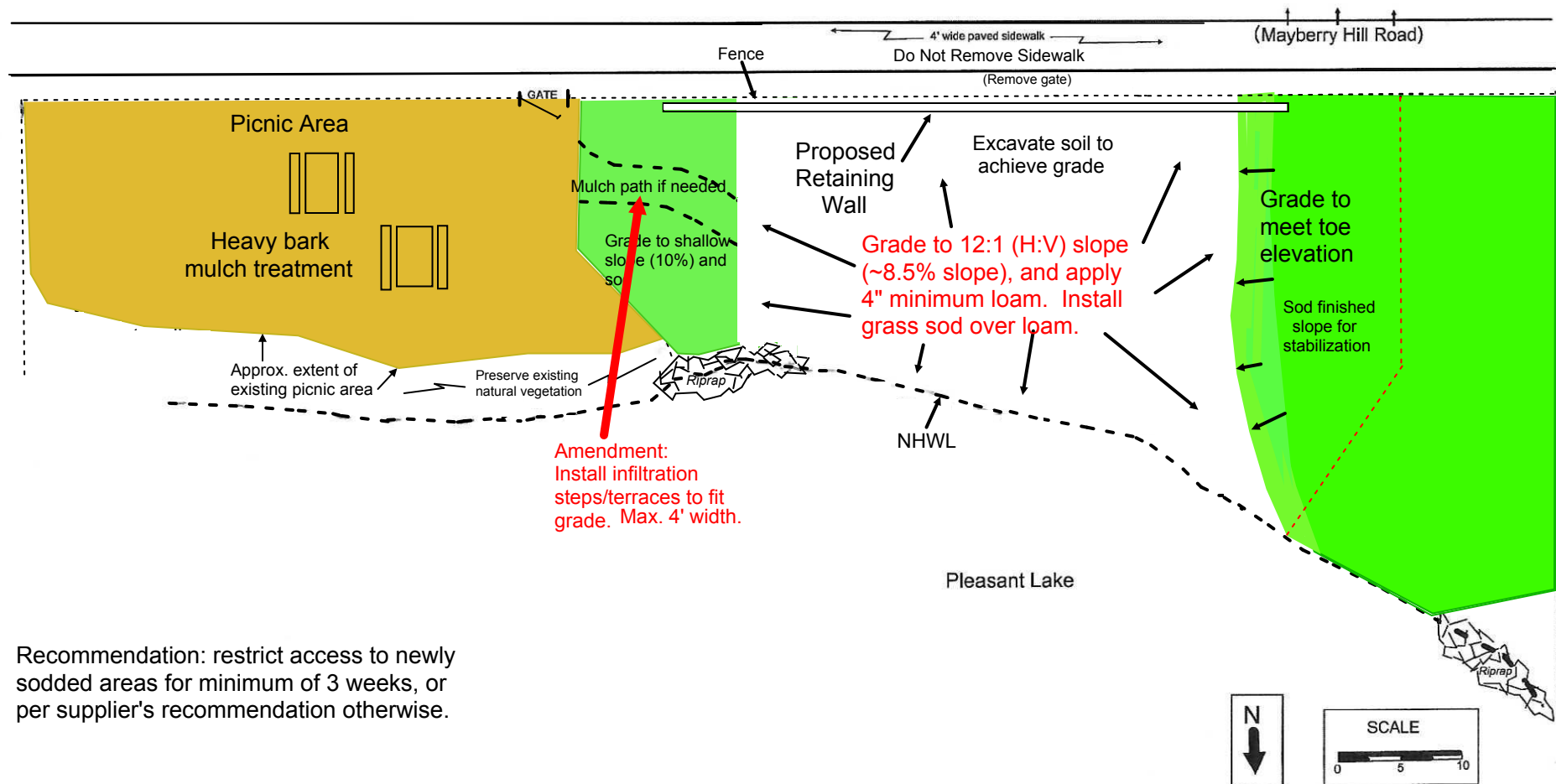


Erosion and sparse vegetation





Attachment 5 & 6- Plans

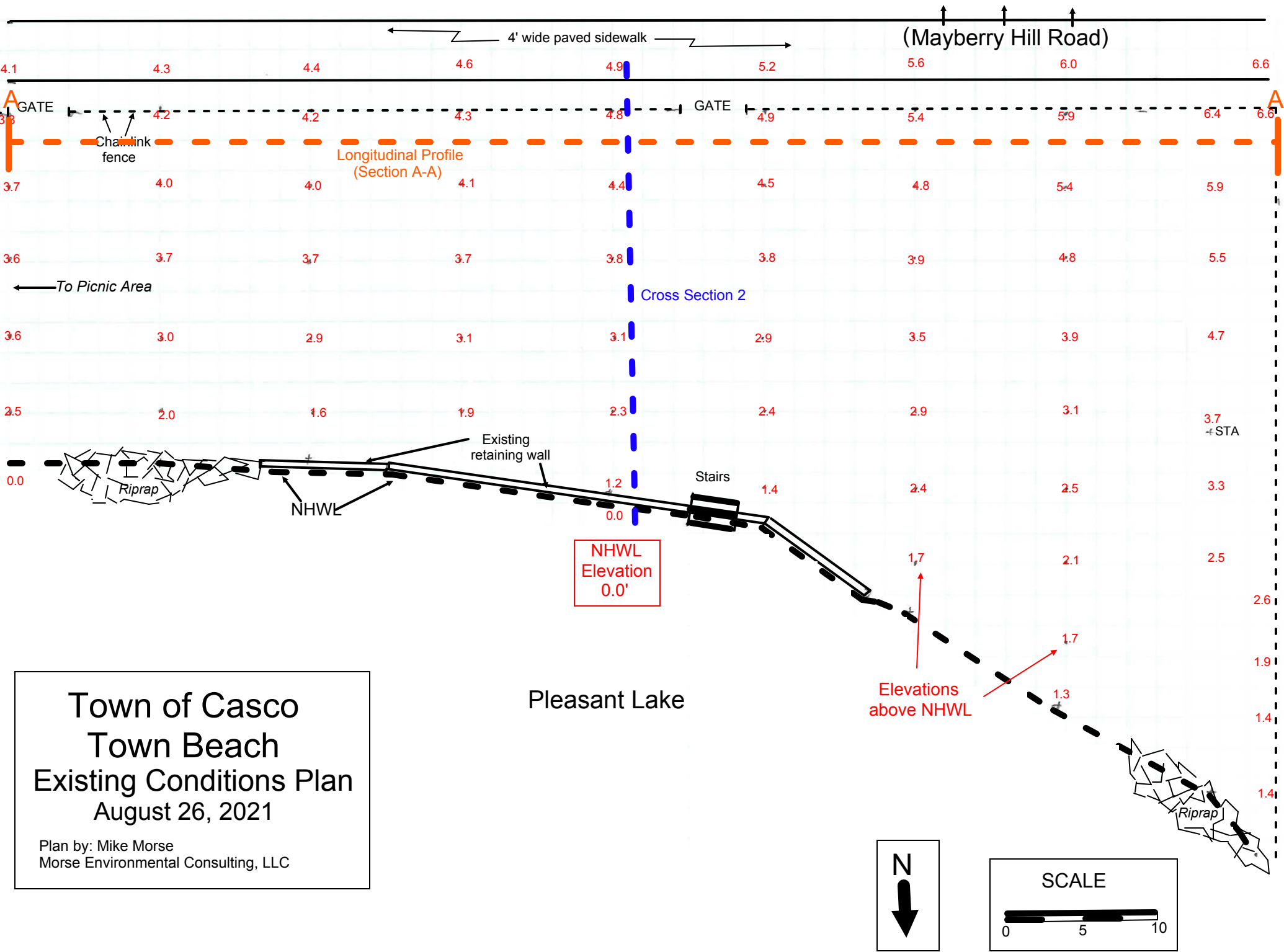


Recommendation: restrict access to newly sodded areas for minimum of 3 weeks, or per supplier's recommendation otherwise.

Town of Casco Town Beach Improvement Overview Plan September 15, 2021

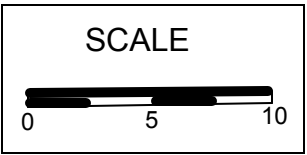
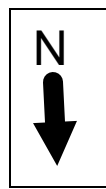
Rev. 4/8/22

