

Chebeague Island Stone Wharf Study Update

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Presentation Overview



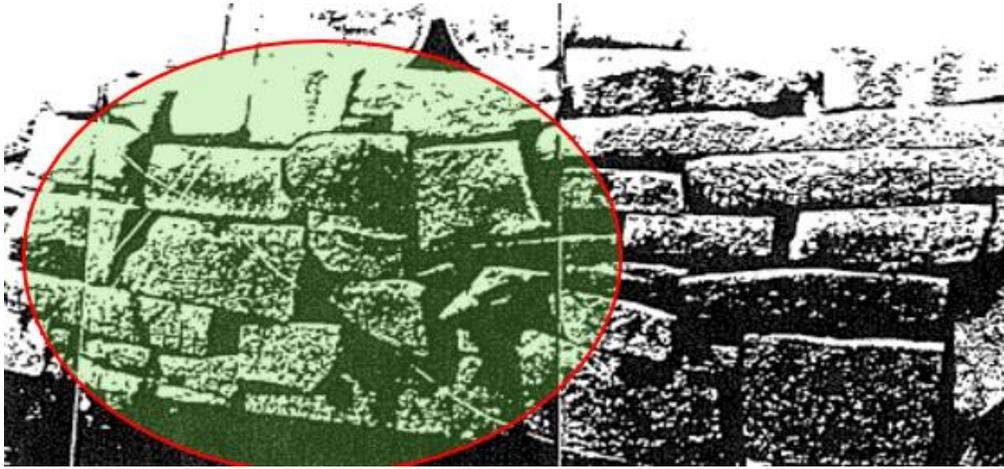
Project Background
Inspection and Data Collection
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Project Background



- The Stone Wharf has been in use for approximately 130 years. It currently serves primary ferry service to the island operated by Chebeague Transportation Company (CTC), as well as private boating, and commercial fishing.
- Granite block retaining walls infilled with native soils to form a pier.
- The Stone Wharf is experiencing ongoing infill settlement, surface pavement cracking and bulging along the face of the westerly wall and pier head. Infill and concrete repairs were conducted in the 1990's and most recently in 2003.
- A 2018 master plan study was conducted based on limited assessment of the general conditions of the Stone Wharf.
- This evaluation focuses on stability of the Stone Wharf in its current use and stability under modification for future uses.

Inspection and Data Collection



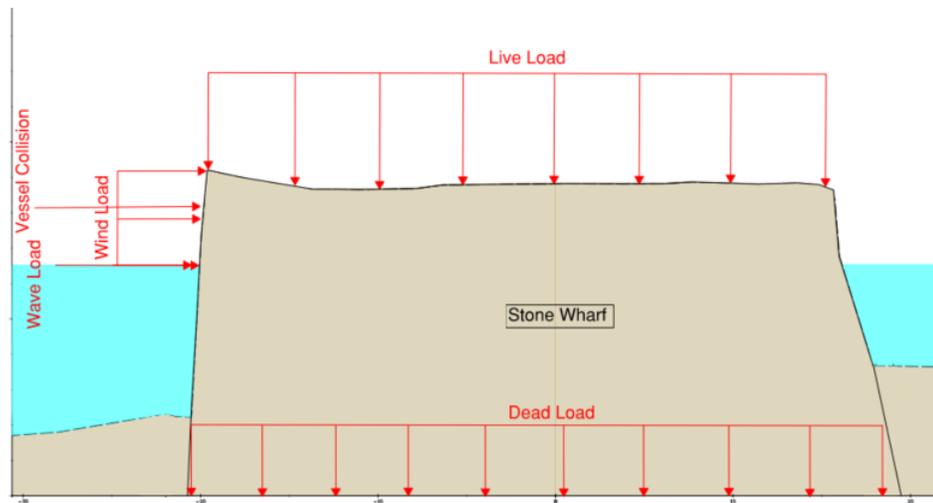
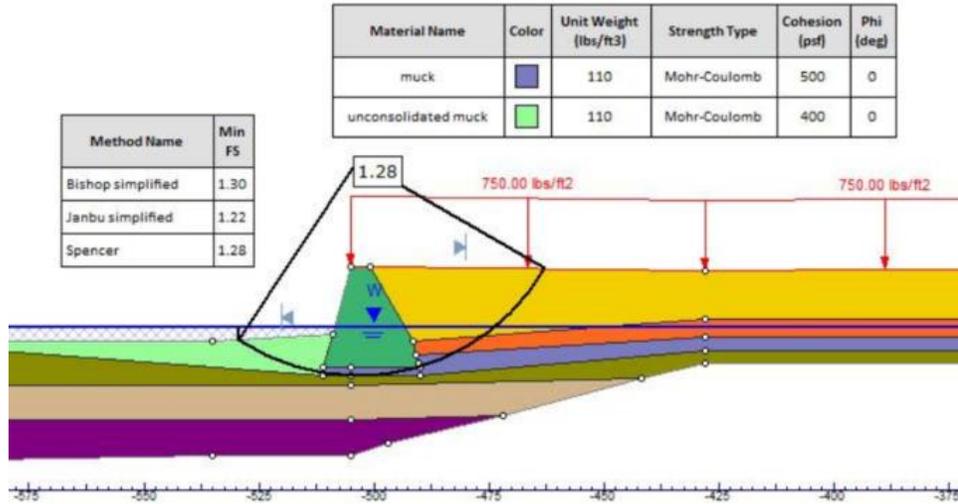
1980 Wright Pierce Inspection Photo



