SITKA SEDGE STATE NATURAL AREA: DIKE AND FISH PASSAGE ALTERATION RESEARCH HISTORY AND RESULTS

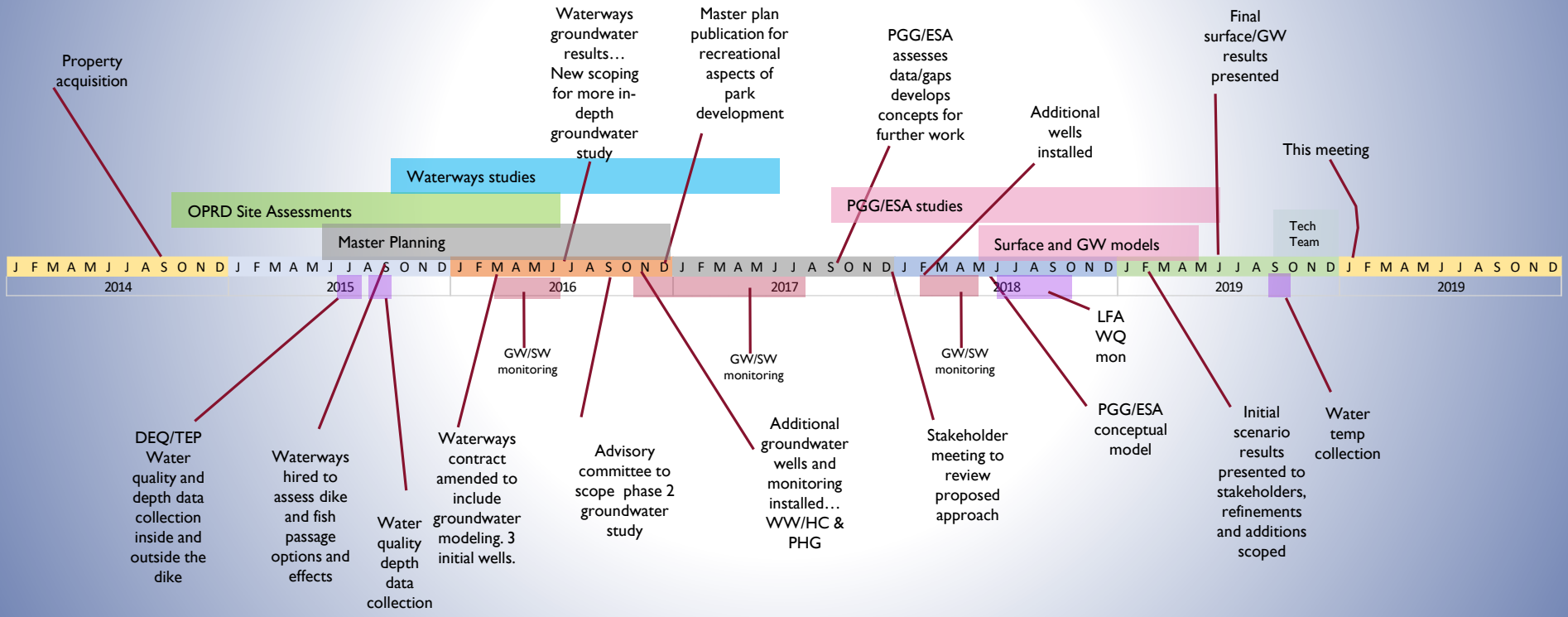
Location


Sand Lake
BELTZ DIKE
Tide Gate
Beltz Marsh
Renee's Creek
Bells Creek
Tierra Del Mar Ditch
Tierra Del Mar
Small Lake Road Ditch
"East Marsh"
"No Name Creek"
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

The Problem and Need

- Current tide gate is failing
  - Boards on the flap are missing
  - The dike is eroded around the box culvert and wing walls
  - The box culvert itself appears to be compromised
  - The amount of work that would need to be done to repair and stabilize the existing gate would trigger fish passage regulations that would not allow the use of the current old-model structure
- Current tide gate is undersized
  - The 4' x 4' opening is insufficient to efficiently drain stormwater during major storms – resulting in backed up water inside the dike
- Current tide gate restricts fish passage to Reneke, Beltz, and No-name Creeks as well as to the marsh behind the dike

Approximate timeline



Background and History

What has been studied:

- Modeling of surface water response to dike modification scenarios:
- Assessment of groundwater interaction with surface water, and modeling of response of TDM groundwater in response to dike modification scenarios
- Habitat change modeling in response to dike modification scenarios
- Current vegetation and habitat composition, condition, conservation value assessment
- Wildlife value and effects assessment
- Recreational use and development concepts
- Water quality characteristics – 2015 early and late summer 2019 temperature.
- 2018 Limiting Factors Analysis summer-fall.
- Sediment accretion rates in the Sand Lake Estuary (OSU, in progress)

Background and History

Outreach and public involvement:

Meetings open to the public and advertised on the website and through mailing list

- Master Plan process
  - 2 public meetings August 2015
  - 2 public meetings in January 2016
  - 3 public meetings in May 2016
- OPRD/Tierra Del Mar outreach meeting between Scott Nebeker and TDM
- Surface and Groundwater assessment scope development meeting September 2016
- Hydrology study: presentation of approach and refined scope to stakeholders December 2016/January 2017
- Hydrology study: presentation of site characterization and modeling kickoff with stakeholder
- Hydrology Study: presentation of findings of initial modeling, selection of next modeling steps with stakeholders
- Hydrology study: presentation of final results to stakeholders
- Technical Team alternatives characterization, review, and scoring kickoff meeting
- Technical team alternatives characterization, review, and scoring meeting #2
- Technical team alternatives characterization, review, and scoring meeting number 3
- Technical Team alternatives characterization, review, and scoring meeting #4

In all, at least 17 stakeholder meetings advertised and open to the public

Media

- news releases
- Website
- Email list release of notes and availability of materials on the website

Other

- Meetings with adjacent landowners: Avolio & Lilly/Rawls family
- Frequent ongoing email collaboration and correspondence with TDM Neighborhood Association, interested landowners

Alternatives

No action/ existing condition – reference condition

Dike breach – 40’ bottom width, 80’ top width, or larger

Replace existing tide gate with modern muted tidal regulator– two 10’ wide by 8ft’ tall gates with 7 or 8’ closure valve… Reneke inside or outside… location…

Setback dike- construct new dike closer to TDM that includes a modern tide gate, then breach the old dike… tide gate style/sizing/closure settings… location…

Findings: Surface Water

EXISTING GATE:

- The existing tide gate results in backed up water during major storms and high tides due to inefficient drainage. Under extreme conditions the existing tide gate can back up very high water for up to several days

BREACH:

- A breach would result in frequent inundation of areas within the range of the high tide. Tides over 8 feet would inundate portions of two private properties adjacent to the marsh in TDM

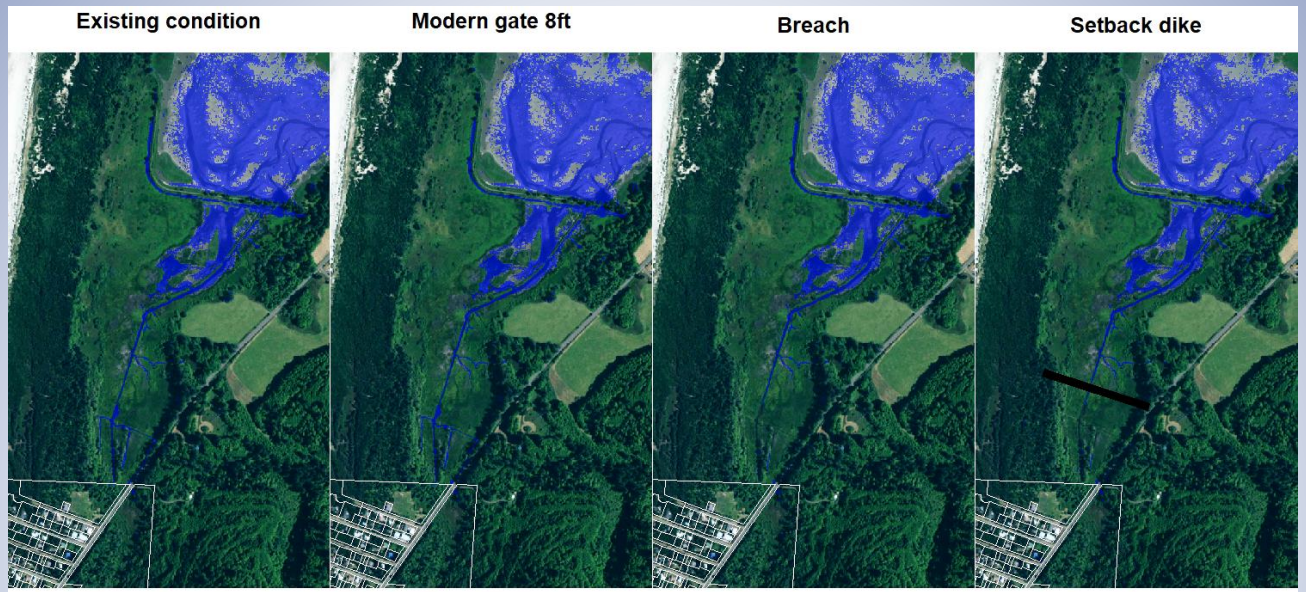
MODERN TODE GATE:

- Modern muted tidal regulator tide gates limit tides inside the dike to a selected set-point.
- A 7 foot closure point would result in lower water levels than the current tide gate and would not frequently overtop the banks of the tidal channels – limiting habitat benefits for fish.
- An 8 foot closure setting would approximate current marsh habitat characteristics and would frequently overtop tidal channel banks, but would not reach the same highest elevations as the existing tide gate

SETBACK DIKE :

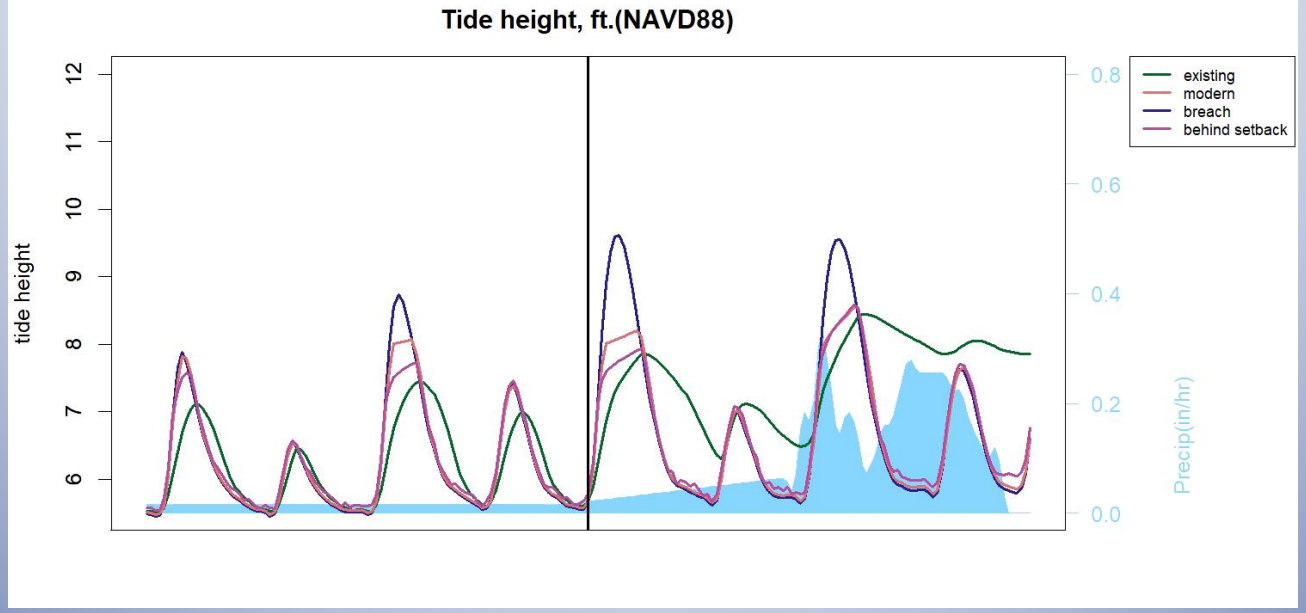
- A setback dike would result in estuary conditions north of the setback dike, and would result in maintained low water surface elevations south of the setback dike

