Belfast Climate Crisis Committee

Coastal Shoreline Stabilization

July 6, 2022

Gartley & Dorsky
ENGINEERING SURVEYING

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Preliminary Site Assessment

- Is there imminent danger to persons or property?
- Owner's needs and budget
- Height and steepness of existing slope
- Construction access/permanent pedestrian access
- Ground cover
- Conditions on abutting properties
- Global Stability – Site History – Geotechnical Engineer

Preliminary Site Assessment

- Hydrology
  - Surface water
  - Ground water
  - Outlet Pipes
- Intertidal Assessment
  - Ledge or Rocky
  - Mudflats
  - Vegetation
  - Fetch

Imminent danger to life and property.
Rockport

Gradual undercutting due to ice damage
and lower energy wave action.
Round Pond

Grass clippings hindered vegetation,
resulted in significant localized failure.
Cushing

Homeowners sometimes use other methods to “control” erosion!

Friendship

Freeze/thaw action crumbling ledge.

Owl's Head

Previous site after stabilization.

Owl's Head

Significant failure

Rockland

Field Survey

- Existing conditions survey and topography
  - Structures
  - Property lines if possible
  - Drainage features (pipe outfalls, swales, streams, etc.)
  - Significant trees
  - Significant intertidal features (spartina or ledge)

- Regulatory Tide Lines
  - Highest Annual Tide (HAT)
  - Mean High Water (MHW) *(Elevations published by*
  - Mean Low Water (MLW) *NOAA)*

Regulatory Considerations

- M.D.E.P. - *Natural Resources Protection Act*
  - *Inland Fisheries and Wildlife*
  - *Department of Marine Resources*
- U. S. Army Corps - *Cat. 2 Programmatic General Permit*
- Municipal
  - *Shoreland Zoning*
  - *CEO*
  - *Is Building Permit needed?*
  - *Is Planning Board review needed?*
  - *Is Floodplain Permit needed?*

Stabilization Design

1. Armoring Base
2. Riprap Slope
3. Surface Water
4. Ground Water
5. Vegetation

Stabilization Design

- Armoring Base
  - *Heavy armoring to protect against wave action and to provide a structural base for the upper portion of the stabilization*
  - *Typically stones are not less than 3'-4' in diameter*
  - *First course should be buried approx. 3' (or pinned)*
  - *Slope: Goal is no greater than 1.5H:1V*
    - *Absolutely no steeper than 1H:1V where needed*
    - *Prefer slopes shallower than 1.5H:1V where possible*
  - *Slope Preparation:*
    - *Armor stone layer*
    - *Underlayer of +/-12" thickness of 6" blasted ledge*
    - *Geotextile filter fabric*
    - *Gravel/sand layer if native material is clay or clay/silt*

Stabilization Design

- Riprap Slope
  - *Used to stabilize slope above armored base*
  - *Stone size may gradually decrease up-slope from armored base*
  - *Surface stones typically never less than 10” to 12” diameter, with smaller stones used to chink voids*
  - *Slope preparation same as for armored base, but begins transition to vegetated area above*

- *Surface Water*
  - *Intercept surface water when feasible and direct to stabilized discharge location*
  - *Outlet foundation drains and roof runoff to stabilized discharge location*