2021 Wright Pierce Inspection Photo

- Conducted a walk-around inspection to note existing conditions.
- Surveyed the Stone Wharf with a 3-D scanning UAV.
- Set survey monitoring points for confirmation over time of movement of the Stone Wharf.
- Compared findings to similar photos taken as part of a 1980 evaluation of the Stone Wharf.

Geotechnical Exploration and Stone Wharf Analysis



- Conducted a 3-day subsurface program between May 25 and May 27, 2021.
- Subsurface conditions in two of the borings include granular fill over muck on marine sediment and bedrock.
- Timbers were encountered in the upper half of the muck stratum.
- A boring at the head of the pier included muck and marine sediment over Presumpscot Formation of marine silt-clay and a thin layer of glacial till over bedrock.
- Geotechnical and structural stability analyses were completed for existing conditions and a sensitivity analysis was performed for increased Stone Wharf height of 4 and 8 feet in the future to determine if structural strengthening is required.

Geotechnical Exploration and Stone Wharf Analysis

Configuration Modeled	FS _{min}	Conclusions
Existing conditions with 2-ft live load surcharge	1.5	Satisfactory
Short-term future (4-foot SLR): Existing conditions with 4-ft SLR in addition to 2-ft live load surcharge	1.3	Unsatisfactory; structural measures required
Short-term future with micropiles	1.5	Satisfactory with 40-kip (shear capacity) micropiles, 5 ft on-center OR 45-kip micropiles, 6 ft on-center
Long-term future: Existing conditions with 8-ft SLR in addition to 2-ft live load surcharge	1.1	Unsatisfactory; structural measures required
Long-term future with micropiles	1.4 to 1.5	Satisfactory with 50-kip (shear capacity) micropiles, 3 to 4 ft on-center; recommend additional subsurface evaluation and analyses to assess more cost-effective alternatives

Results of Analysis

- **The Stone Wharf is stable in its existing configuration.**
- **If the Wharf is to be raised in the future, structural modifications to the foundation will be required.**
- **Micropiles (steel cased concrete piles with a reinforced steel core socketed to bedrock) are a common application for strengthening by retrofit and recommended for this project.**

