Bayside Conceptual Adaptation Strategy Designs
Captiva, FL

Captiva Community Panel Meeting

January 11, 2022

integral consulting inc.

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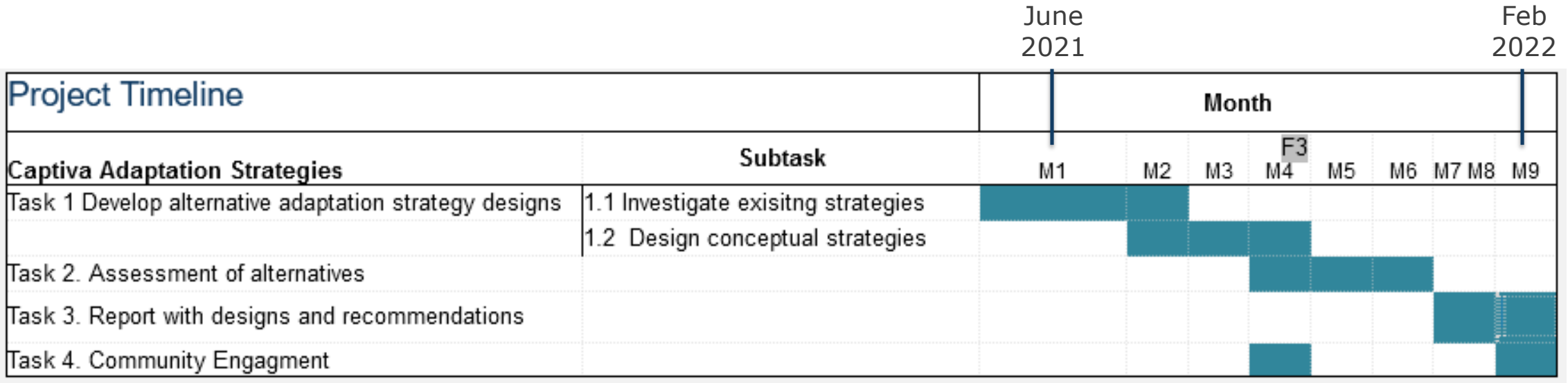
Bio – Dr. Cheryl Hapke

- Ph.D. in Coastal Geology, UC Santa Cruz
- 22 years with U.S. Geological Survey studying coastal change hazards and vulnerabilities (early retirement in 2019)
- Integral Consulting: Coastal Resilience lead, East and Gulf Coasts
  - Working with communities and coastal facilities to understand and model coastal hazards, conduct vulnerability and risk assessments, and develop adaptation plans to address storm and sea level rise hazards
- Research Professor at USF College of Marine Science
- 2021 AEG Jahn's Distinguished Lecturer, also awarded a 2021 Presidential Citation from AEG
- Over 80 peer-reviewed papers, book chapters and technical reports
- Served as coastal science subject matter expert to numerous local, state and federal agencies

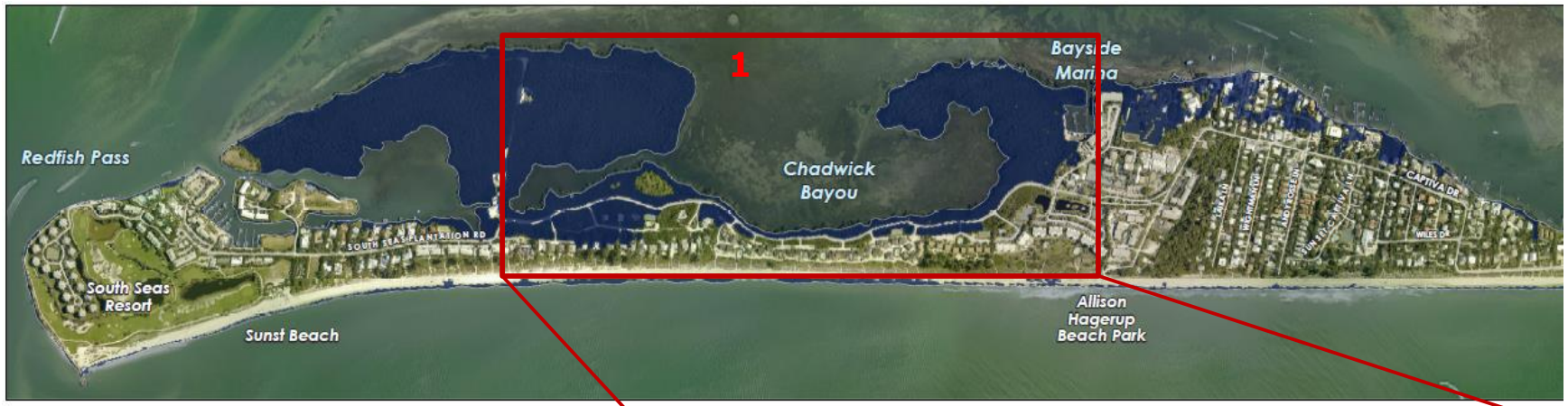
Background and Scope

- Project initiated following Integral's completion of a baseline sea level rise (SLR) vulnerability assessment (1, 2, and 4 ft of SLR)
- Vulnerability assessment *only included SLR*, not storms: have submitted 3 grant proposals to conduct full assessments of both Captiva and Sanibel that include storm modelling as well as SLR
- Captiva SLR committee identified 5 priority areas on bayside of island
- Committee funded Integral to develop conceptual adaptation designs for 2 ft of SLR for each of 5 bayside priority areas
- Integral presented designs to SLR committee (iterative process); currently working on a technical memorandum that will be available to the community