Stabilization Design

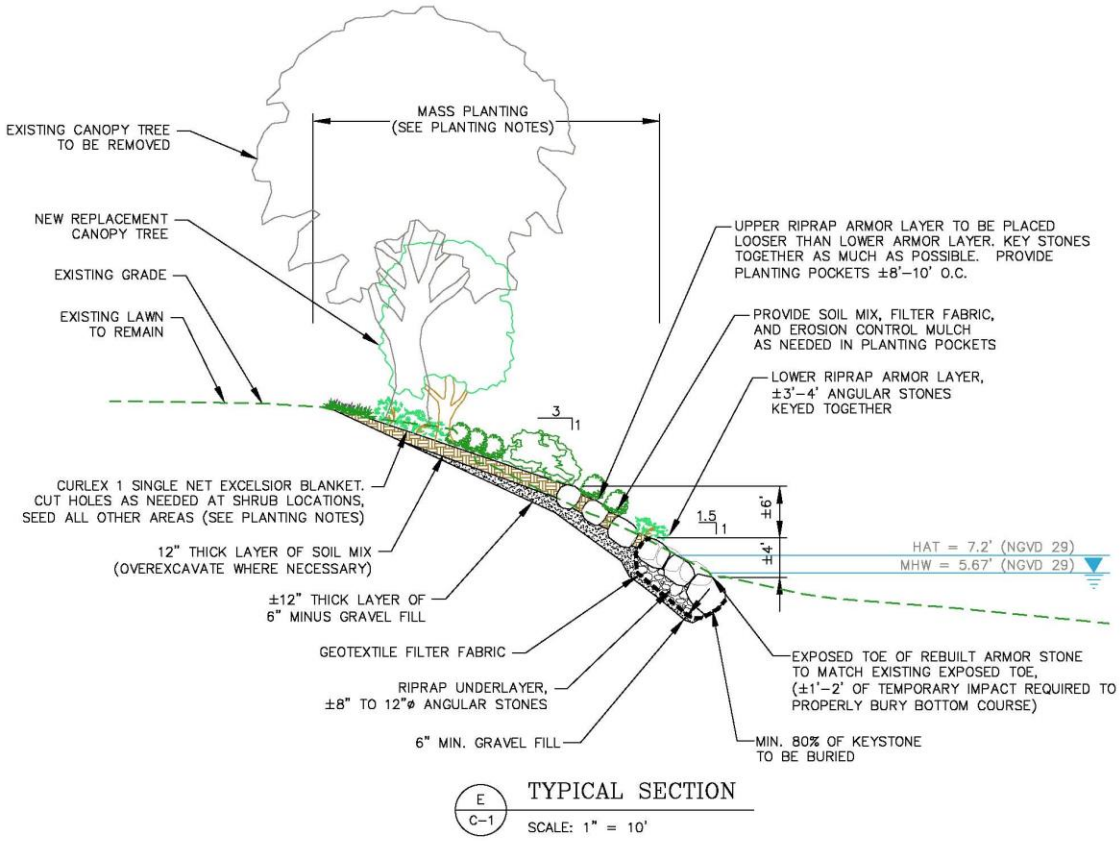
- Ground Water
  - *Provide interceptor trench when feasible. Considerations include:*
    - *Significant tree roots*
    - *Structures*
    - *Septic fields or other*
  - *Must be primary consideration when choosing:*
    - *Stabilization material (Stone vs. vegetation)*
    - *Slope steepness*
    - *Slope preparation*

Significant trees and septic system prevent curtain drainage
Owl's Head

Stabilization Design

- Vegetation
  - Protect existing vegetation when possible, except when large unstable trees threaten further failures
  - Cut back slope as much as possible (3H:1V preferred)
  - Provide organic layer, 6” minimum
  - Drainage
  - Choose native, exposure-tolerant species
  - Provide heavy woody mulch between plantings
  - Protect seeded areas with erosion control fabric
  - If steeper than 3H:1V, consider planting shrubs through erosion control fabric and seeding throughout, or adding some random stones to help hold soils and prevent sliding
  - Temporary irrigation
  - Replacement Trees (shoreland zoning)