Plan drawn by: Mike Morse
Morse Environmental Consulting, LLC

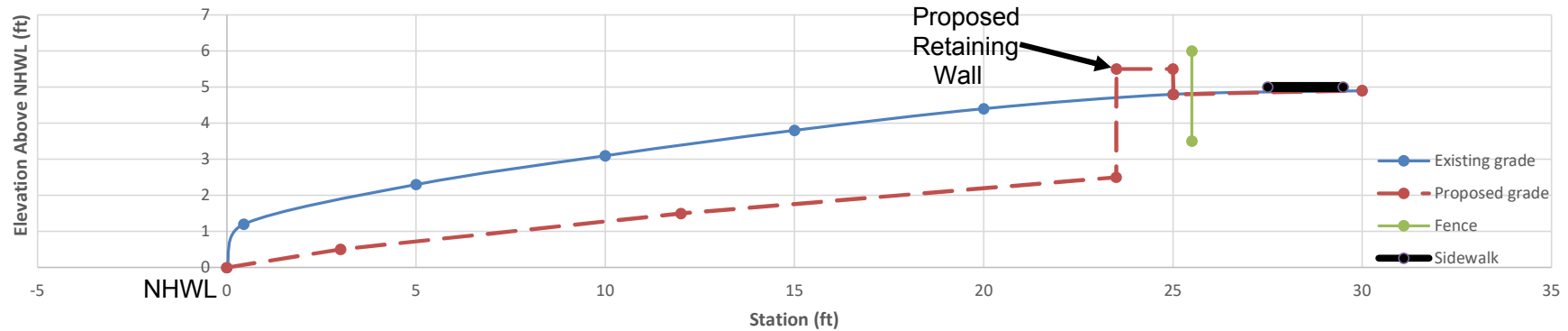


Town of Casco Town Beach Existing Conditions Plan August 26, 2021

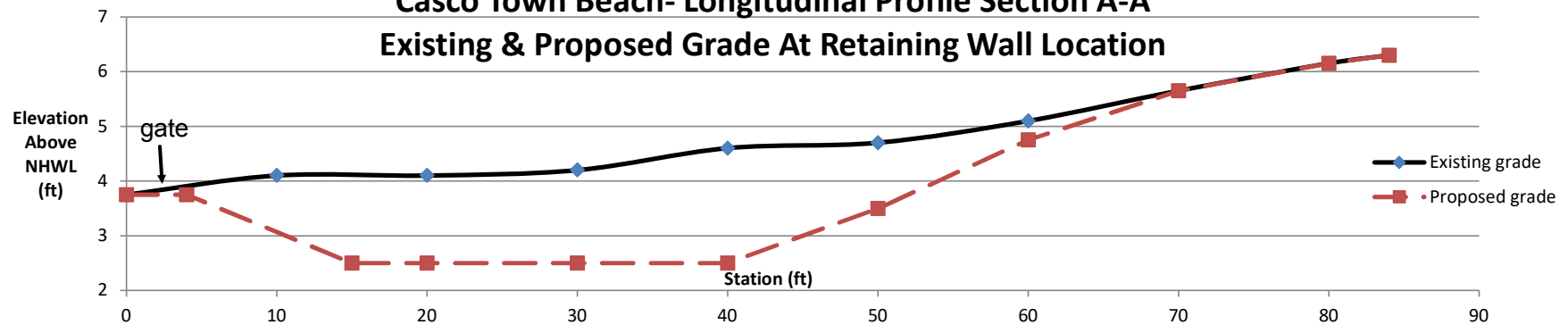
Plan by: Mike Morse
Morse Environmental Consulting, LLC

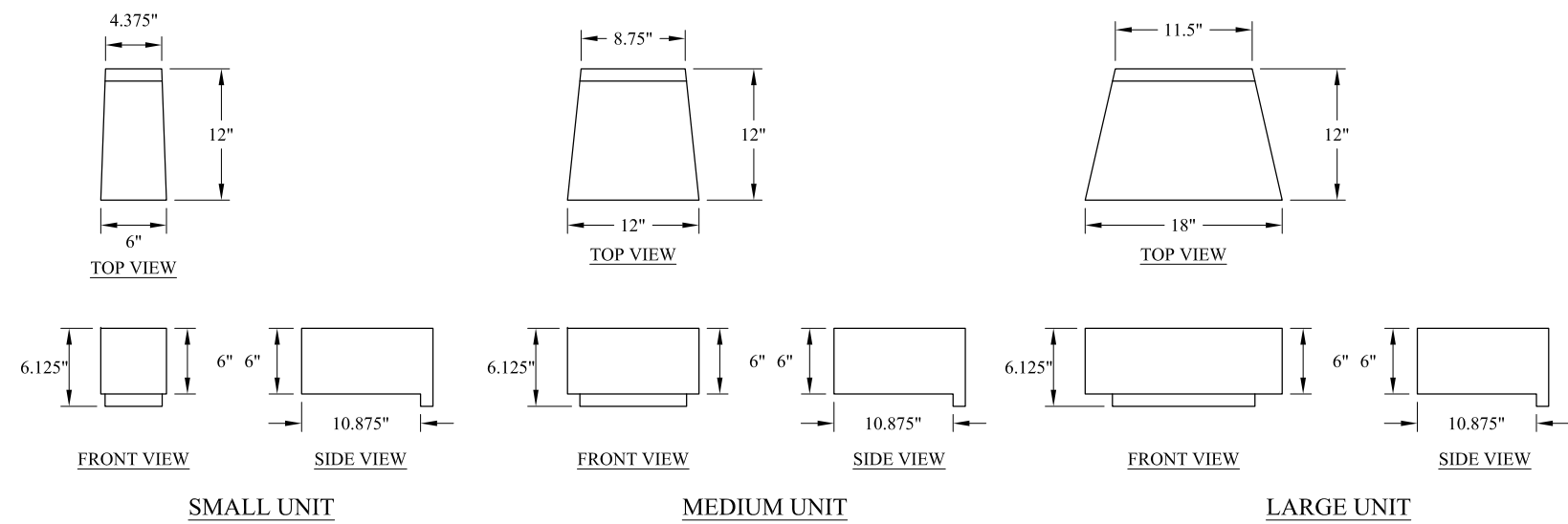


Casco Town Beach- Cross Section 2, Center Project Area Existing & Proposed Grades

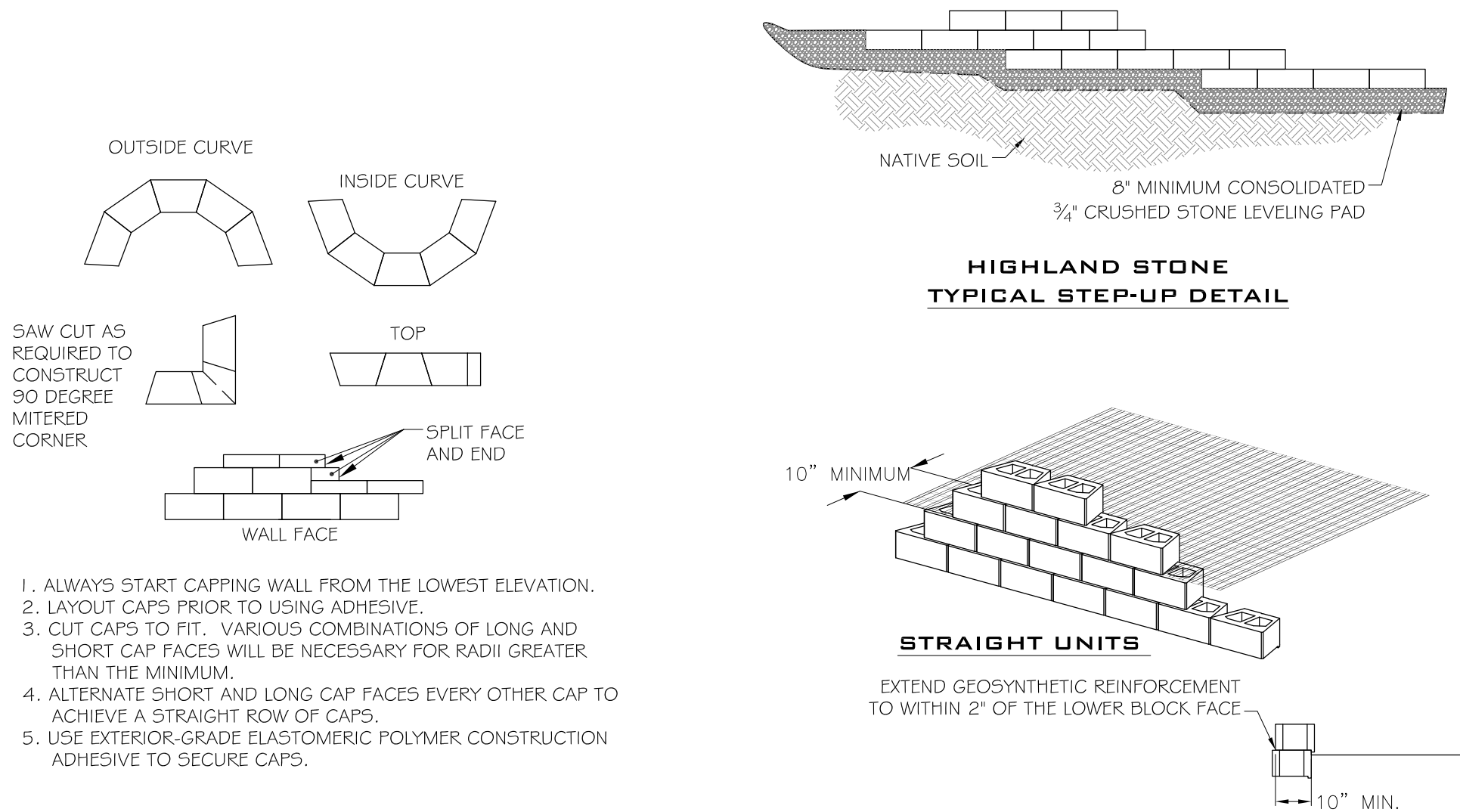


Casco Town Beach- Longitudinal Profile Section A-A Existing & Proposed Grade At Retaining Wall Location