Timeline



Vulnerability Assessment 2 ft SLR

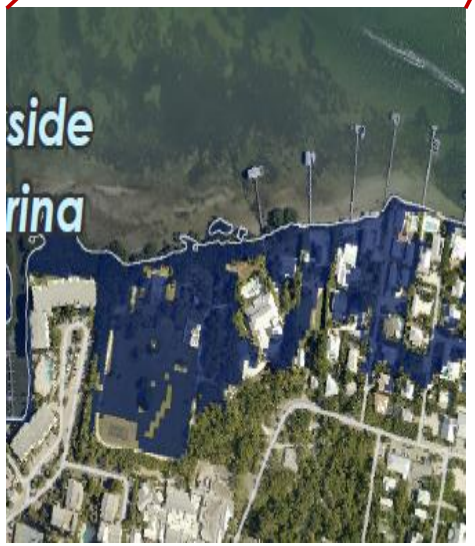


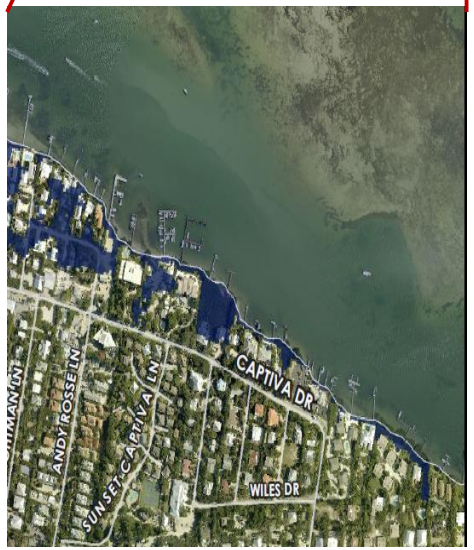
Site characteristics

- Low wave exposure
- Large accommodation space
- Low gradient
- Low tidal flow
- Protective seagrass beds/shoals

Site characteristics

- High potential exposure to waves
- Moderate accommodation space
- Some tidal flow impacts
  - (3>2)
- Depth variations
- Different orientations





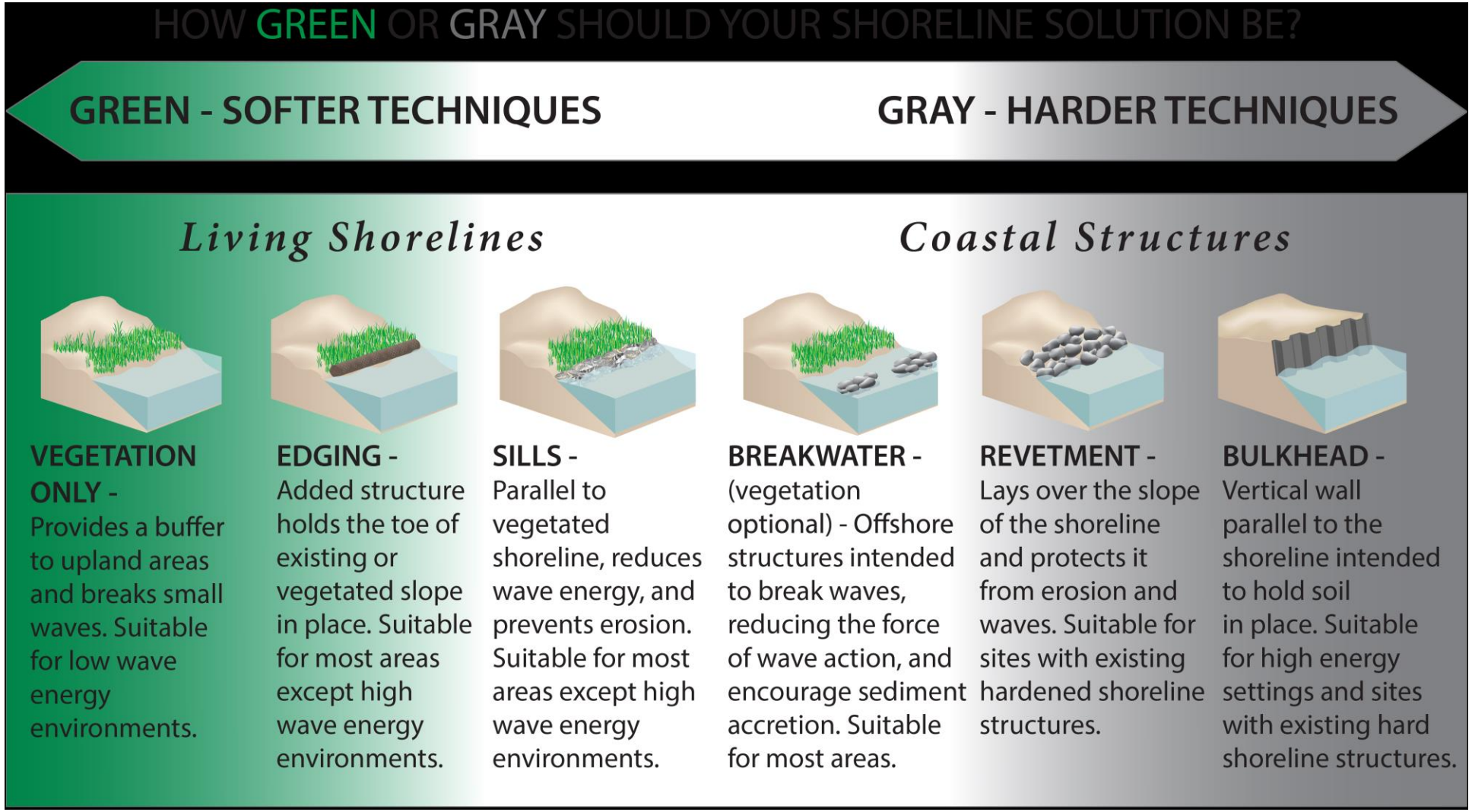
Site characteristics

- No exposure to waves
- Tidal flow impacts
- Little accommodation space

Site characteristics

- Moderate exposure to waves
- Large tidal flow impacts
- Little accommodation space

