Restoration Strategies Science Plan

Use of Soil Amendments/Management to Control P Flux

Quarterly Long-term Plan Meeting
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Study Hypothesis

- Reducing the flux of phosphorus (P) from the soil to the water column in an operating STA will lead to a reduction of P concentration in surface water at the outflow

Key Study Question

- How can internal loading of phosphorus to the water column be reduced or controlled, especially in the lower reaches of the treatment trains?

Original Study Design

- Conducted in three phases with a ***STOP-GO*** decision to proceed after Phases I and II
- Phase I
  - Expand preliminary literature review
  - Summarize relevant past SFWMD studies
  - Conduct a feasibility assessment to the extent practicable
- Phase II
  - Conduct small-scale short-term screening experiments based on Phase I results
- Phase III
  - Conduct large-scale long-term field trials based on Phase II results, need this scale for obtain design information

Study Components

- Soil Amendments
  - Natural minerals, manufactured materials, waste by-products [adsorption/precipitation]
  - ~~Wood chips~~ [carbon source]
- Soil Management Techniques
  - Soil inversion
  - Soil capping
  - ~~Soil removal~~

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Draft Phase I Report

- Literature review – soil amendments
  - 100+ materials identified
  - Many inorganic materials containing Al, Fe, Ca or Mg will sequester P to some degree
  - Cannot cross-compare different studies due to differences in study methodology & conditions
  - Most studies were short-term, small-scale and tested high P wastewater or farm runoff
  - The few long-term data available demonstrate that soil amendments become saturated over time and lose effectiveness to remove P

Draft Phase I Report (cont.)

- Literature review – soil management
  - Soil capping [reactive materials (e.g., alum)] and soil removal are used in lake management
  - SJRWMD wetland soil capping demo (Hoge et al., 2003) – 2-ac cells
  - Soil inversion and soil removal proposed for nutrient management in agricultural systems & treatment wetlands, respectively

Draft Phase I Report (cont.)

- Relevant District studies
  - Chimney et al. (2007) – soil cores/Reclime®
  - CH2M Hill (2003) - mesocosms
  - PSTA Field-scale cell (5 ac) – limerock cap
  - PSTA Field-scale cell (5 ac) – soil removal
  - STA-3/4 PSTA cell (100 ac) –soil removal
  - Soil inversion field-scale demonstrations for Cu & P remediation

Draft Phase I Report (cont.)

- Feasibility assessment
  - Constructability – no foreseen problems
  - Treatment Efficacy – found no published case studies on long-term effectiveness of soil amendments/management in treatment wetlands; District studies small-scale, short-term and/or did not experience large storm pulses
  - Operations & Regulatory Issues – nothing foreseen that would prohibit using these technologies

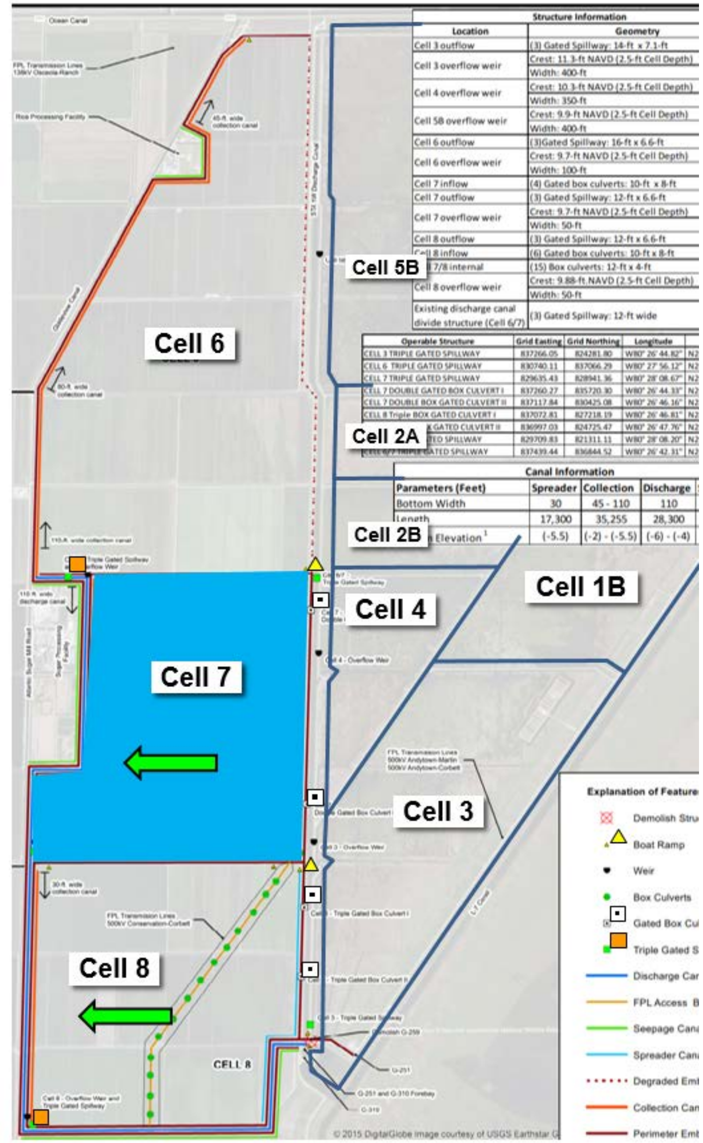
Draft Phase I Report (cont.)