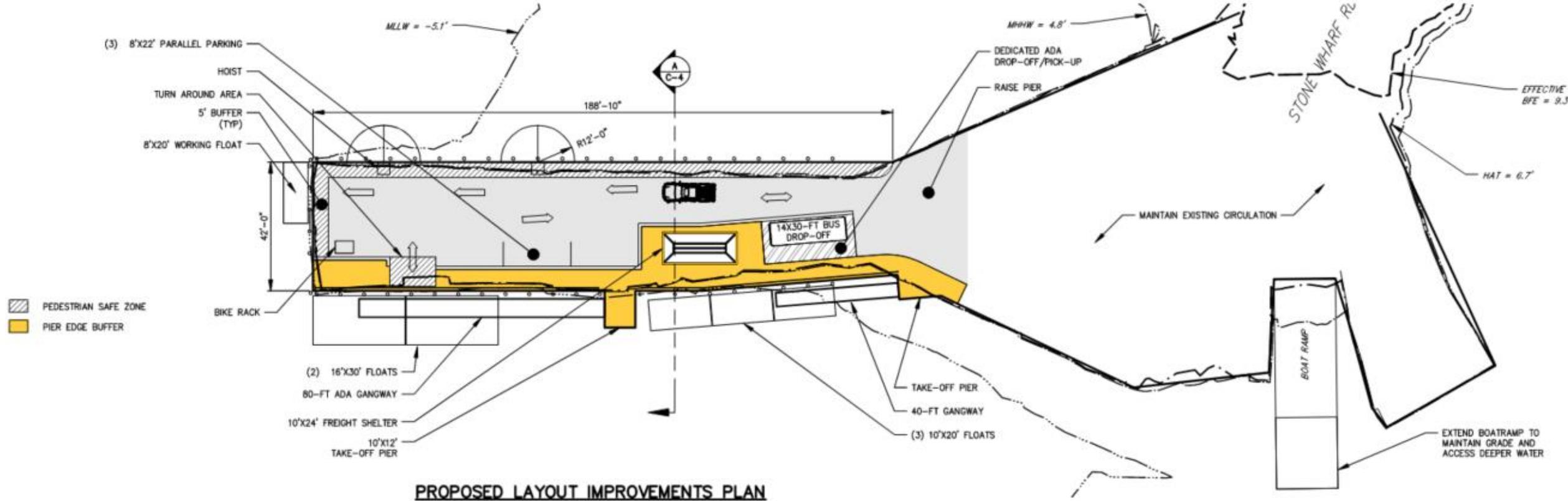
Analysis and Programming

Design storm and sea level rise considerations

PROJECT ELEVATIONS (BY DATUM)				
ELEVATION		Stone Wharf, Chebeague Island		Notes
		CHART (ft)	NAVD88 (ft)	
Prepare to Manage_ 5.0 + BFE		19.6	14.3	Maine Climate Council- 2070
Commit to Manage_ 2.4 + BFE		17.0	11.7	
Existing Stone Pier Surface		13.3	8.0	Elevation varies +/-
Base Flood Elevation (Effective)		14.6	9.3	FEMA 1985 FIRM, ZONE A2
Stillwater Elevations	0.2% Annual Chance	15.0	9.7	FIS Transect 80 (Chebeague Island)
	1% Annual Chance	14.4	9.1	
	2% Annual Chance	14.0	8.7	
	10% Annual Chance	13.4	8.1	
Highest Annual Tide		12.0	6.7	Maine DEP (Great Chebeague Island)