Gray vs. Green Adaptation Solutions



Conceptual Designs

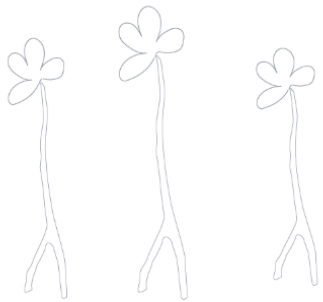
- Considered green and gray options (living shorelines through seawalls)
- Evaluated designs/design elements based on:
  - Efficacy
  - Economics
  - Sustainability
  - Impacts on nature
  - Consistency with Captiva Plan
  - Permitable in an aquatic preserve
- Elements are interconnected, designed to be used together and complement one another
- All adaptation strategies will require maintenance through time

Design Elements

Mangrove seedling = individual mangrove seedlings

Purpose: inexpensive approach to encourage mangrove recovery and propagation

Where: locations with low exposure to waves and tidal flow or that are protected from waves and flow by other features (i.e. sediment berms)



Young mangrove = small but established mangrove trees

Purpose: restores mangroves and encourages propagation

Where: locations where mangroves have been removed or heavily cropped/thinned; locations where tidal flow is too high for mangrove seedlings; to enhance and encourage seedlings to propagate

Design Elements

Salt tolerant vegetation = landscaping option

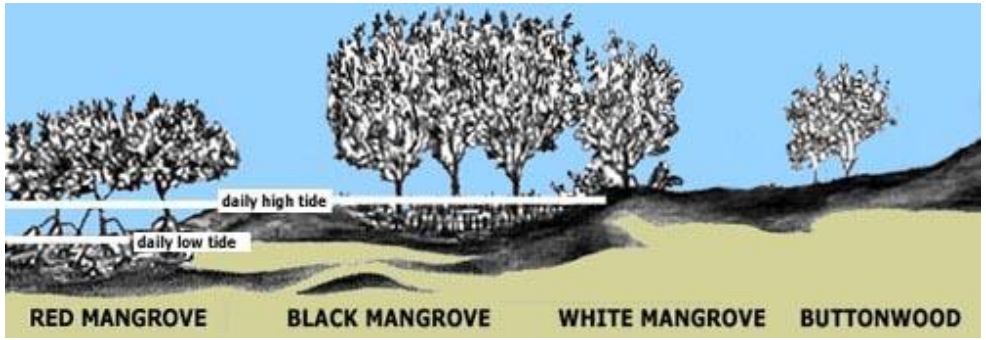
Purpose: provides root system to hold elevated fill in place; provides aesthetics landward of seawalls

Where: landward locations to where no plantings exist or where land surface has been elevated with fill

Upland (black) mangroves = mangrove varietals that exist higher in the intertidal zone

Purpose: restores natural landward mangrove fringe; creates more diverse mangrove forest

Where: landward locations where mangroves have been removed or heavily cropped/thinned

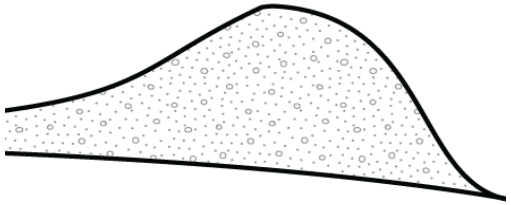


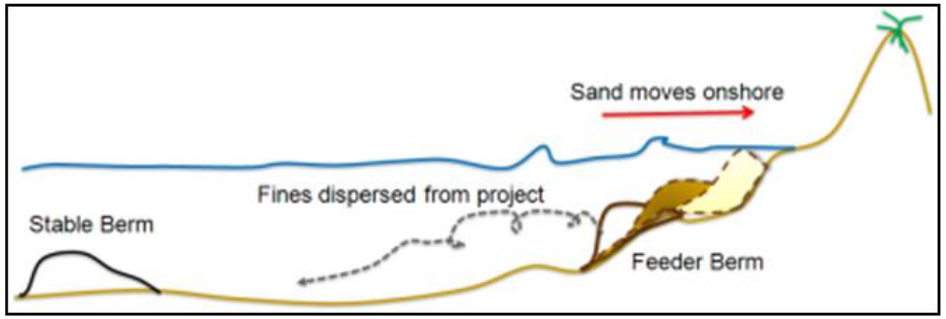
Design Elements

Protective berm or feeder berm = sand or silt dependent on its purpose

Purpose: provide protection of living shoreline components (i.e. mangrove seedlings), and acts as feeder berm to provide additional sediment to encourage mangrove propagation landward of the berm

Where: applicable in all types of environments except for where there is strong tidal flow (i.e. Blind Pass)