Findings: Surface Water



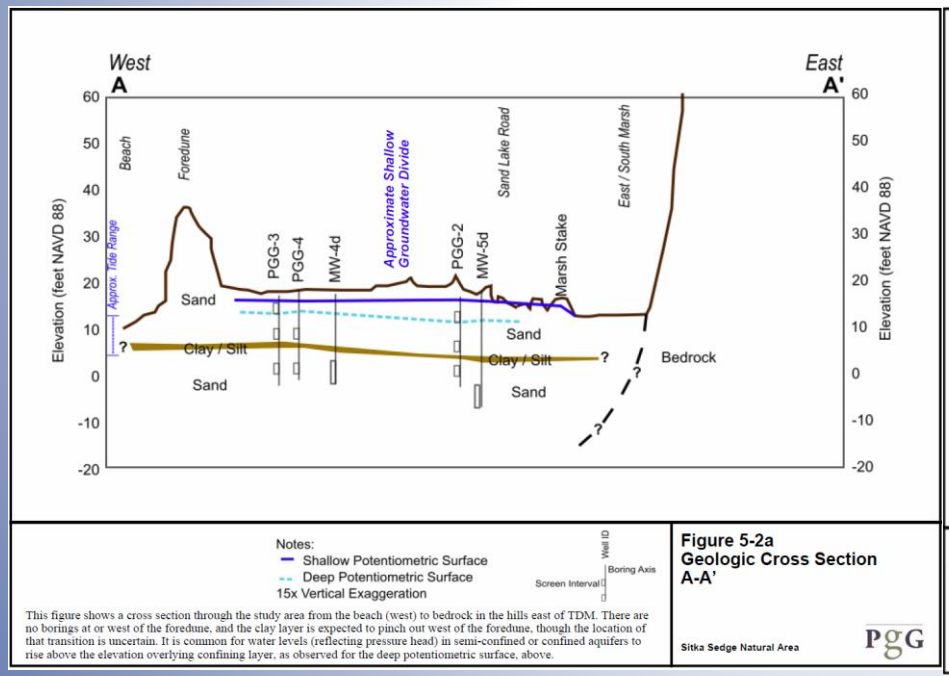
Ave

Storm/King

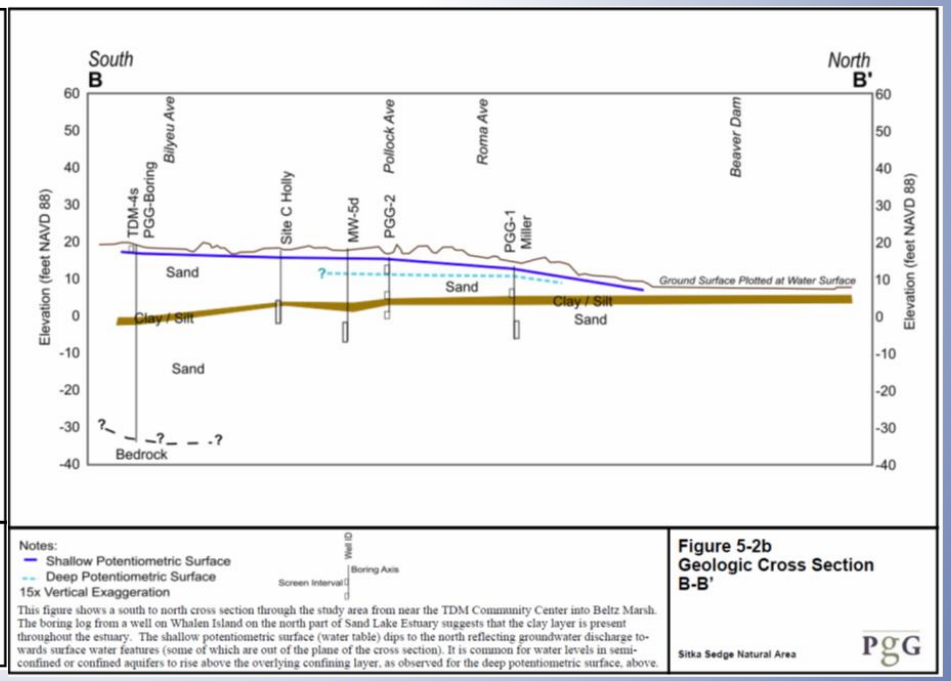


Findings: Ground Water

- 2 aquifers separated by a clay layer
- The surface aquifer is the primary interest due to it's effect on septic systems and stormwater issues



East-west cross section



North-south cross section

Findings: Ground Water

- The groundwater interacts with surface water, but slowly.
- **Effects of tidal water in Beltz Marsh on groundwater in TDM**

  <u>During average tides</u>

  - BREACH: a breach might result in up to ¼ inch increase in water table elevation relative to the existing condition
  - MODERN TIDE GATE OR SETBACK DIKE: likely a small decrease in water table elevation relative to the existing condition

  <u>During a major storm and tide event</u>

  - BREACH: a breach might result in up to a 2 inch decrease in water table elevation relative to the existing tide gate due to the existing tide gate's effect of backing up water for days
  - MODERN TIDE GATE OR SETBACK DIKE: A modern tide gate or setback dike with a modern tide gate would similarly result in a decreased water table elevation relative to the existing tide gate

Comparison of Alternatives

No-action (leaving the dike and tide gate exactly how they are)