MHHW		9.9	4.7	NOAA Tidal Station 8418150 (Portland)
MHW		9.5	4.2	
NAVD88		5.3	0.0	
MLW		0.4	-4.9	
MLLW		0.0	-5.3	

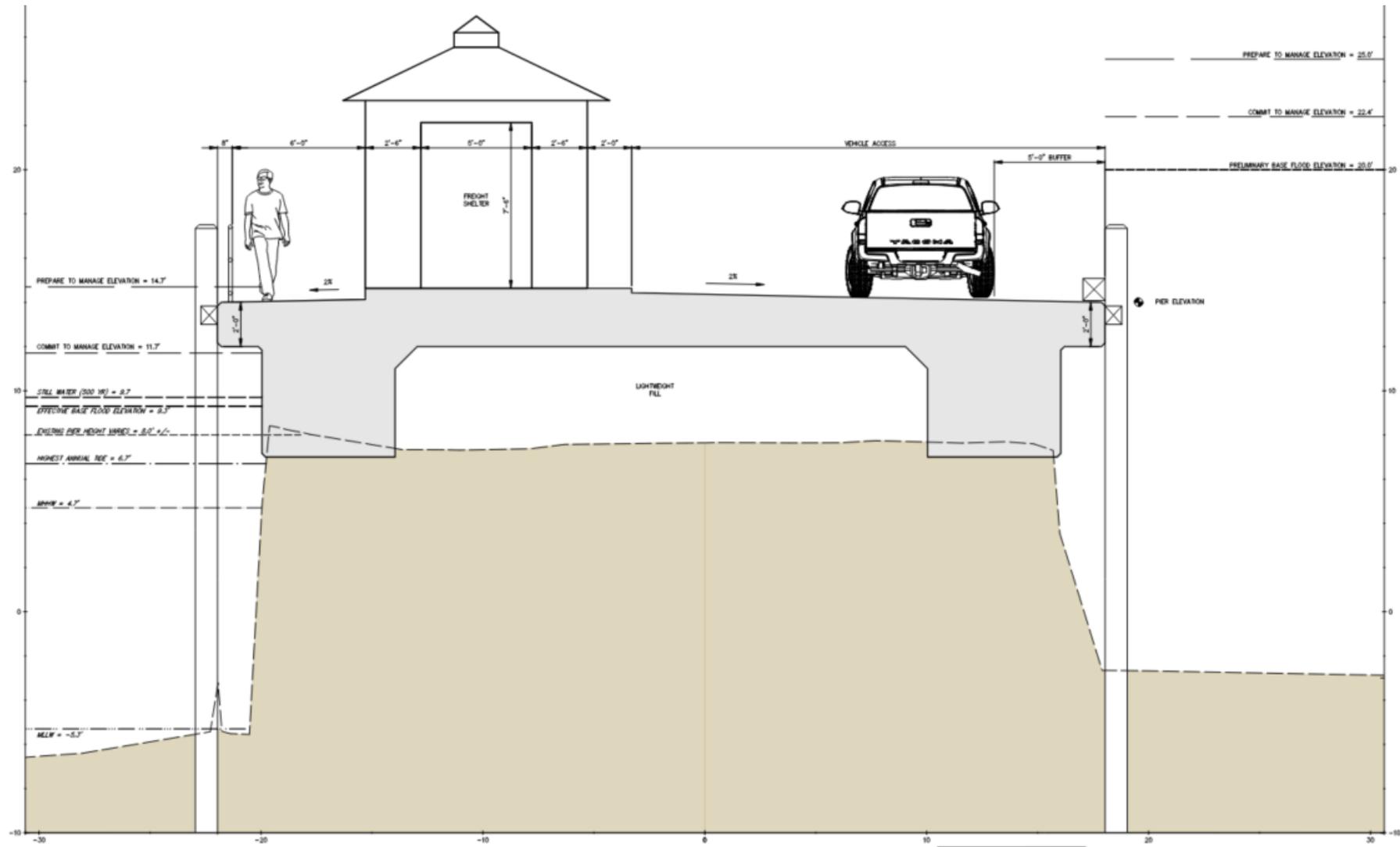
- The Existing Stone Wharf Elevation is 8.0.
- Maine Climate Council recommends 'commit to manage' and 'prepare to manage' elevations.
- Given the effective Base Flood Elevation (BFE) 9.3, developed by FEMA, and the 1% stillwater elevation of 9.1, it is recommended to 'commit to manage' to Elevation 11.7, representing a 3.7-foot rise in the Stone Wharf surface.
- For reference, The 2017 preliminary BFE for the project area was set at Elevation 20.0.
- Managing to elevation 14.3 results in a 6.3-foot rise in the Stone Wharf surface.