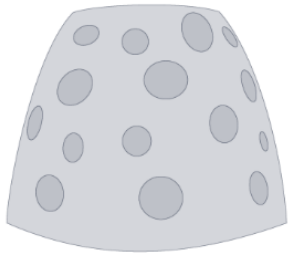




Reef balls = portable fiberglass mold, filled with concrete

Purpose: protection from erosion; supports marine life, recruitment

Where: areas of high tidal flow and medium wave exposure

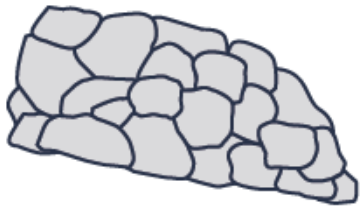


Design Elements

Rock sill = cobbles

Purpose: provide protection for sediment berm from wave and current erosion

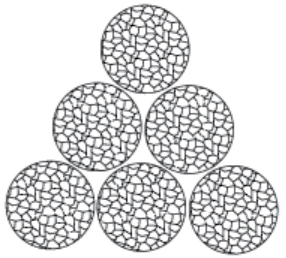
Where: locations where exposure to waves and tidal flow is medium to high



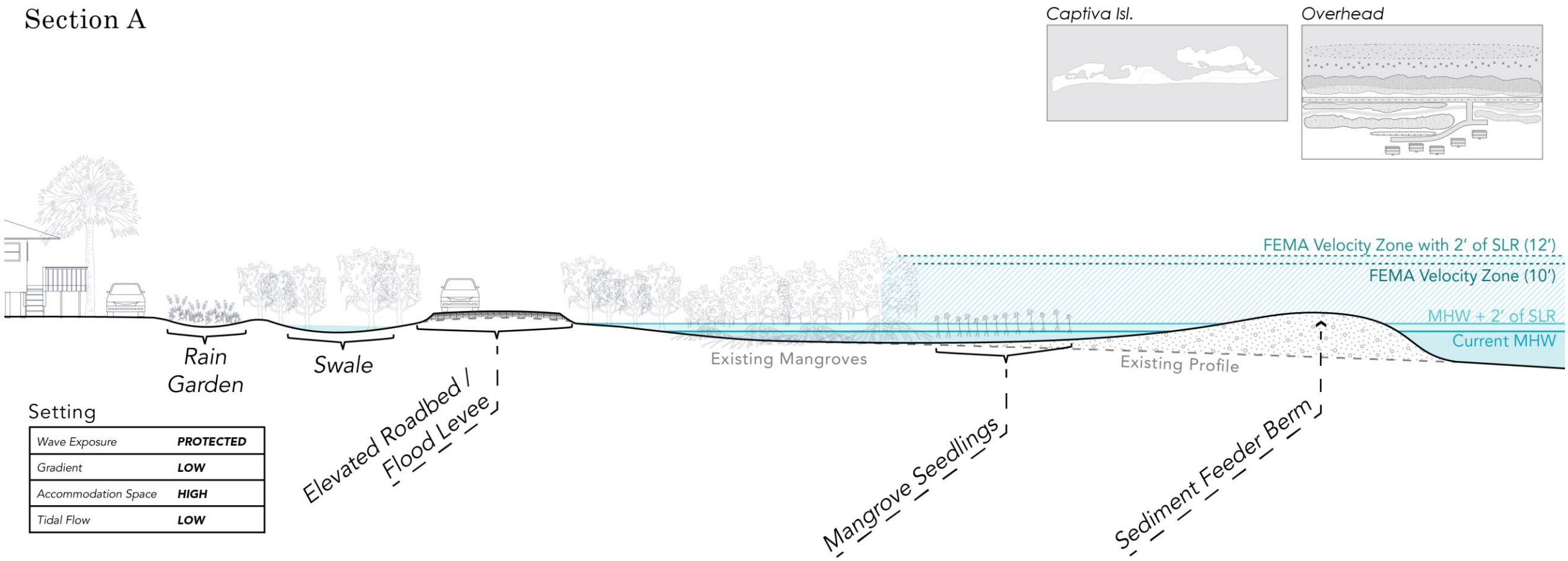
Coir logs (natural material)