Armor layer showing riprap underlayer and geotextile.
Lincolnville



Design section optimized for planting

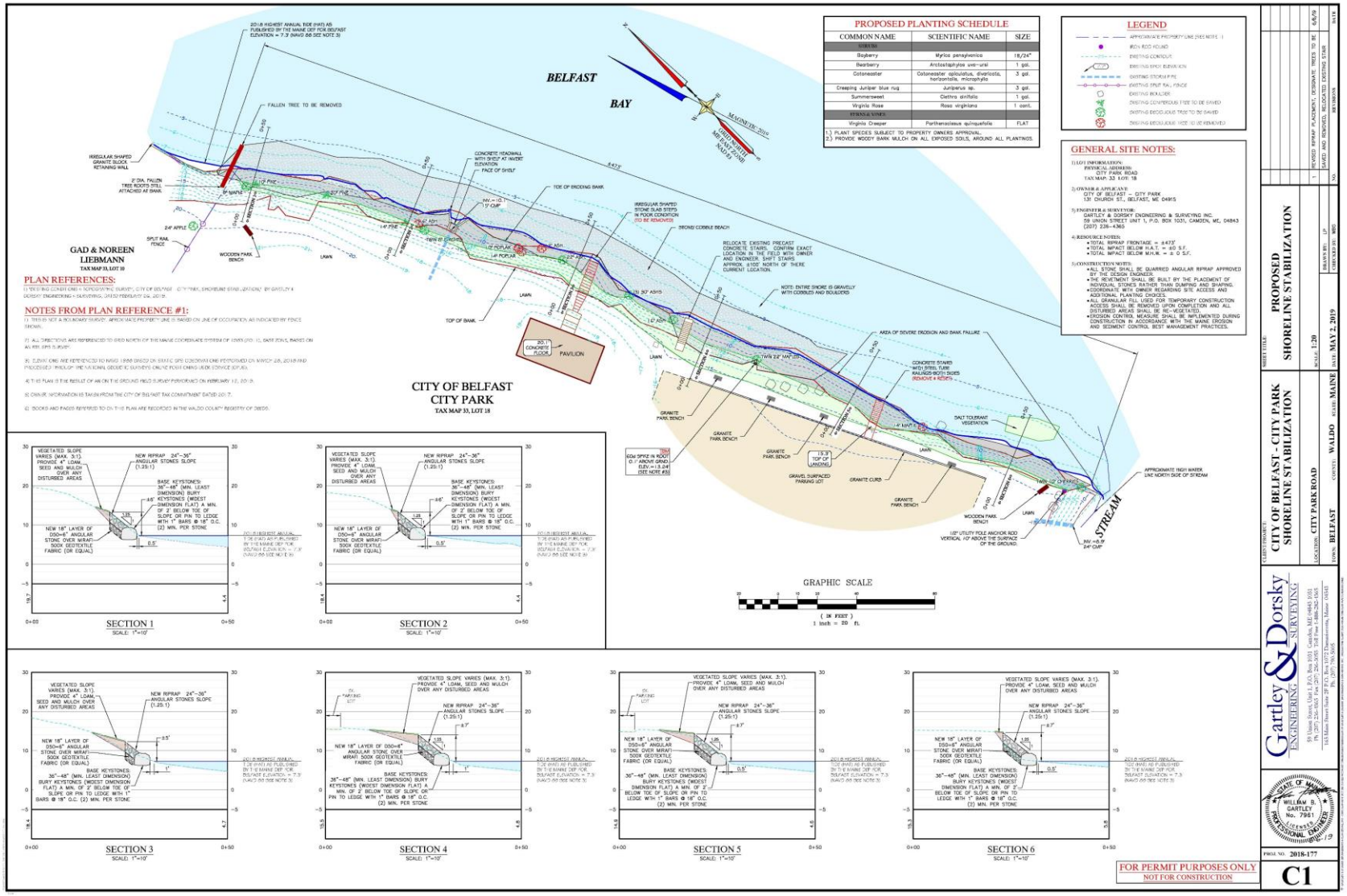
South Thomaston

Design Goal

- The ultimate goal in designing coastal stabilization projects is to use a method that:
  - *Stabilizes the site as permanently as possible*
  - *Is cost effective*
  - *Is aesthetically pleasing to both the owner and general public*
  - *Is as environmentally friendly as possible to both the intertidal and riparian habitats*