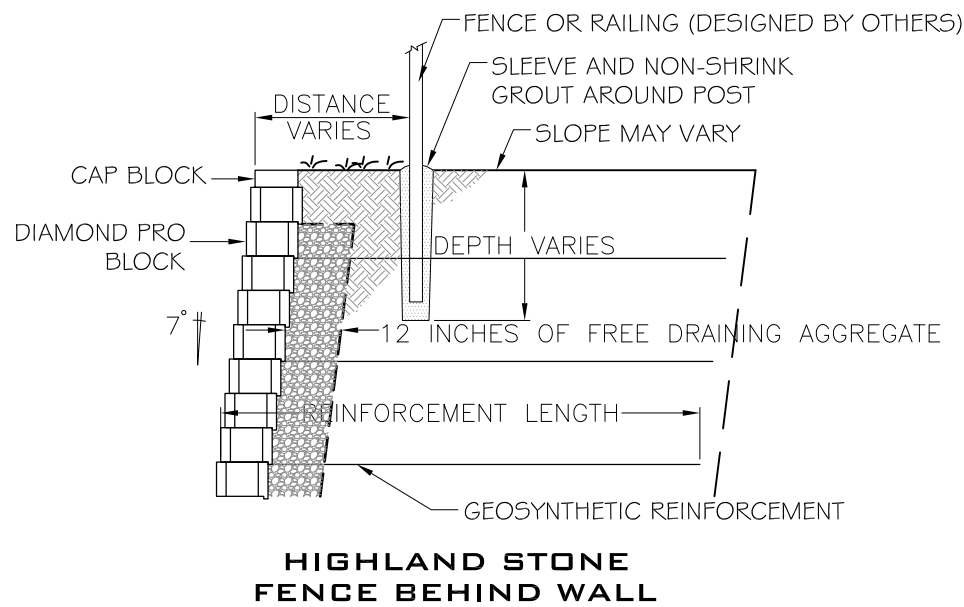


HIGHLAND STONE UNIT DETAILS

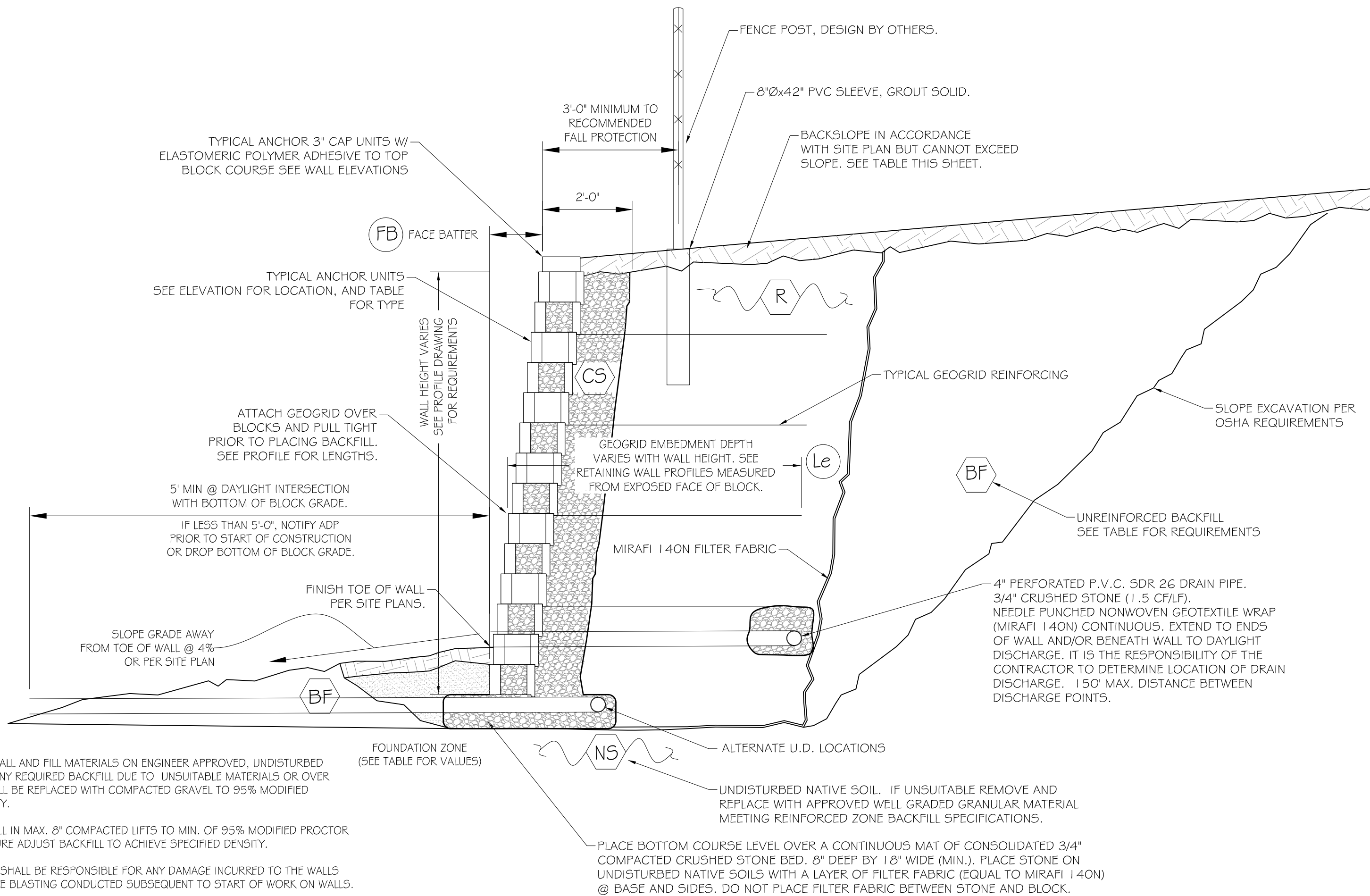


HIGHLAND STONE 3" CAP BLOCK DESIGN DETAILS

HIGHLAND STONE REINFORCEMENT CONNECTION DETAIL



HIGHLAND STONE FENCE BEHIND WALL



NOTES:

1. CONSTRUCT WALL AND FILL MATERIALS ON ENGINEER APPROVED, UNDISTURBED NATIVE SOILS. ANY REQUIRED BACKFILL DUE TO UNSUITABLE MATERIALS OR OVER EXCAVATIONS WILL BE REPLACED WITH COMPACTED GRAVEL TO 95% MODIFIED PROCTOR DENSITY.
2. PLACE BACKFILL IN MAX. 8" COMPACTED LIFTS TO MIN. OF 95% MODIFIED PROCTOR DENSITY. MOISTURE ADJUST BACKFILL TO ACHIEVE SPECIFIED DENSITY.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO THE WALLS FROM ANY ONSITE BLASTING CONDUCTED SUBSEQUENT TO START OF WORK ON WALLS.

TYPICAL ANCHOR WALL SECTION

SCALE: NTS

1. SHOP DRAWING ACTION STAMP:

1.1. THIS IS AN ENGINEERED SHOP DRAWING DESIGN BASED UPON INFORMATION PROVIDED BY OTHERS. THE WALL DESIGN DEPICTED HEREIN SHOULD BE REVIEWED BY THE SITE DESIGNER OR OTHERWISE RESPONSIBLE ENTITY TO VERIFY COMPLIANCE WITH THE GENERAL INTENT OF THE SITE DESIGN WITH RESPECT TO GRADING, WALL ALIGNMENT AND GEOMETRY, WALL STEPS, ETC.
1.2. THIS DESIGN IS BASED UPON INFORMATION PROVIDED BY OTHERS. SHOULD VARIATIONS BE ENCOUNTERED THE CONTRACTOR, SITE DESIGNER OF RECORD, OR OTHER RESPONSIBLE ENTITY SHALL NOTIFY THE OWNER/ENGINEER AND ASSOCIATED DESIGN PARTNERS, INC., (ADP) TO MAKE APPROPRIATE ADJUSTMENTS.

2. WALL DESIGN NOTES:

2.1 THE WALL DESIGN(S) REPRESENTED HEREIN ARE BASED ON THE PROCEDURES DESCRIBED IN THE INDUSTRY STANDARD PUBLICATION NCMA TR127A "DESIGN MANUAL FOR SEGMENTAL RETAINING WALLS, 2ND ED".

2.2 IN ACCORDANCE WITH NCMA TR127A "DESIGN MANUAL FOR SEGMENTAL RETAINING WALLS, 2ND ED" SEC. 5.1.4, EXTERNAL GLOBAL STABILITY HAS NOT BEEN ADDRESSED AS PART OF THIS RETAINING WALL DESIGN.

2.3 THE WALL STABILITY ANALYSES IS BASED ON ANTICIPATED SOIL DESIGN VALUES AS REPRESENTED IN THE TABLE BELOW. THE PROJECT GEOTECHNICAL ENGINEER SHOULD REVIEW THE VALUES REPRESENTED HEREIN, AND NOTIFY ASSOCIATED DESIGN PARTNERS AND/OR THE SITE CONTRACTOR IF MODIFICATIONS TO THE SOIL DESIGN PARAMETERS IS NECESSARY. A GEOTECHNICAL REPORT HAS NOT BEEN PROVIDED AT THIS TIME.

3. FILL SOIL COMPACTION:

3.1. ALL GRANULAR SOIL FILL SHALL BE COMPACTED TO 95% OF THE MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D698 STANDARD PROCTOR.

3.2. STONE IN WALL BASE PAD AND IN FILL LOCATIONS TO BE CONSOLIDATED TO 100% OF DRY RODDED UNIT WEIGHT PER ASTM C-29. ROUNDED ROCK OR PEA STONE IS SPECIFICALLY NOT ALLOWED AT CRUSHED STONE FILL LOCATIONS.