Purpose: provide core reinforcement to protective sediment berm or feeder berm

Where: locations where exposure to waves and tidal flow is medium to high



Conceptual Designs - Section A



Priority Area 1: Chadwick Bayou

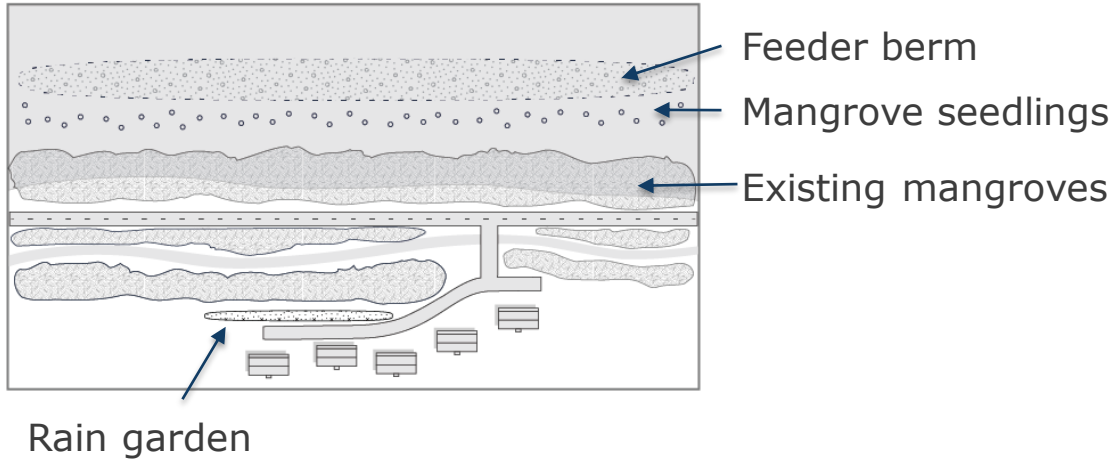
Conceptual Designs - Section A

Priority Area 1: Chadwick Bayou

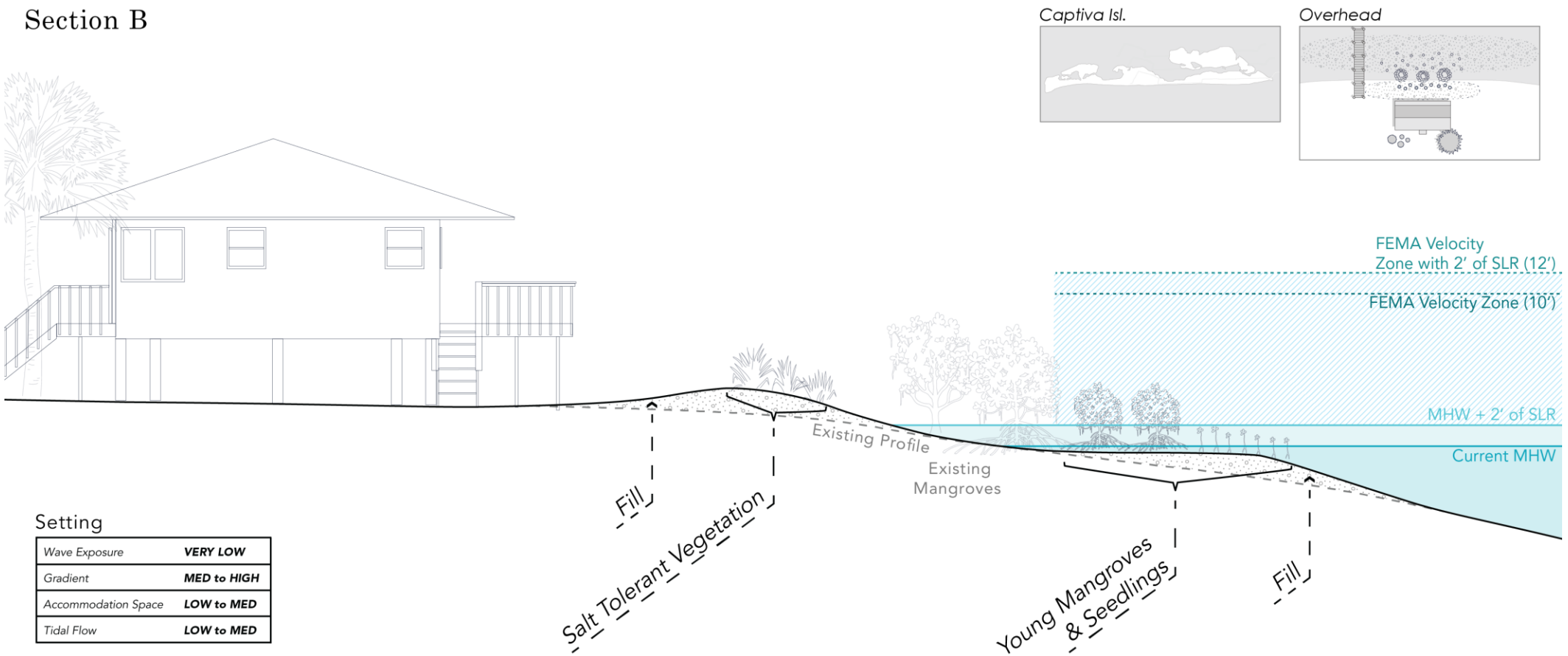
Setting

Wave Exposure	***PROTECTED***
Gradient	***LOW***
Accommodation Space	***HIGH***
Tidal Flow	***LOW***