City of Belfast – City Park

City of Belfast – City Park

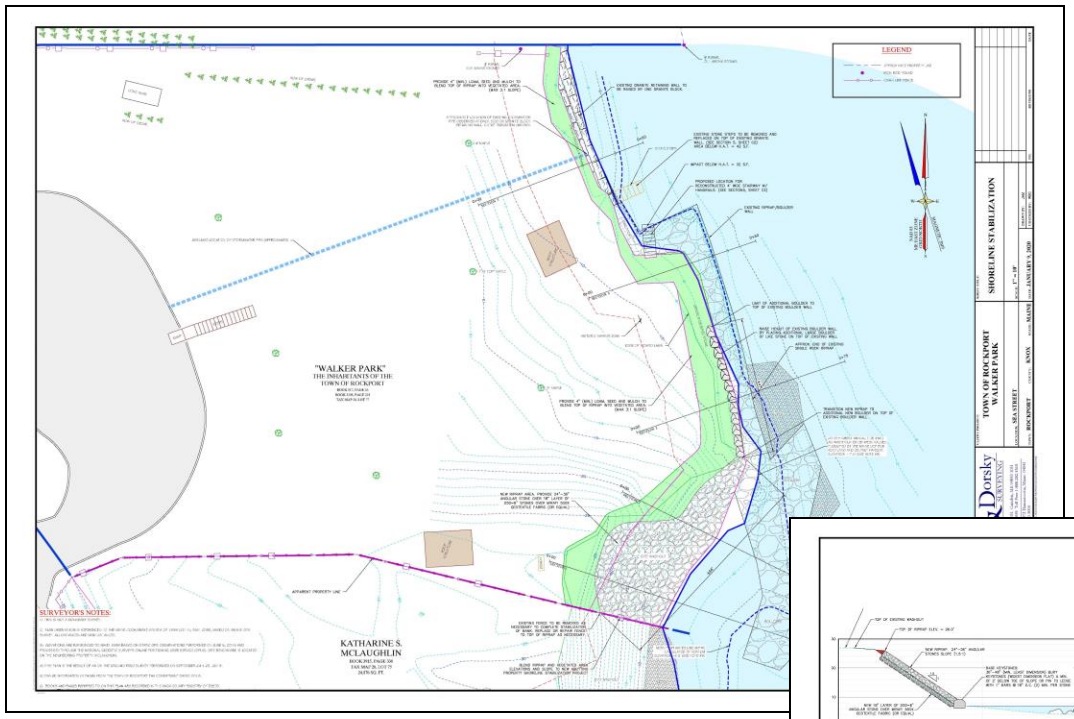


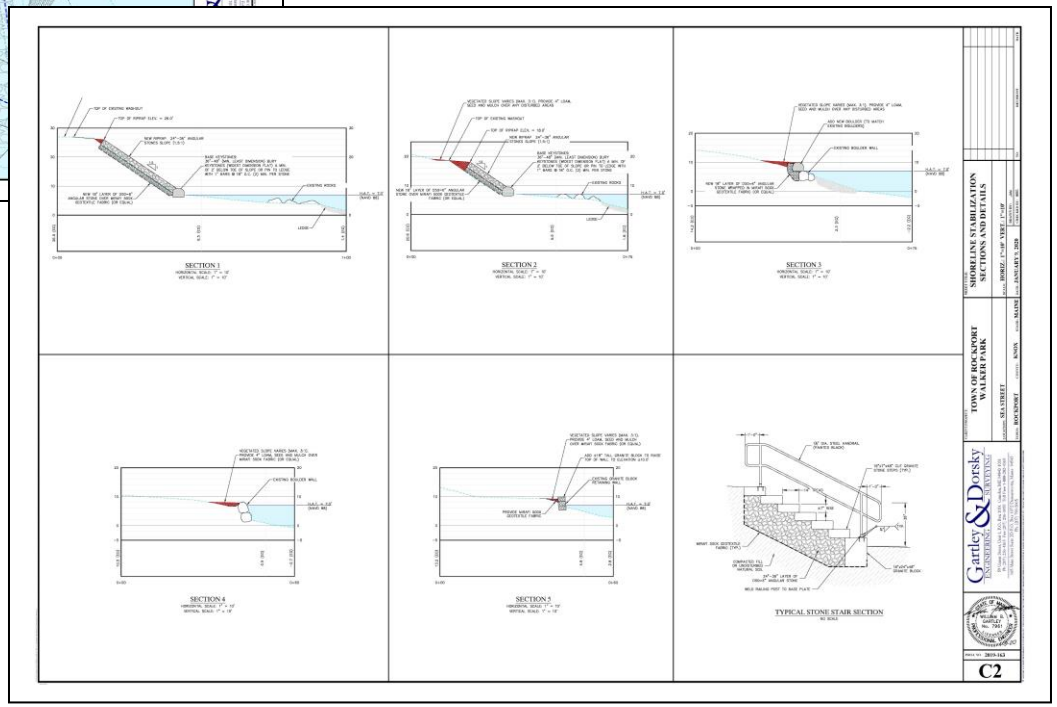
City of Belfast – City Park

Completed in 2019
Construction Cost: $80,000-$120,000

Town of Rockport – Walker Park

Town of Rockport – Walker Park





Town of Rockport – Walker Park