4. GENERAL:

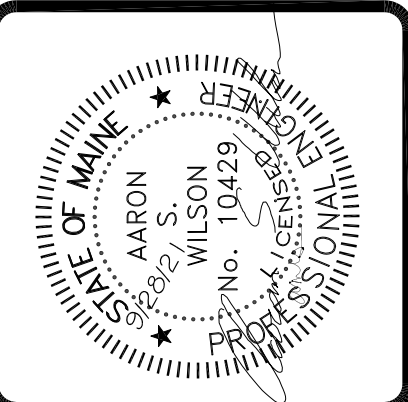
- 4.1. PLACE ANCHOR BLOCKS ON A 8" DEEP BASE FOOTING OF CONSOLIDATED 3/4" CRUSHED STONE. LEAN CONCRETE MAY ALSO BE USED FOR THE BASE FOOTING. IF LEAN CONCRETE IS USED IT SHALL BE PLACED ON 6" OF CRUSHED STONE, WITH SMOOTH FORMED VERTICAL SURFACES, BELOW ANTICIPATED FROST DEPTH.
- 4.3. INSTALL GEOGRID REINFORCING FABRIC AT LOCATIONS AND ELEVATIONS SHOWN ON THE WALL ELEVATION DRAWINGS.
- 4.4. ROLL GEOGRID OUT WITH STRONG FIBER (MACHINE DIRECTION) DIRECTION PERPENDICULAR TO WALL FACE TO EMBEDMENT LENGTH (LE) AS SPECIFIED ON THE PROFILE ELEVATIONS. IMPORTANT: GRID MUST BE LAID SMOOTH, FREE OF WRINKLES, PULLED TAUT AND STAKED PRIOR TO FILL PLACEMENT.
- 4.5. PLACE A MINIMUM OF 6" OF SOIL OVER GRID BEFORE ALLOWING MACHINERY ON THE REINFORCEMENT AREA.
- 4.6. GENERAL SOIL COMPACTION GUIDELINES: SITE EXCAVATION CONTRACTOR IS RESPONSIBLE FOR THE METHODS AND RESULTS OF THE COMPACTION PROCESS. THE FOLLOWING IS A SUGGESTED METHOD OF INSTALLATION.
4.6.1. PLACE SOIL IN MAXIMUM 8" LOOSE LIFT THICKNESS AND COMPACT TO 95% OF THE MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D-698, STANDARD PROCTOR. USE ONLY HAND OPERATED ROLLER OR PLATE COMPACTORS WITHIN 5' OF THE BACK OF WALLS FOR LESS THAN 15' HIGH AND WITHIN 10' OF WALLS GREATER THAN 15' HIGH FOLLOW CONTRACT DOCUMENT COMPACTION SPECIFICATION.
- 4.7. LAY SUCCESSIVE COURSES OF BLOCK AND LAYERS OF GEOGRID ACCORDING TO PLANS AND PROFILE ELEVATIONS.
- 4.8. NOTIFY ENGINEER IMMEDIATELY IF ACTUAL SITE GRADES/CONTOURS DIFFER BY MORE THAN 1'-0" FROM THOSE INDICATED ON THESE SITE PLANS. VERTICAL AND HORIZONTAL DIMENSIONS AND THIS SPECIFIC WALL(S) DESIGN IS BASED UPON APPROXIMATE SITE GRADES TAKEN FROM SITE PLANS PREPARED BY OTHERS. IT IS COMMON FOR ACTUAL GRADES TO DIFFER FROM THOSE AS REPRESENTED BY CONTOURS OR SPOT GRADES SHOWN ON SITE DESIGN PLANS. VARIATIONS OF MORE THAN 1'-0" WILL EFFECT THE DESIGN OF THIS WALL. (SEE NOTE #1.2)
- 4.9. ALL SOIL TESTING TO FOLLOW CONTRACT SPECIFICATIONS. PROVIDE SEIVE ANALYSIS, SHEAR TEST, AND COMPACTION TEST REPORTS TO ASSOCIATED DESIGN PARTNERS INC. AND THE OWNER.

PROJECT SPECIFIC DESIGN VALUES

DETAIL REFERENCE LETTER	DESIGN VALUES DESCRIPTION	E/P A/C	VALUE	UNITS	CONSTRUCTION COMPLIANCE CONFIRMED
NS	NATIVE SOIL SUBGRADE ALLOWABLE BEARING CAPACITY	E/A	2000	P.S.F.	
	NATIVE SOIL SUBGRADE INTERNAL FRICTION ANGLE	E/A	28°	DEGREES	
	NATIVE SOIL SUBGRADE UNIT WEIGHT TOTAL ±5 P.C.F.	E/A	120	P.C.F.	
	NATIVE SOIL SUBGRADE COHESION	E/A	N/A	P.C.F.	
R	REINFORCED FILL MATERIAL INTERNAL FRICTION ANGLE	P	32	DEGREES	
	REINFORCED FILL MATERIAL UNIT WEIGHT TOTAL ±5 P.C.F.	P	130	P.C.F.	
	REINFORCED FILL MATERIAL MAXIMUM PARTICLE SIZE	P	4	INCHES	
	REINFORCED FILL MATERIAL MAXIMUM FINES PASSING 200 SIEVE	P	0-7	PERCENT	
BF	UNREINFORCED BACKFILL MATERIAL INTERNAL FRICTION ANGLE	P	30	DEGREES	
	UNREINFORCED BACKFILL UNIT WEIGHT	P	130	P.C.F.	
	UNREINFORCED BACKFILL MATERIAL MAXIMUM PARTICAL SIZE	P	6	INCHES	
CS	CRUSHED STONE UNIT FILL MEDIAN PARTICLE SIZE	P	3/4	INCHES	MDOT 703.12
	TOP OF WALL MAXIMUM BACKSLOPE ANGLE	P	5	DEGREES	
FB	FACE BATTER	P	7	DEGREES	
K	SIZE / TYPE OF UNITS	P	HIGHLAND	BLOCK	

LEGEND

E - EXISTING CONDITION OR VALUE
P - PROPOSED CONDITION OR VALUE
A - ASSUMED VALUE BASED UPON ANTICIPATED SITE CONDITIONS
D - DERIVED VALUE GIVEN BY OTHERS BASED UPON EXPLORATION, TESTING, OR OBSERVATION
PCF - POUNDS PER CUBIC FOOT
PSF - POUNDS PER SQUARE FOOT



ASSOCIATED DESIGN PARTNERS INC.

Office: (207) 878-1751
Fax: (207) 878-1788
E-Mail: adp@adpengineering.com

THIS DRAWING, DESIGN AND ELECTRONIC FILE ARE THE PROPERTY OF ASSOCIATED DESIGN PARTNERS, INC. THE REPRODUCTION, COPYING OR ANY OTHER USE OF THIS DOCUMENT WITHOUT WRITTEN CONSENT IS PROHIBITED.

PROJECT: CASCO TOWN BEACH, MSE

CASCO, ME
FOR: GENEST CONCRETE

SHEET TITLE:
ANCHOR WALL SECTION, DESIGN VALUES
CONSTRUCTION NOTES, & DETAILS

REVISIONS	DESCRIPTION	DATE	BY	No.

DATE : 9-29-21

SCALE : AS NOTED

DESIGN BY: ASW

DRAWN BY: RSC

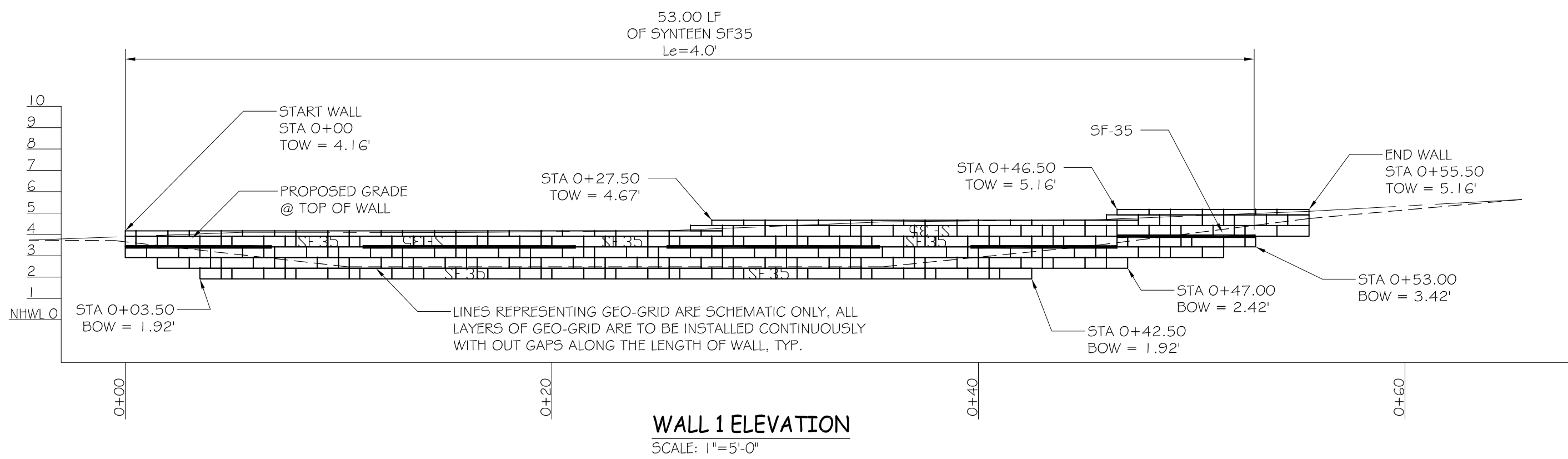
FILE #: 21291-RT.DWG

PROJECT NUMBER:

21291

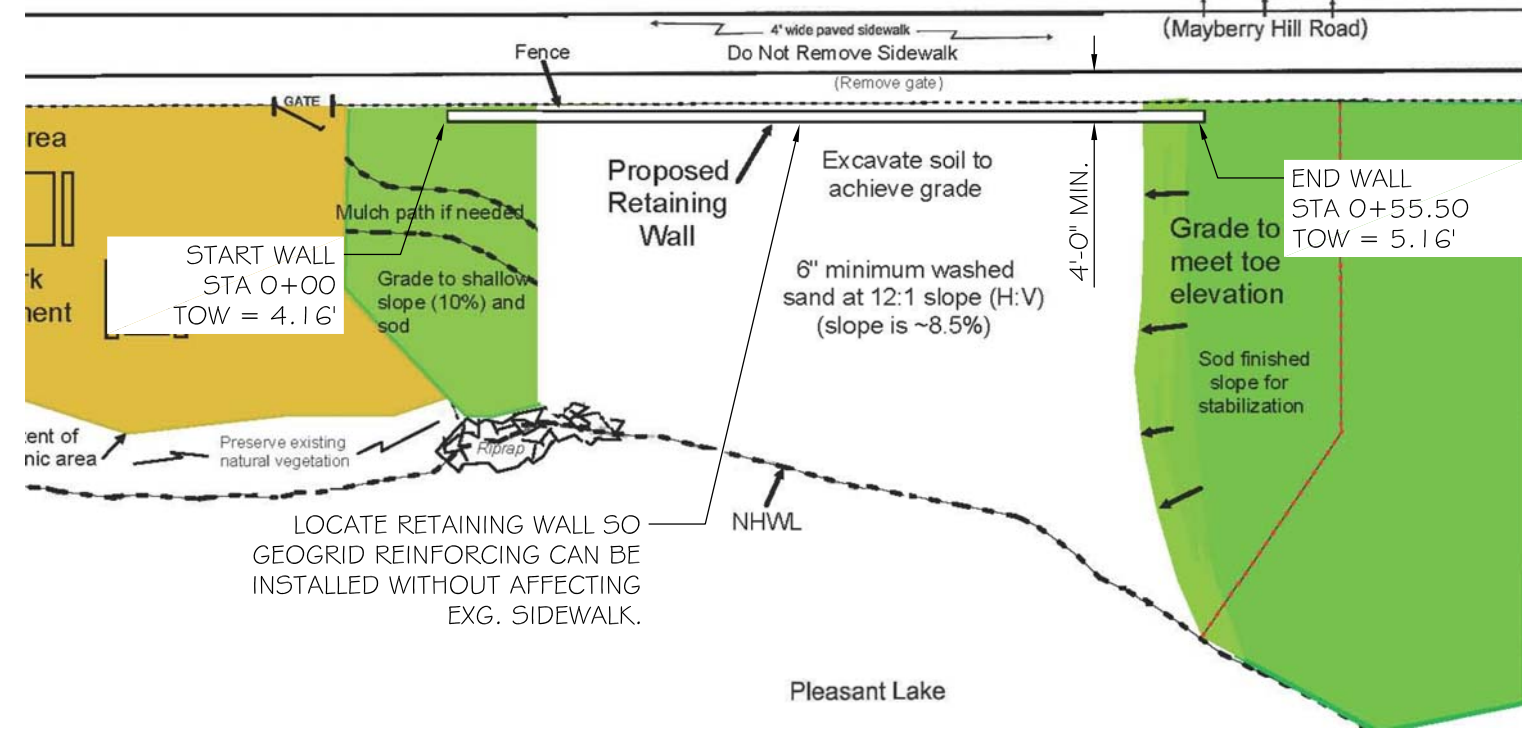
SHEET NO:

RT1



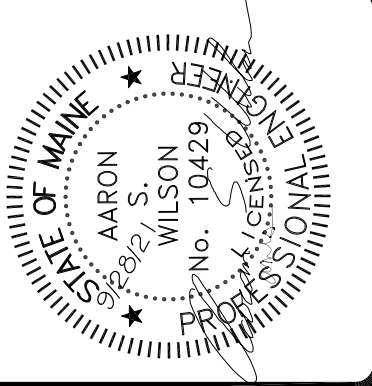
WALL 1 TOTALS

46 - 3' CAPS
113 SF (76 SETS) - HIGHLAND UNITS
25 - 5Y OF SYNTEEN SF35



SITE PLAN GENERATED FROM DIGITAL FILE. SCALE IS APPROXIMATE AND USER IS CAUTIONED AGAINST SCALING ITEMS FROM PLAN.

PARTIAL SITE PLAN EXTRACTED FROM PDF FILES PROVIDED BY MORSE ENVIRONMENTAL CONSULTING LLC. TOWN OF CASCO TOWN BEACH IMPROVEMENT OVERVIEW PLAN, DATED 09/15/21. PLAN ASSUMED TO BE MOST CURRENT. ADP DOES NOT WARRANT, GUARANTEE, OR REPRESENT IN ANY WAY THAT THIS SITE PLAN, PREPARED AND PROVIDED BY OTHERS, IS CORRECT OR ACCURATE. CONTRACTOR SHALL FIELD VERIFY EXISTING GRADES AND CONDITIONS SHOWN ON THIS PLAN PRIOR TO START OF CONSTRUCTION. CONTACT ASSOCIATED DESIGN PARTNERS, INC. IF DESCREPENCIES ARE ENCOUNTERED.



ASSOCIATED DESIGN
PARTNERS INC.

Office: (207) 878-1751
Fax: (207) 878-1788
E-Mail: odp@adpengineering.com

THIS DRAWING, DESIGN AND ELECTRONIC FILE ARE THE PROPERTY OF ASSOCIATED DESIGN PARTNERS, INC. THE REPRODUCTION, COPYING OR ANY OTHER USE OF THIS DOCUMENT WITHOUT WRITTEN CONSENT IS PROHIBITED.

PROJECT: CASCO TOWN BEACH, MSE CASCO, ME
FOR: GENEST CONCRETE

SHEET TITLE: ANCHOR WALL ELEVATION & PARTIAL SITE PLAN

REVISIONS	DATE
DESCRIPTION	
No.	BY
1	AS
2	AS
3	AS
4	AS

DATE : 9-29-21
SCALE : AS NOTED
DESIGN BY: ASW
DRAWN BY: RSC
FILE #: 21291-RTDWG
PROJECT NUMBER:
21291
SHEET NO:
RT2



MSE CALCULATIONS SHOP DRAWING SUBMITTAL
FOR
CASCO TOWN BEACH
MSE RETAINING WALL
CASCO, ME

SUBMITTED ON September 28, 2021

BY

Genest Concrete

45 Enterprise Dr

Windham, ME

207-892-2100

Contact: John Jacques

PREPARED BY:

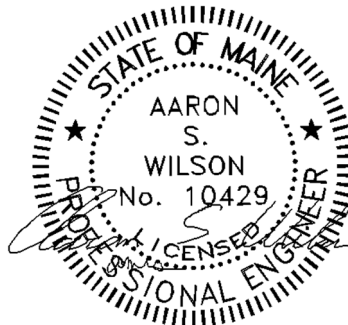
ASSOCIATED DESIGN PARTNERS INC.

80 LEIGHTON ROAD

FALMOUTH, MAINE 04105

(207) 878-1751 FAX (207) 878-1788

ADP# 21291



CALCULATIONS

CASCO TOWN BEACH ANCHOR DIAMOND PRO MSE RETAINING WALL CASCO, MAINE

- THESE CALCULATIONS ARE PROVIDED FOR AN "ANCHOR WALL SYSTEMS" MECHANICALLY STABILIZED EARTH RETAINING STRUCTURE FOR THE ABOVE REFERENCED PROJECT. THE ATTACHED ANALYSIS IS BASED UPON THE SITE CIVIL CONTRACT DOCUMENTS. SHOULD ANY VARIATIONS OR DISCREPANCIES IN THOSE DOCUMENTS BE IN EXISTENCE, OUR CALCULATIONS AND SUBMITTAL MAY CHANGE ACCORDINGLY. ASSOCIATED DESIGN PARTNERS, INC. MAKES NO CERTIFICATION TO THE ACCURACY OR COMPLETENESS OF CONTRACT DOCUMENTS PROVIDED BY OTHERS. PRESENTATION OF THIS SUBMITTAL IN NO WAY IMPLIES ACCEPTABILITY OR ADEQUACY OF THE COMPONENTS OR SYSTEMS USED WITHIN THE OVERALL STRUCTURE FOR PERFORMANCE OR CAPACITY OTHER THAN THAT, WHICH IS SPECIFICALLY REPRESENTED ON THE DRAWINGS AND CALCULATIONS HEREIN.
- THE WALL HAS BEEN DESIGNED FOR SUPPORT OF A UNIFORMLY DISTRIBUTED LIVE LOAD SURCHARGE OF 250PSF AT SIDEWALK AREAS ABOVE THE WALLS.
- FORCES ASSOCIATED WITH SNOW REMOVAL OPERATIONS ARE OUTSIDE THE SCOPE THIS WALL DESIGN.
- THE ATTACHED COMPUTER CALCULATIONS ARE BASED UPON THE MODIFIED COULOMB METHOD WITH SEISMIC PROVISIONS CONSIDERED. THIS ANALYSIS ASSUMES $A = 0.08$
- THIS ANALYSIS PROVIDES REASONABLE RESULTS FOR THE WALL DESIGN SCENARIOS AND GEOMETRY DEPICTED ON THE CIVIL SITE CONTRACT DRAWINGS. WALL DISPLACEMENT ANALYSIS, GLOBAL INSTABILITY, AND SOIL LIQUIFACTION ASSOCIATED WITH SEISMIC ANALYSIS ARE BEYOND THE SCOPE OF THIS ANALYSIS.



AnchorWall®

7.0 SOFTWARE

© 2020 Callide Technologies Inc.



Project Design Inputs

Design Standard National Concrete Masonry Association 3rd Edition

Minimum Factors of Safety

Conventional

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.50	FSSL	Internal Sliding	1.50		
FSbc	Bearing Capacity	2.00	FSsc	Shear Capacity	1.50		
FSot	Overturning	1.50					

MultiDepth

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.50					
FSbc	Bearing Capacity	2.00					
FSSH	Interface Shear	1.50					
FSot	Overturning	1.50					

No Fines

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.50					
FSbc	Bearing Capacity	2.00					
FSot	Overturning	1.50					

Reinforced

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.50	FSSL	Internal Sliding	1.50	FScs	Connection Strength 1.50
FSbc	Bearing Capacity	2.00	FSpO	Pullout	1.50	FSsc	Facing Shear 1.50
FSct	Crest Toppling	1.50	FSto	Tensile Overstress	1.50		
FSot	Overturning	1.50					

Seismic

Conventional

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.10	FSSL	Internal Sliding	1.10		
FSbc	Bearing Capacity	1.10	FSsc	Shear Capacity	1.10		
FSot	Overturning	1.10					

MultiDepth

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.10					
FSbc	Bearing Capacity	1.10					
FSSH	Interface Shear	1.50					
FSot	Overturning	1.10					

No Fines

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.10					
FSbc	Bearing Capacity	1.50					
FSot	Overturning	1.10					

Reinforced

External		Value	Internal		Value	Facing	Value
FSSL	Base Sliding	1.10	FSSL	Internal Sliding	1.10	FScs	Connection Strength 1.10
FSbc	Bearing Capacity	1.50	FSpO	Pullout	1.10	FSsc	Facing Shear 1.10
FSct	Crest Toppling	1.10	FSto	Tensile Overstress	1.10		
FSot	Overturning	1.50					

Design Factors

Term	Description	Minimum (as appl.)	Maximum (as appl.)
RC	Reinforced coverage ratio	1.00	0.00