Overhead



Conceptual Designs - Section B



Priority Area 4: Buck Key

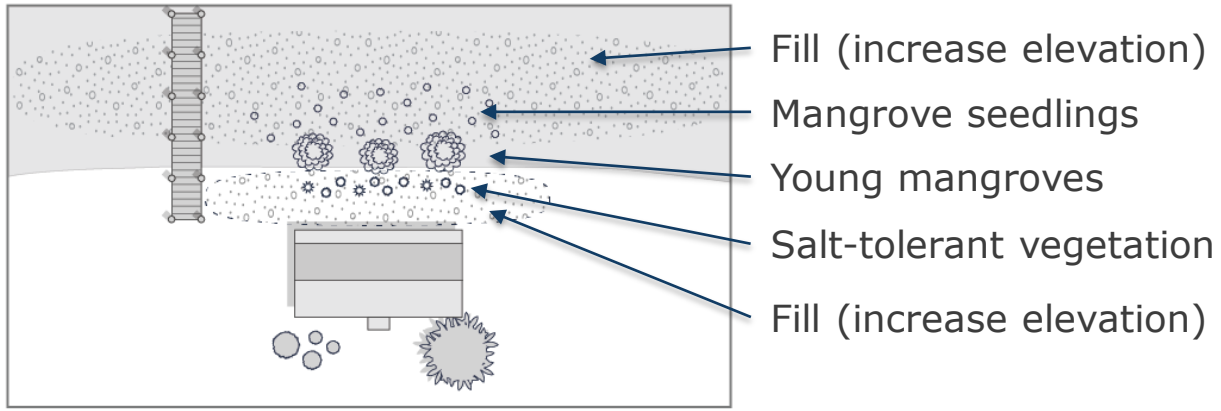
Conceptual Designs - Section B

Priority Area 4: Buck Key

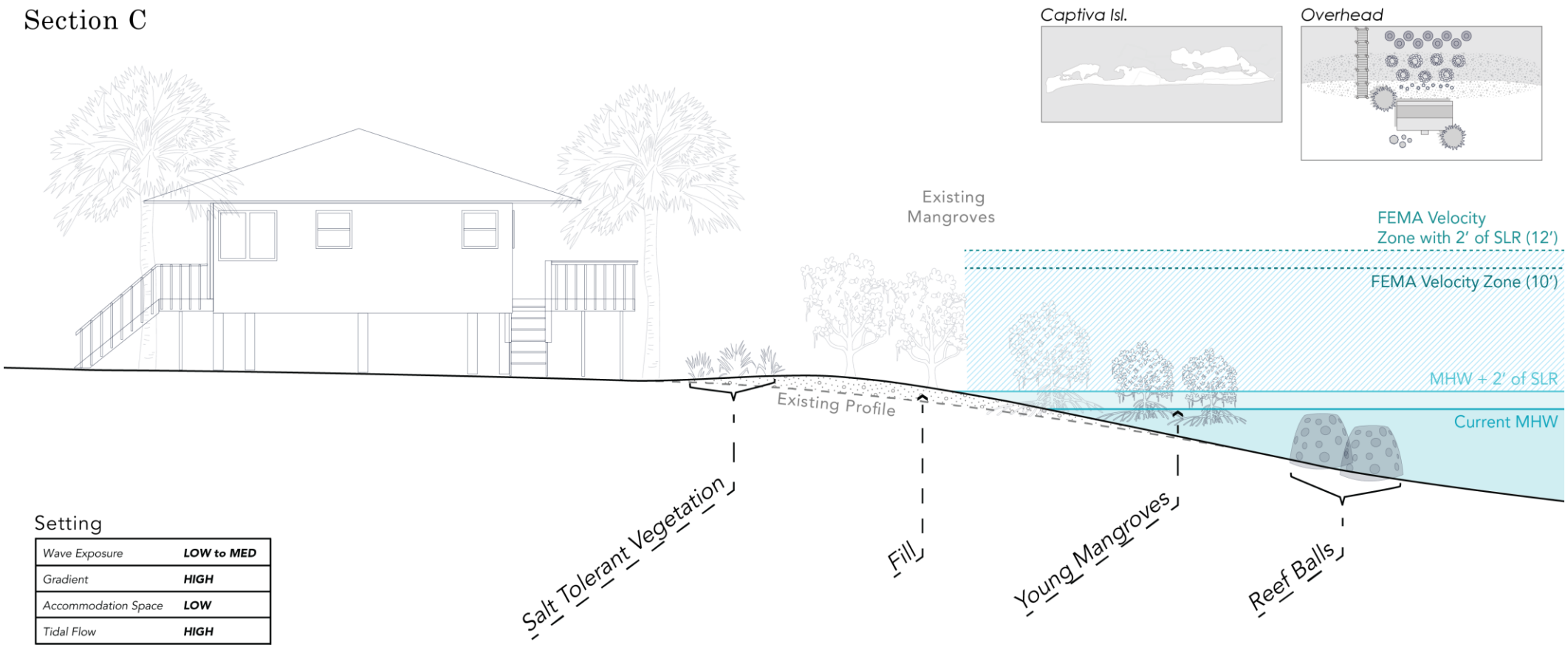
Setting

Wave Exposure	***VERY LOW***
Gradient	***MED to HIGH***
Accommodation Space	***LOW to MED***
Tidal Flow	***LOW to MED***