Completed in 2020
Construction Cost: $40,000

Belfast Shoreline Stabilization

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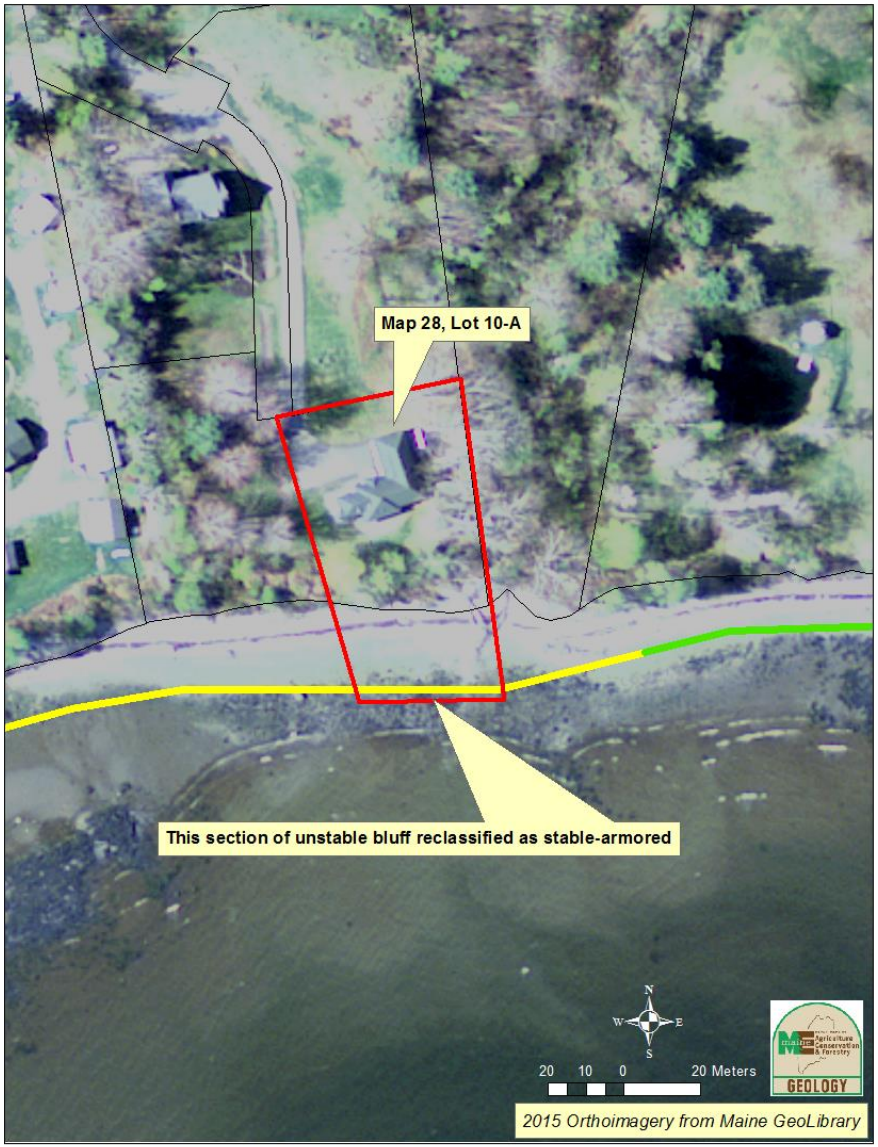

Belfast Shoreline Stabilization

Completed in 2018
Construction Cost: $48,000-$76,000

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