- Feasibility assessment (cont.)
  - Economics
    - Costs were estimated for revised large-scale test facilities (infrastructure only) and full-scale implementation of technologies
    - Two new options for large-scale tests replaced the 10-ac cells originally proposed in the detailed study plan

Large-scale Test Facilities

Option #1 – STA Expansion Area

- Test of soil inversion
- All soil in Cell 7 will be inverted to mitigate Cu
- Use Cell 8 as a control, no soil inversion
- Expansion area will be flow-capable by Dec 31, 2018
- Test only require autosamplers, estimated infrastructure cost ~ $177K



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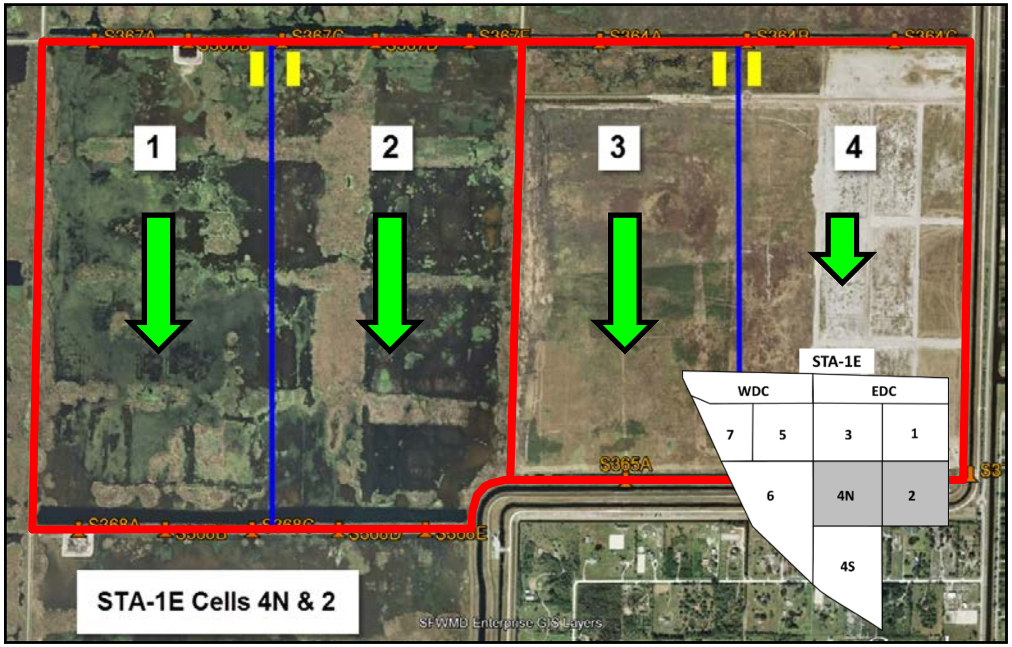
Large-scale Test Facilities (cont.)

Option #2 – Cells in existing STAs

- Partition SAV cells in STA-1E, 1W, 3/4 and 5/6
- Parallel sub-cells range in size from 48 to 612 ac
- Test 1 soil amendment, soil capping, soil inversion and control sub-cell
- Use existing inflow & outflow culverts

STA	Cost
1E	$14.3M
1W	$3.7M
3/4	$14.7M
5/6	$24.8M
Total	**$57.5M**



Full-scale Implementation

- Assumed installation in all SAV-dominated areas ~ 31,000 ac
- Soil amendments will need reapplication
- Limerock cap may need periodic maintenance

Technology	Cost
Soil Amendment[1]	$99.1M
Limerock Cap[2]	$876.4M
Soil Inversion[3]	$85.6M

1 – Cost of one application
2 – No maintenance costs
3 – One-time cost

STOP/GO Decision

- RS Science Plan Management Team
  - Proceed with Option #1 – Planning & budgeting to begin ~ Jan 2018
  - Table consideration of Option #2 for now
- RS Steering Committee
  - Concurred with the RS-SPMT STOP/GO recommendation

Link to Summary Report on SFWMD.gov

http://www.sfwmd.gov/portal/pls/portal/portal_apps.repository_lib_pkg.repository_browse?p_keywords=rsspother&p_thumbnails=no

SOUTH FLORIDA WATER MANGEMENT DISTRICT

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**Restoration Strategies Regional Water Quality Plan –
Science Plan for the Everglades Stormwater Treatment Areas:**

Soil Amendments/Management to Control P Flux

Phase I Summary Report for the Use of Soil Amendments/Management to Control P Flux Study

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