Selected Facing Unit

Licenser/Product Line:	Anchor Wall Systems, Inc.		
Name:	Highland Stone		
Facing Height	Hu	0.50 ft	
Facing Width	Lu	1.50 ft	
Facing Depth	Wu	1.00 ft	
Facing Weight	Xu	120 lb/ft ³	
Center of Gravity	Gu	0.50 ft	
Setback	Δu	0.09 ft	
Batter	ω	10.60 °	
Cap Height	Hcu	0.25 ft	
Initial Shear Capacity	au	584.01 lb/ft	
Apparent Shear Angle	λu	46.00 °	
Maximum Shear Capacity	Vu(max)	2150.01 lb/ft	

Selected Reinforcement Types**Reinforcements**

SF35 - Synteen Geogrid SF35	Supplier: Synteen Technical Fabrics, Inc., Fill Type: Clays and Silts						
Tult	3,436.09 lb/ft	RFcr	1.54	RFd	1.10	LTDS	1,878.14 lb/ft
RFid	1.08	Cds	0.80	Ci	0.80		

Connection/Shear Properties

acs1	410.00 lb/ft	IP-1	2,000.00 lb/ft	acs2	658.00 lb/ft	IP-2	2,000.00 lb/ft
acs max	916.00 lb/ft	au	584.00 lb/ft	λu	46.00 lb/ft	Vu(max)	2,150.00 lb/ft

Selected Soil Types

Soil Zone	Soil Type	Friction Angle φ	In Situ	
			Density γ [lb/ft ³]	Cohesion Cf [lb/ft ²]
Infill (i)	SW	32°	130.00	n/a
Retained (r)	SW	30°	125.00	n/a
Foundation (f)	SC	28°	120.00	0.00
Base (b)	GW	34°	105.00	n/a
Drainage (d)	GP	38°	125.00	n/a

Soil Glossary

CH:	Inorganic clays, high plasticity
CL:	Inorganic clays, low to medium plasticity, gravelly, sandy, silty, lean clays
GC:	Clayey gravels, poorly graded gravel-sand-clay mixtures
GM:	Silty gravels, poorly graded gravel-sand-silt mixtures
GP:	1/2"-3/4" clean crushed stone or crushed gravel
GW:	Well-graded gravels, gravel-sand. Little or no fines.
MH:	Inorganic clayey silts, elastic silts
ML:	Inorganic silts, very fine sands, silty or clayey, slight plasticity
SC:	Clayey sands, poorly graded sand-clay mixtures
SM:	Silty sands, poorly graded sand-silt mixtures
SP:	Poorly-graded sands, gravelly sands. Little or no fines.
SW:	Well-graded sands, gravelly sands. Little or no fines.

Section Geometry

Reinforcement Details

Section	Course	Length [ft]	Area [ft²]	Reinforcement
1	3	4.00	45.00	SF35 - Synteen Geogrid SF35

Analysis Summary

Lowest Values - Reinforced

Static Analysis

Test	Description	Section	Layer/ Course	Minimum Requirement	Result	Status
FSSl	Base Sliding	1		1.50	7.83	Pass
FSbc	Bearing Capacity	1		2.00	14.43	Pass
FSct	Crest Toppling	1	3	1.50	18.11	Pass
FSot	Overturning	1		1.50	37.91	Pass
FSSl	Internal Sliding	1	1	1.50	53.89	Pass
FSpO	Pullout	1	1	1.50	3.57	Pass
FSto	Tensile Overstress	1	1	1.50	22.35	Pass
FScs	Connection Strength	1	1	1.50	5.06	Pass
RsBottom	Max. multiple of Hu at bottom	1		0.0000	3.0000	Pass
RsTop	Max. multiple of Hu at top	1		0.0000	2.0000	Pass
La	Min. Anchorage Length	1		1.0000	2.1427	Pass
L/H Ratio	Min. L/H Ratio	1		0.6000	1.6000	Pass
L	Min. Reinforcement Length	1		4.0000	4.0000	Pass

Seismic Analysis

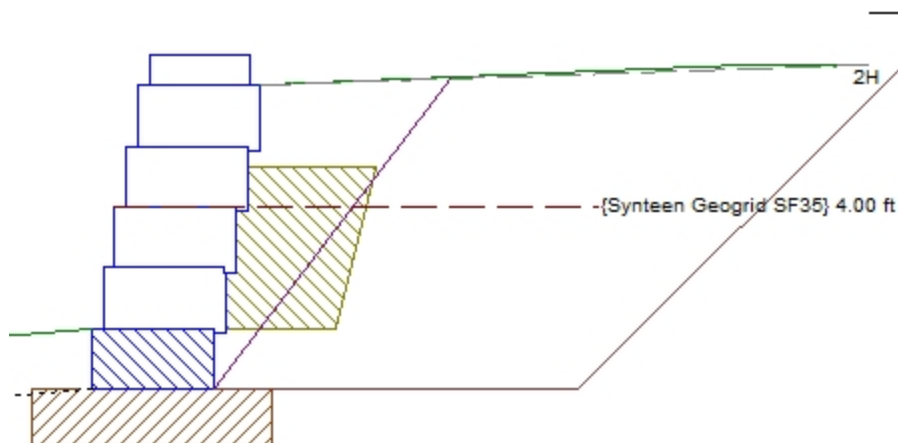
Test	Description	Section	Layer/ Course	Minimum Requirement	Result	Status
FSSl	Base Sliding	1		1.10	6.93	Pass
FSbc	Bearing Capacity	1		1.50	14.42	Pass
FSct	Crest Toppling	1	3	1.10	6.64	Pass
FSot	Overturning	1		1.50	31.90	Pass
FSSl	Internal Sliding	1	1	1.10	43.22	Pass
FSpO	Pullout	1	1	1.10	2.07	Pass
FSto	Tensile Overstress	1	1	1.10	20.00	Pass
FScs	Connection Strength	1	1	1.10	2.94	Pass

Below Standard Values

None

Section 1 Details

Section 1 Cross-section



Section 1 Cross-section Details

Upper Slope Angle	β	2.50 °
Crest Offset		4.00 ft
Live Load	q_l	5 lb/ft ²
Live Offset	q_{lofs}	250.00 ft
Dead Load	q_d	0 lb/ft ²
Dead Offset	q_{dofs}	0.00 ft
Peak Acceleration	A_s	0.08
Top of Section		2.75 ft
Bottom Grade		0.50 ft
Base of Section		0.00 ft
Design Height	H	2.50 ft
Embedment Depth	H_{emb}	0.50 ft

* Analysis includes Vertical Forces

* Embedment is included in Bearing Capacity

Empirical Checks

Check	Description	Min. Requirement	Result	Status
Hemb	Minimum Embedment %	10.0000	25.0000	Pass
L	Min. Reinforcement Length	4.0000	4.0000	Pass
L/H Ratio	Min. L/H Ratio	0.6000	1.6000	Pass
La	Min. Anchorage Length	1.0000	2.1427	Pass
MinHemb	Minimum Embedment	6.0000	6.0000	Pass
RsBottom	Max. multiple of H_u at bottom	0.0000	3.0000	Pass
RsTop	Max. multiple of H_u at top	0.0000	2.0000	Pass

External Checks

Static

Check	Description	Min. Requirement	Result	Status
FSbc	Bearing Capacity	2.00	14.43	Pass
FSct	Crest Toppling	1.50	18.11	Pass
FSot	Overturning	1.50	37.91	Pass
Fssl	Base Sliding	1.50	7.83	Pass

Seismic

FSbc	Bearing Capacity	1.50	14.42	Pass
FSct	Crest Toppling	1.10	6.64	Pass
FSot	Overturning	1.50	31.90	Pass
Fssl	Base Sliding	1.10	6.93	Pass

Internal and Local Checks

Static

Layer	Elevation (ft)	FScs	FSpo	FSsl	FSto
1	1.50	5.06	3.57	53.89	22.35

Seismic

Layer	Elevation (ft)	FScs	FSpo	FSsl	FSto
1	1.50	2.94	2.07	43.22	20.00

Static Calculations**General Equations**

Elevation of influence of live load	Eqlinfl	0.00 ft	Eq. 7-93
Elevation of influence of dead load	Eqdinfl	2.50 ft	Eq. 7-94
External interface friction angle	δ_e	30.00 °	Eq. 7-2
Internal interface friction angle	δ_i	21.33 °	Eq. 7-44
External failure plane	α_e	50.68 °	Eq. 5-5
Internal failure plane	α_i	52.81 °	Eq. 7-50
Width of reinforced zone	L'	3.00 ft	Eq. 7-3
Increase in width of reinforced zone due to β	L"	0.02 ft	Eq. 7-4
Increase in height due to backslope	h	0.13 ft	Eq. 7-5
Increase in height due to backslope at L β	hmax	0.25 ft	Eq. 7-6
Maximum height of slope influence	hmaxint	0.22 ft	Eq. 7-45
Increase in height due to backslope	hs	0.17 ft	Eq. 7-7
Equivalent slope at back of rein. zone	β_{ext}	0.93 °	Eq. 7-9
Height of back of wall for ext. stability	Hext	2.63 ft	Eq. 7-10
Horizontal width of rein. zone at backslope	L β	3.02 ft	Eq. 7-11
External live load reduction factor	qlfactor	1.000	Eq.
External dead load reduction factor	qdfactor	1.000	Eq.
External active earth pressure	Kaext	0.226	Eq. 7-1
Internal active earth pressure	Kaint	0.211	Eq. 7-43
Height above rein. area at int. failure plane	hint	0.06 ft	Eq. 7-26
Horz. influence distance	dint	1.48 ft	Eq. 7-27
Distance dead load applied for broken back	L β qd	3.02 ft	Eq. 7-29
Earth pressure from soil weight	Ps	97.67 lb/ft	Eq. 7-12
Force of uniform surcharge	Pq	0.00 lb/ft	Eq. 7-13
Horz. component of Ps	PsH	92.13 lb/ft	Eq. 7-14
Horz. force of dead load surcharge	PqdH	0.00 lb/ft	Eq. 7-15
Horz. force of live load surcharge	PqlH	0.00 lb/ft	Eq. 7-16
Horz. component of active earth force	PaH	92.13 lb/ft	Eq. 7-17
Resisting moment arm for PsH	Ys	0.88 ft	Eq. 7-18
Resisting moment arm for PqH	Yq	1.32 ft	Eq. 7-19
Vert. component of Ps	PsV	32.44 lb/ft	Eq. 7-20
Vert. force of dead load surcharge	PqdV	0.00 lb/ft	Eq. 7-21
Vert. force of live load surcharge	PqlV	0.00 lb/ft	Eq. 7-22
Vert. component of active earth force	PaV	32.44 lb/ft	Eq. 7-23
Resisting moment arm for PsV	Xs	4.16 ft	Eq. 7-24
Resisting moment arm for PqV	Xq	4.25 ft	Eq. 7-25