Overhead



Conceptual Designs - Section C



Priority Area 5: Blind Pass

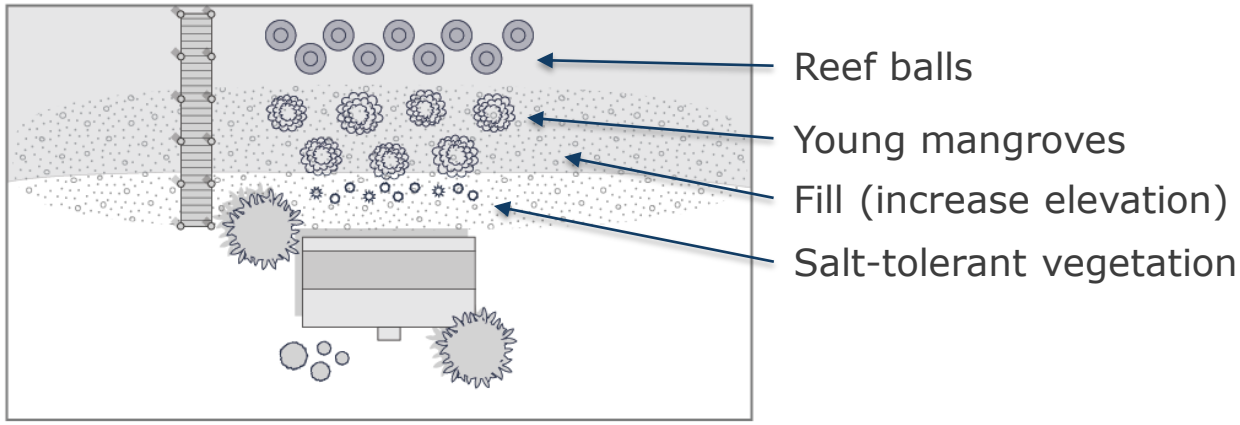
Conceptual Designs - Section C

Priority Area 5: Blind Pass

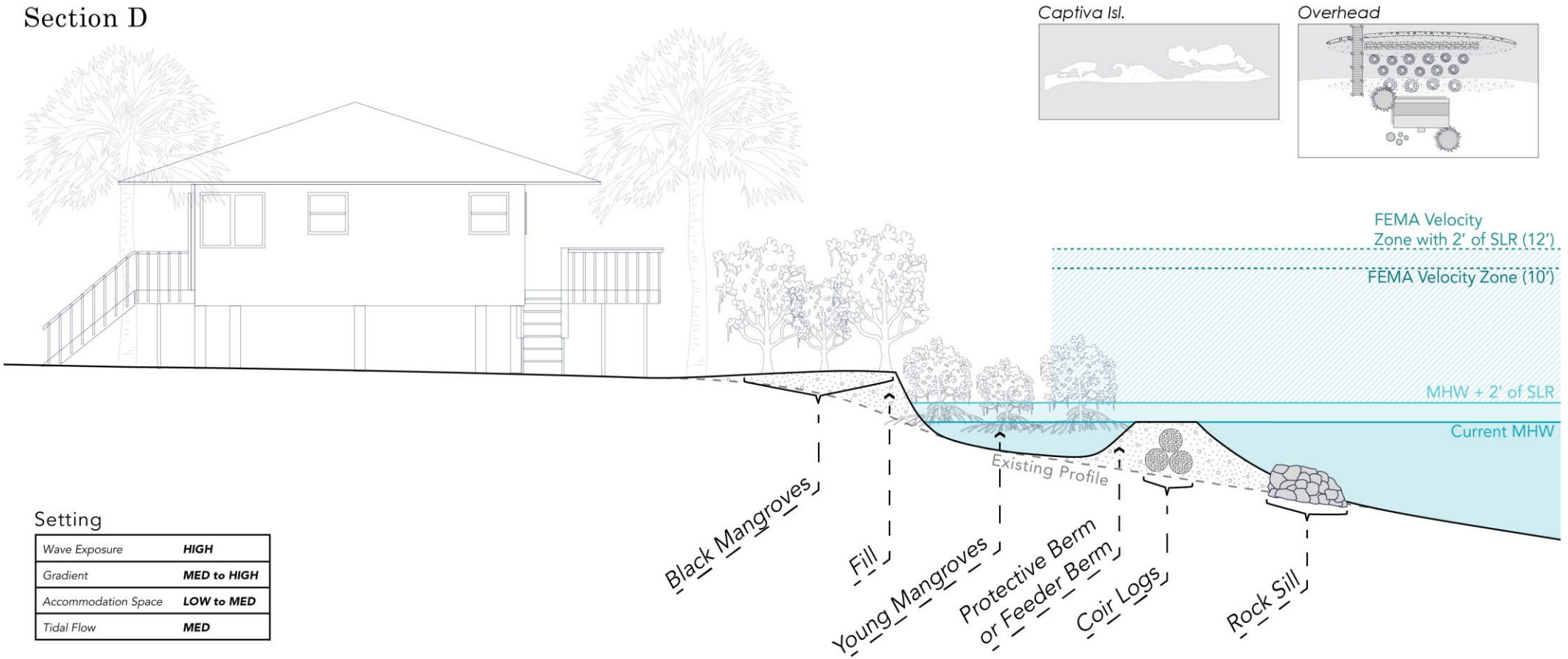
Setting

Wave Exposure	***LOW to MED***
Gradient	***HIGH***
Accommodation Space	***LOW***
Tidal Flow	***HIGH***