Pros:

- **None.**

Cons:

- **The existing dike is the worst fish passage barrier among the alternatives.**
- **It is likely to collapse in the near future.**
- **It causes extreme stormwater retention and elevated groundwater in TDM during major storms.**
- **It results in prolonged inundation of private property during a large storm and tide event.**

Comparison of Alternatives

Dike breach

Pros:

- **Highest degree of fish passage and habitat improvement.**

Cons:

- **Increased frequency of inundation of two private properties.**
- **Potentially lower protection from storm surge with sea level rise.**
- **Local public concern.**
- **Increased the frequency of flooding on Sand Lake Road .**
- **Recreational access impacts.**

Comparison of Alternatives

Modern tide gate (7ft closure setpoint)

Pros:

- **Decreased inundation of two private properties.**
- **Improved fish passage for juvenile and adult salmon.**
- **Creation of freshwater habitats would benefit some species**

Cons:

- **No improvement of estuarine habitat.**
- **Reduced juvenile salmon rearing habitat *relative to all other scenarios*.**
- **Mechanically complex structure requiring maintenance and has limited life span.**
- **Community protection only until sea level rise overtops levee.**

Comparison of Alternatives

Modern tide gate (8ft closure setpoint)

- **Pros:**
  - **Decreased inundation of the two private properties.**
  - **Improved fish passage for juvenile and adult salmon.**

- **Cons:**
  - **No or only minor improvement of estuarine habitat.**
  - **Low lying wetland plant communities would be similar to existing, with increased uplands above 9'.**
  - **Intermediate-quality juvenile salmon foraging habitat**
  - **Mechanically complex structure requiring maintenance and has limited life span.**
  - **Community protection only until sea level rise overtops levee.**

Comparison of Alternatives

Construction of a modern setback dike

Pros:

- Fish passage and rearing habitat benefits second only to those of the breach scenario.
- Higher protection to TDM than the existing dike.
- Stormwater drainage from TDM comparable to Modern Tide Gate Scenarios.
- Requires much smaller tide gate.

Cons:

- Would be constructed through high value wetland habitat.
- Includes a mechanical tide gate structure.
- Recreation impacts
- Most expensive option (in terms of construction costs only) .

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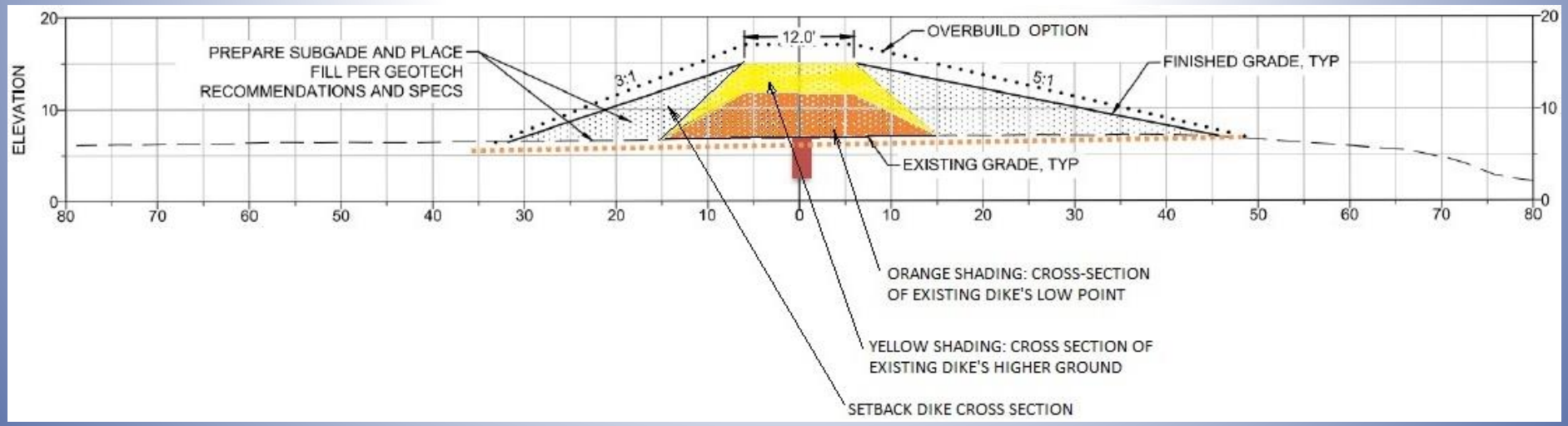

Next steps…