Base Sliding

Dead load over reinforced zone	WGTDl	0.00 lb/ft	Eq.
Weight of reinforced mass	Wri	1300.00 lb/ft	Eq. 7-30
Weight of soil above wall	Wr β	24.81 lb/ft	Eq. 7-31
Base sliding resistance	Rs	721.66 lb/ft	Eq. 7-32
Base sliding	FSsl	7.833	Eq. 7-33

Overturning

Dead load over reinforced zone	WGTDl	0.00 lb/ft	Eq.
Weight of reinforced mass	Wri	1300.00 lb/ft	Eq. 7-30
Weight of soil above wall	Wr β	24.81 lb/ft	Eq. 7-31
Resisting moment arm for rein. zone	Xri	2.19 ft	Eq. 7-35
Resisting moment arm for surcharge	Xq β	2.98 ft	Eq. 7-37
Resisting moment arm in top slope	Xr β	3.47 ft	Eq. 7-36B
Resisting moment	Mr	3064.42 lb	Eq. 7-34
Driving moment	Mo	80.84 lb	Eq. 7-38
Overturning	FSot	37.909	Eq. 7-39

Bearing Capacity

Equivalent bearing area	B	4.00 ft	Eq. 7-40
Eccentricity of bearing force	e	0.00 ft	Eq. 7-41
Applied bearing pressure	Qa	339.31 lb/ft ²	Eq. 7-42
Ultimate bearing pressure	Qult	4895.26 lb/ft ²	Eq. 12-10
Bearing capacity	FSbc	14.427	Eq. 12-11

Tensile Overstress

Layer/ Course	Elevation (ft)	LTDS (lb/ft) [2-3]	Acn (ft) [7-54..57]	Dn (ft) [7-58..60]	Fgn (lb/ft) [7-61]
3	1.50	1878.14	2.50	1.25	84.02

Layer/ Course	Elevation (ft)	FSto [7-62]	qdfn []	qlfn []
3	1.50	22.354	1.000	1.000

Pullout

Layer/ Course	Elevation (ft)	Fgn (lb/ft) [7-61]	ACn (lb/ft) [7-63]	La (ft) [7-64]	dn (ft) [7-65]
3	1.50	84.02	299.72	2.14	1.08

Layer/ Course	Elevation (ft)	FSpO [7-66]
3	1.50	3.567

Internal Sliding

Layer/ Course	Elevation (ft)	PsH (lb/ft) [7-67]	PqdH (lb/ft) [7-68]	PqIH (lb/ft) [7-69]	PsV (lb/ft) [7-70]
3	1.50	17.05	0.00	0.00	6.00

Layer/ Course	Elevation (ft)	PqdV (lb/ft) [7-71]	PqIV (lb/ft) [7-72]	PaH (lb/ft) [7-73]	PaV (lb/ft) [7-74]
3	1.50	0.00	0.00	17.05	6.00

Layer/ Course	Elevation (ft)	R's (lb/ft) [7-75]	W'ri (lb/ft) [7-76]	Vu (lb/ft) [7-77]	FSsl [7-78]
3	1.50	210.36	390.00	708.26	53.888

Connection Strength

Layer/ Course	Elevation (ft)	Fgn (lb/ft) [7-61]	Fgconn (lb/ft) [7-61X]	Tconn (lb/ft) [7-79]	FSCs [7-80]
3	1.50	84.02	84.02	424.88	5.057

Crest Toppling

Height from top layer to grade	H _z	1.00 ft	Eq.
Horz. component of Ps	PsH	14.67 lb/ft	Eq. 7-83
Uniform surcharge	PqH	0.00 lb/ft	Eq. 7-84
Vert. component of Ps	PsV	2.78 lb/ft	Eq. 7-85
Vert. force from dead load surcharge	PqdV	0.00 lb/ft	Eq. 7-86
Vert. force from live load surcharge	PqIV	0.00 lb/ft	Eq. 7-87
Resisting moment arm	X _w	0.57 ft	Eq. 7-90
Resisting moment	Mr	88.52 lb	Eq. 7-89
Overtopping moment	Mo	4.89 lb	Eq. 7-91
Crest toppling	FSct	18.108	Eq. 7-88

Seismic Calculations

General Equations

Seismic inertial angle	θ_{int}	6.25 °	Eq. 9-3,4
Internal horz. acceleration coefficient	k_{hint}	0.110	Eq. 9-22,23
External horz. acceleration coefficient	k_{hext}	0.024	Eq. 9-24,25
External seismic inertial angle	θ_{ext}	1.37 °	Eq. 9-27
Seismic active earth pressure coefficient	K_{aEext}	0.240	Eq. 9-48
Seismic active earth pressure coefficient	K_{aEint}	0.280	Eq. 9-81
Dynamic active earth pressure coefficient	ΔK_{Dyn}	0.015	Eq. 9-9
Horz. component of earth pressure coefficient	K_{aH}	0.213	Eq. 9-10
Vert. component of earth pressure coefficient	K_{aV}	0.075	Eq. 9-13
Horz. component of P_s	P_{sH}	92.13 lb/ft	Eq. 9-16
Vert. component of P_s	P_{sV}	32.44 lb/ft	Eq. 9-19
Horz. total seismic earth pressure coefficient	K_{aEHext}	0.227	Eq. 9-50
Horz. seismic earth pressure coefficient increment	ΔK_{DynH}	0.014	Eq. 9-51
Horz. Static + Seismic component	P_{aEH}	98.15 lb/ft	Eq. 9-52
Horz. Seismic component increment	ΔP_{DynH}	6.02 lb/ft	Eq. 9-53
Horz. static + 50% seismic total	P_{aEHext}	95.14 lb/ft	Eq. 9-54
Vert. total seismic earth pressure coefficient	K_{aEVext}	0.080	Eq. 9-55
Vert. seismic earth pressure coefficient increment	ΔK_{DynV}	0.005	Eq. 9-56
Vert. Static + Seismic component	P_{aEV}	34.56 lb/ft	Eq. 9-57
Vert. Seismic component increment	ΔP_{DynV}	2.12 lb/ft	Eq. 9-58
Vert. static + 50% seismic total	P_{aEVext}	33.50 lb/ft	Eq. 9-59
Weight of reduced width reinforced mass	W'_i	81.25 lb/ft	Eq. 9-61
Reduced width reinforced zone	$L''0.5H$	0.00 ft	Eq. 9-62
Reduced height reinforced zone	h'	0.01 ft	Eq. 9-63
Weight of top slope for reduced rein. mass	$W'\beta$	0.17 lb/ft	Eq. 9-64,69
Reduced distance for $W_r\beta$	$Y'\beta$	2.50 ft	Eq. 9-70
Horz. inertial force	P_{IR}	9.12 lb/ft	Eq. 9-60

Base Sliding

Base sliding resistance	R_{swdyn}	722.23 lb/ft	Eq. 9-71
Seismic base sliding	F_{Ssl}	6.927	Eq. 9-72

Overturning

Total driving moment	$M'\beta$	0.13 lb/ft	Eq. 9-75
Inertial moment	h_{IR}	1.25 ft	Eq. 9-76
Resisting moment	M_r	3068.92 lb	Eq. 9-73
Driving moment	M_o	96.21 lb	Eq. 9-74
Seismic overturning	F_{Sot}	31.899	Eq. 9-77

Bearing Capacity

Eccentricity of bearing force	e	0.00 ft	Eq. 9-78
Applied bearing stress at leveling pad	B	4.00 ft	Eq. 9-79
Applied bearing pressure	Q_a	339.58 lb/ft ²	Eq. 9-80
Ultimate bearing pressure	Q_{ult}	4895.26 lb/ft ²	Eq. 12-10
Bearing capacity	F_{Sbc}	14.416	Eq. 12-11

Tensile Overstress

Layer/ Course	Elevation (ft)	F_{in} (lb/ft) [9-84]	F_{dyn} (lb/ft) [9-87]	F_{Sto} [9-88]	LTDS (lb/ft) [9-89]
3	1.50	144.65	27.75	19.996	2892.33

Pullout

Layer/ Course	Elevation (ft)	AC_n (lb/ft) [7-63]	F_{in} (lb/ft) [9-84]	F_{Spo} [9-90]
3	1.50	299.72	144.65	2.072

Internal Sliding

Layer/ Course	Elevation (ft)	ΔP_{DynH} (lb/ft) [9-91]	ΔP_{DynV} (lb/ft) [9-92]	R'_{swdyn} (lb/ft) [9-93]	ΔP_{IR} (lb/ft) [9-94]
3	1.50	1.11	0.39	210.46	3.65

Layer/ Course	Elevation (ft)	ΔW_w (lb/ft) [9-95]	ΔW_i (lb/ft) [9-96]	FSsl [9-97]
3	1.50	120.00	32.50	43.222

Connection Strength

Layer/ Course	Elevation (ft)	Fgconn (lb/ft) [7-61X]	Tconn (lb/ft) [7-79]	Fin (lb/ft) [9-84]	FScs [9-98]
3	1.50	144.65	424.88	144.65	2.937

Crest Toppling

Height from top layer to grade	H _z	1.00 ft	Eq.
Horz. total earth force	ΔP_{DynH}	0.00 lb/ft	Eq. 9-99
Vert. total earth force	ΔP_{DynV}	0.18 lb/ft	Eq. 9-100
Resisting moment	M _r	88.62 lb	Eq. 9-101
Driving moment	M _o	13.35 lb	Eq. 9-102
Overturning	F _{Sct}	6.637	Eq. 9-103

Attachment 7- Construction Plan

The following steps are proposed for construction:

- 1) Install proper erosion control BMP
- 2) Remove fencing to allow excavation equipment access to the project area
- 3) Excavate soil in accordance with the plans
- 4) Install retaining wall and complete finish grading
- 5) Place ~~6" washed sand~~ onto high-intensity beach area Rev: 4" loam & grass sod
- 6) Prepare regraded areas for sod placement and install sod
- 7) Remove excavating equipment from site
- 8) Reinstall protective fencing

Attachment 8- Erosion Control Plan

Project construction will occur up to, but not below the NHWL of Pleasant Lake. Two rows of silt fence will be installed at the toe of the construction site following the same grade elevation. For areas not being actively worked for more than 7 days, and prior to expected rainfall, hay or straw will be applied at a minimum rate of 2 bales per 1000 square feet of disturbed area for temporary stabilization. Actively worked disturbed areas and material stockpiles will be mulched prior to a predicted rain event at the same minimum rate as described above.