Overhead



Conceptual Designs - Section D



Priority Area 2 or 3: Village, no existing seawall

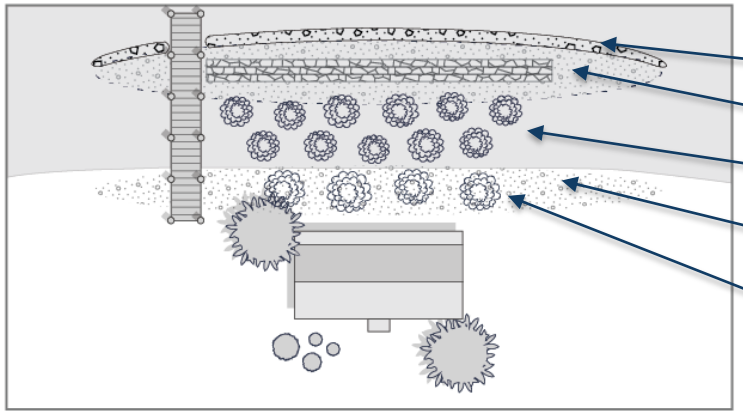
Conceptual Designs - Section D

Priority Area 2 or 3: Village, no existing seawall

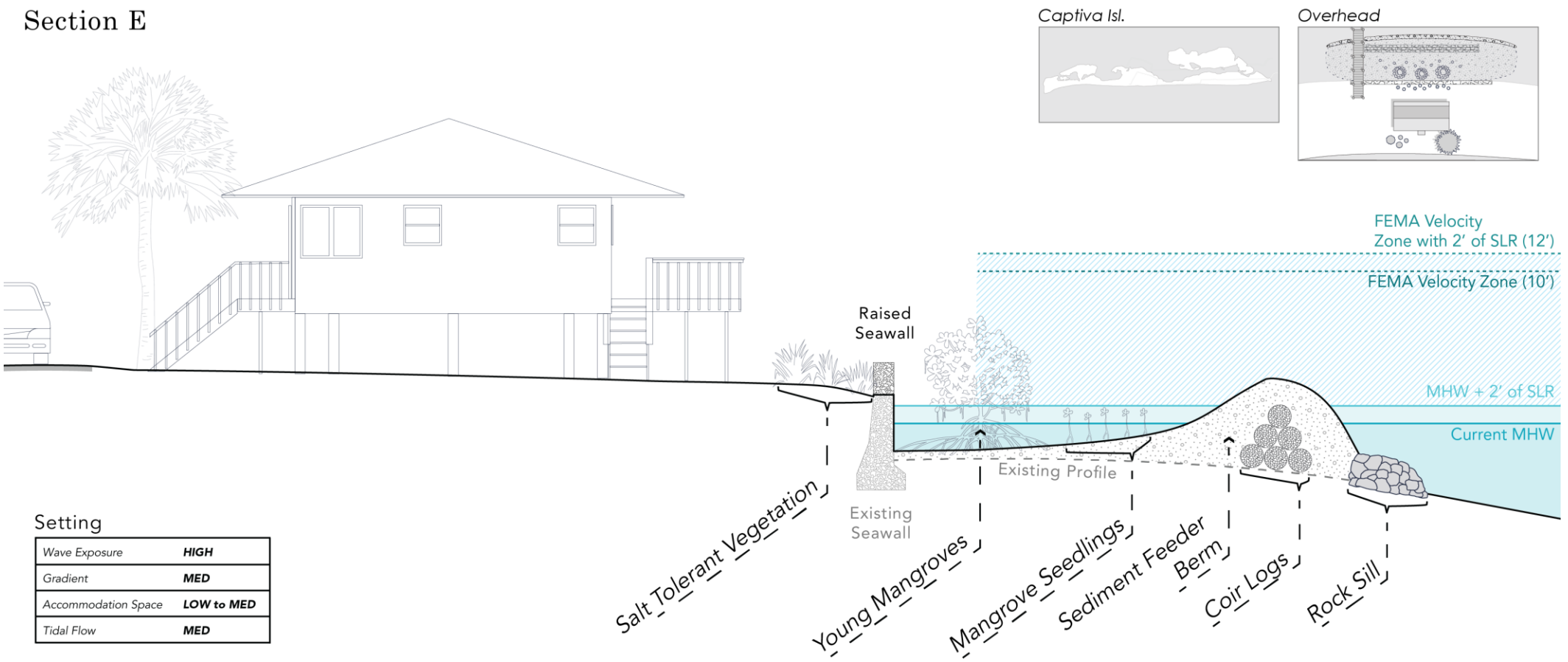
Setting

Wave Exposure	***HIGH***
Gradient	***MED to HIGH***
Accommodation Space	***LOW to MED***
Tidal Flow	***MED***

Overhead



Conceptual Designs - Section E



Setting

Wave Exposure	**HIGH**
Gradient	**MED**
Accommodation Space	**LOW to MED**
Tidal Flow	**MED**

Priority Area 2 or 3: Village, seawall

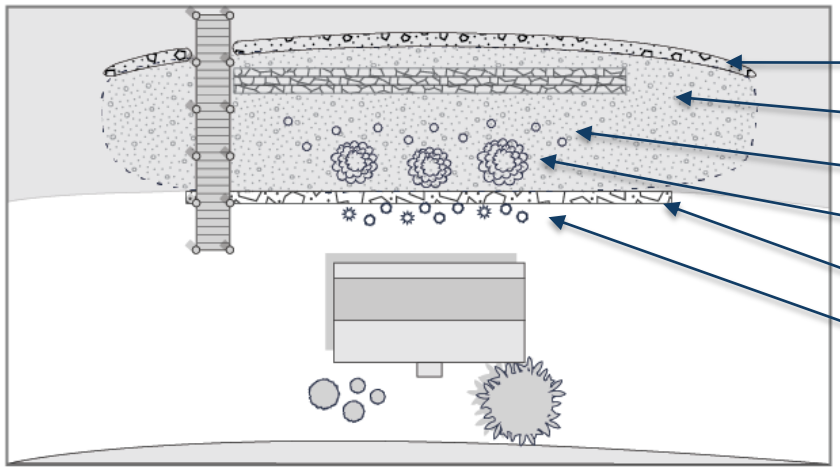
Conceptual Designs - Section E

Priority Area 2 or 3: Village, seawall

Setting

Wave Exposure	***HIGH***
Gradient	***MED***
Accommodation Space	***LOW to MED***
Tidal Flow	***MED***

Overhead



- Rock sill
- Feeder berm with coir logs
- Mangrove seedlings
- Young mangroves
- Seawall (opt. increase height)
- Salt tolerant vegetation

Summary

- Conceptual designs to evaluate a variety of adaptation options
- Intended to be interconnected – the elements work together for best success
- Consideration of what would be permitable in an aquatic preserve
- Intended to address SLR of 2 ft, but designs do incorporate some storm protection features
- Maintenance will be required throughout history of project, similar to Gulf beach nourishment

Questions?