Analysis and Programming



- Proposed revised traffic flow for vehicles and pedestrians.
- Proposed drop-off zone reconfiguration.
- Proposed freight and passenger shelter.
- Proposed reconfigured gangways and floats.

Analysis and Programming



Section A-A Concrete Deck with Lightweight Infill Alternative

Discussion – Next Steps



- Compile and address comments on preliminary layout.
- Finalize draft report
 - Recommendations for near-term and mid-term Stone Wharf upgrades.
 - Operational safety and efficiency
 - Parking
 - Code compliant access
 - Develop opinions of cost for upgrades
 - Recommendations for facility monitoring
 - Permitting strategies
 - Funding strategies

THANK YOU

Contact Information

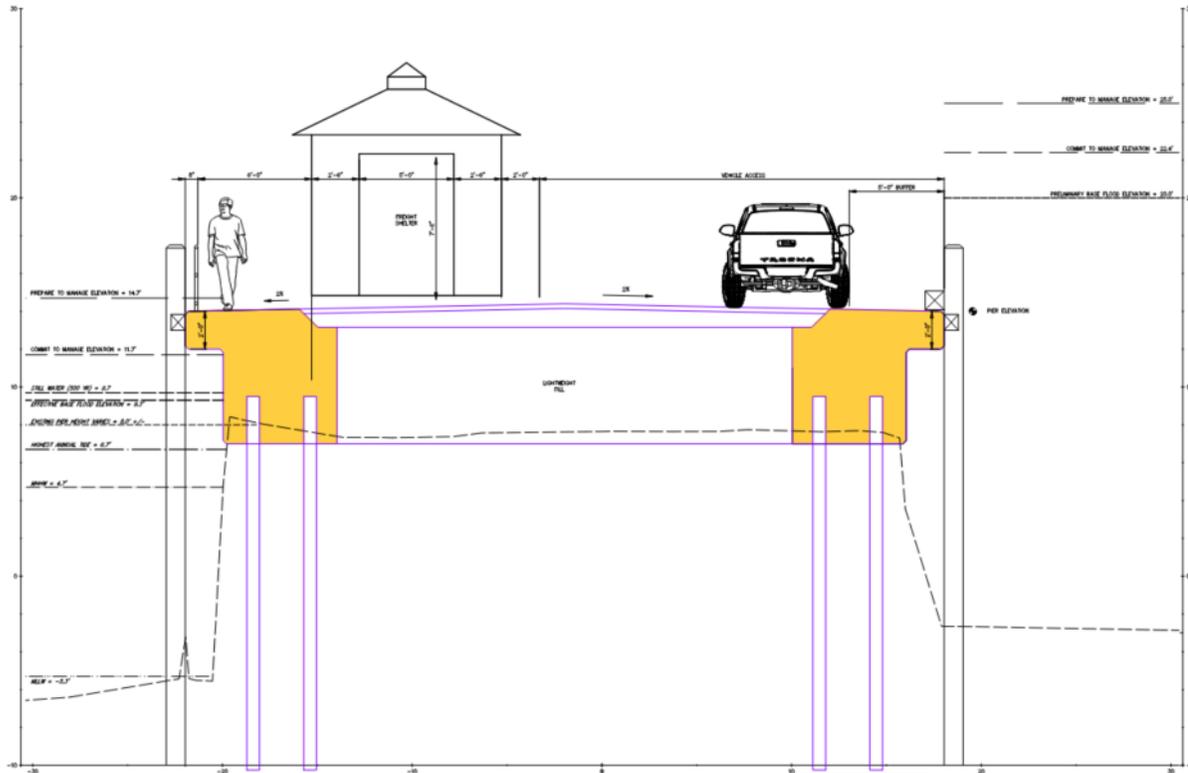


Jason Gallant, PE

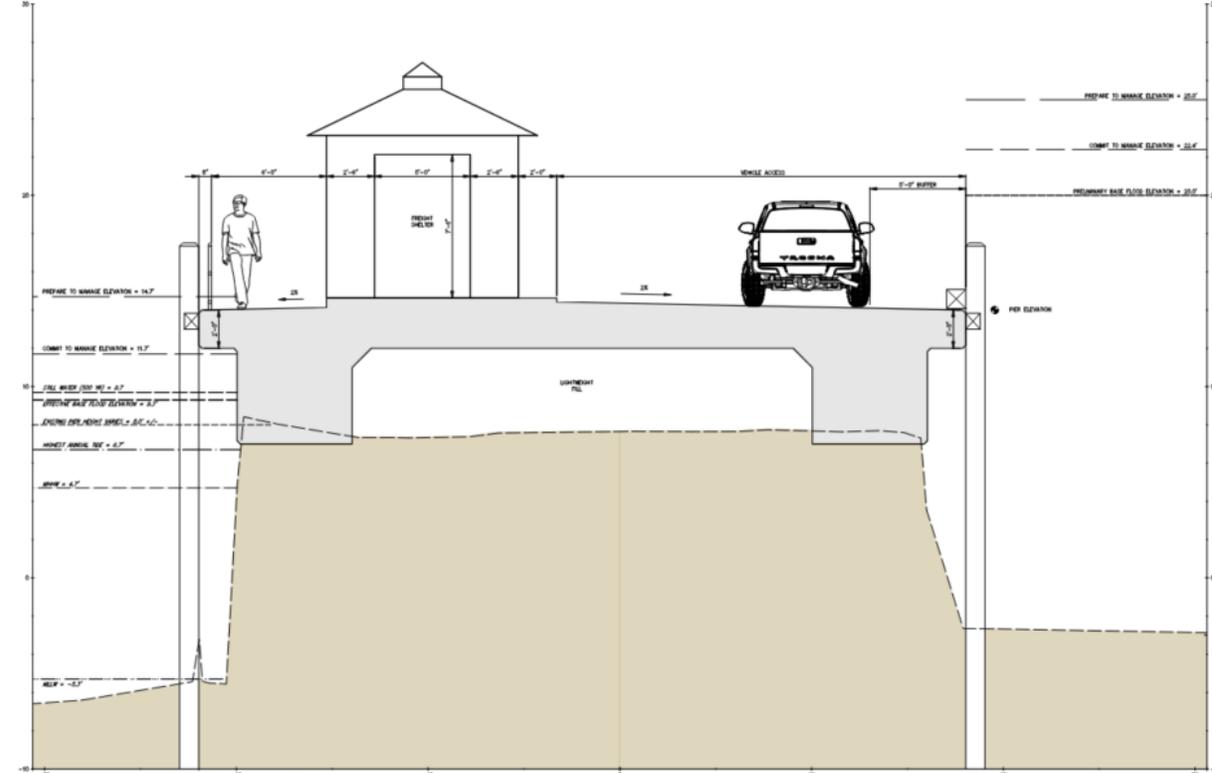
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Analysis and Programming

Pier section – expansion alternatives



Concrete Grade Beams with Lightweight Infill



Concrete Deck with Lightweight Infill