Silt fencing will be installed and maintained according to specifications. Any accumulated silt or sediment will be carefully removed from the silt fence after a rain event, and the silt fence will be inspected to ensure that it will continue to function properly.

Permanent stabilization of the sloped grass areas will be accomplished by the placement of grass sod over suitably prepared topsoil. Silt fence will remain in place and will be maintained until it is determined that the sod has sufficiently taken root. During a typical growing season, allow a minimum of 3 weeks for sod to take root into the topsoil. Additional mulch will be applied to the picnic area portion of the facility to ensure continued soil stability.

Attachment 9- Site Condition Report

Does not apply- no direct impacts to a freshwater wetland, great pond, or other protected natural resource

Notice of Intent to File

PUBLIC NOTICE FILING AND CERTIFICATION

Department Rules, Chapter 2, require an applicant to provide public notice for all Tier 2, Tier 3 and individual Natural Resources Protect Act projects. In the notice, the applicant must describe the proposed activity and where it is located. **“Abutter”** for the purposes of the notice provision means any person who owns property that is BOTH (1) adjoining and (2) within one mile of the delineated project boundary, including owners of property directly across a public or private right of way.

1. **Newspaper:** You must publish the Notice of Intent to File in a newspaper circulated in the area where the activity is located. The notice must appear in the newspaper within 30 days prior to the filing of the application with the Department. You may use the attached Notice of Intent to File form, or one containing identical information, for newspaper publication and certified mailing.
2. **Abutting Property Owners:** You must send a copy of the Notice of Intent to File by certified mail to the owners of the property abutting the activity. Their names and addresses can be obtained from the town tax maps or local officials. They must receive notice within 30 days prior to the filing of the application with the Department.
3. **Municipal Office:** You must send a copy of the Notice of Intent to File and a **duplicate of the entire application** to the Municipal Office.

ATTACH a list of the names and addresses of the owners of abutting property.

CERTIFICATION

By signing below, the applicant or authorized agent certifies that:

1. A Notice of Intent to File was published in a newspaper circulated in the area where the project site is located within 30 days prior to filing the application;
2. A certified mailing of the Notice of Intent to File was sent to all abutters within 30 days of the filing of the application;
3. A certified mailing of the Notice of Intent to File, and a duplicate copy of the application was sent to the town office of the municipality in which the project is located; and (completed application to be mailed 11/29/21)
4. Provided notice of and held a public informational meeting, if required, in accordance with Chapter 2, Rules Concerning the Processing of Applications, Section 13, prior to filing the application. Notice of the meeting was sent by certified mail to abutters and to the town office of the municipality in which the project is located at least ten days prior to the meeting. Notice of the meeting was also published once in a newspaper circulated in the area where the project site is located at least seven days prior to the meeting.

The Public Informational Meeting was held on _____.
Date

Approximately _____ members of the public attended the Public Informational Meeting.

Michael J. Morse

November 24, 2021

Signature of Applicant or authorized agent

Date

(blue)

**PUBLIC NOTICE:
NOTICE OF INTENT TO FILE**

Please take notice that the Town of Casco, Town Office, 635 Meadow Road, Casco, Maine (207-627-4515), is intending to file a Natural Resources Protection Act permit application with the Maine Department of Environmental Protection pursuant to the provisions of 38 M.R.S. §§480-A thru 480-BB on or about November 30, 2021. The application is for erosion mitigation and facility improvements at the Town's public beach located at the southerly end of Pleasant Lake, 18 Mayberry Hill Road, Casco, Maine.

You have received this notification because you own property abutting the project location, according to property assessment records maintained by the Town of Casco.

A request for a public hearing or a request that the Board of Environmental Protection assume jurisdiction over this application must be received by the Department in writing, no later than 20 days after the application is found by the Department to be complete and is accepted for processing. A public hearing may or may not be held at the discretion of the Commissioner or Board of Environmental Protection. Public comment on the application will be accepted throughout the processing of the application.

The application will be filed for public inspection at the Department of Environmental Protection's office in Portland during normal working hours. A copy of the application may also be seen at the municipal offices in Casco, Maine.

Written public comments may be sent to the regional office in Portland, where the application is filed for public inspection: MDEP, Southern Maine Regional Office, 312 Canco Road, Portland, Maine 04103



Certificate of Mailing — Firm

Name and Address of Sender Mike Morse Morse Environmental Consulting, LLC 16 Liberty Road Falmouth, Maine 04105		TOTAL NO. of Pieces Listed by Sender 2	TOTAL NO. of Pieces Received at Post Office™ 2	Affix Stamp Here <i>Postmark with Date of Receipt.</i> 			
USPS® Tracking Number Firm-specific Identifier		Address (Name, Street, City, State, and ZIP Code™)		Postage	Fee	Special Handling	Parcel Airlift
1. Robert S. Spalding, Jr & Sharlene Spalding		P.O. Box 37 Casco, Maine 04015		 0000 U.S. POSTAGE PAID GRAY, ME 04039 NOV 18 21 AMOUNT \$1.65 R2304N118226-5			
2. Holly Beth Hancock		P.O. Box 148 Casco, Maine 04015					
3.				 0000 U.S. POSTAGE PAID GRAY, ME 04039 NOV 18 21 AMOUNT \$1.65 R2304N118226-5			
4.							
5.							
6.							

NOTICE OF INTENT TO FILE Please take notice that the Town of Casco, Town Office, 635 Meadow Road, Casco, Maine (207-627-4515), is intending to file a Natural Resources Protection Act permit application with the Maine Department of Environmental Protection pursuant to the provisions of 38 M.R.S. 480-A thru 480-BB on or about November 30, 2021. The application is for erosion mitigation and facility improvements at the Town's public beach located at the southerly end of Pleasant Lake, 18 Mayberry Hill Road, Casco, Maine. A request for a public hearing or a request that the Board of Environmental Protection assume jurisdiction over this application must be received by the Department in writing, no later than 20 days after the application is found by the Department to be complete and is accepted for processing. A public hearing may or may not be held at the discretion of the Commissioner or Board of Environmental Protection. Public comment on the application will be accepted throughout the processing of the application. The application will be filed for public inspection at the Department of Environmental Protection's office in Portland during normal working hours. A copy of the application may also be seen at the municipal offices in Casco, Maine. Written public comments may be sent to the regional office in Portland, where the application is filed for public inspection: MDEP, Southern Maine Regional Office, 312 Canco Road, Portland, Maine 04103

(Portland Press Herald 11/19/2021)

APPENDIX A: MDEP VISUAL EVALUATION FIELD SURVEY CHECKLIST

(Natural Resources Protection Act, 38 M.R.S. §§ 480 A - Z)

Name of applicant: Town of Casco Phone: 207-627-4515

Application Type: Individual NRPA

Activity Type: (brief activity description) Erosion mitigation and facility improvements

Activity Location: Town: Casco County: Cumberland

GIS Coordinates, if known: _____

Date of Survey: 8/26/21 Observer: Mike Morse/Morse Env. Consult Phone: 207-558-0842

	Distance Between the Proposed Visibility Activity and Resource (in Miles)			
	0-¼	¼-1	1+	
1. Would the activity be visible from:				
A. A National Natural Landmark or other outstanding natural feature?	☐	☐	☐	
B. A State or National Wildlife Refuge, Sanctuary, or Preserve or a State Game Refuge?	☐	☐	☐	
C. A state or federal trail?	☐	☐	☐	
D. A public site or structure listed on the National Register of Historic Places?	☐	☐	☐	
E. A National or State Park?	☐	☐	☐	
F. 1) A municipal park or public open space?	☒	☐	☐	
2) A publicly owned land visited, in part, for the use, observation, enjoyment and appreciation of natural or man-made visual qualities?	☒	☐	☐	
3) A public resource, such as the Atlantic Ocean, a great pond or a navigable river?	☒	☐	☐	**Note: the activity is located at the public facility
2. What is the closest estimated distance to a similar activity?	☐	☐	☐	
3. What is the closest distance to a public facility intended for a similar use?	☒	☐	☐	
4. Is the visibility of the activity seasonal? (i.e., screened by summer foliage, but visible during other seasons)		☐ Yes	☒ No	
5. Are any of the resources checked in question 1 used by the public during the time of year during which the activity will be visible?		☒ Yes	☐ No	

A listing of National Natural Landmarks and other outstanding natural features in the State of Maine can be found at: www.nature.nps.gov/nnl/Registry/USA_map/states/Maine/maine.htm . In addition, unique natural areas are listed in the Maine Atlas and Gazetteer published by DeLorme.

(pink)