Overview Of Alcoa's Enhanced Natural Systems (ENS) Project

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Mt. Holly, South Carolina

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&

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ROUX

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Alcoa, Mt. Holly Plant

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Purpose Of Mt. Holly ENS Pilot Project

- **Identify and evaluate passive "green" technologies that can:**
  - ✓ **Enhance the stormwater quality in on-site retention ponds;**
  - ✓ **Reduce the quantity of water discharged from stormwater retention ponds;**
  - ✓ **Eliminate process water discharges to the local POTW; and**
  - ✓ **Enhance the quality of stormwater runoff from the**

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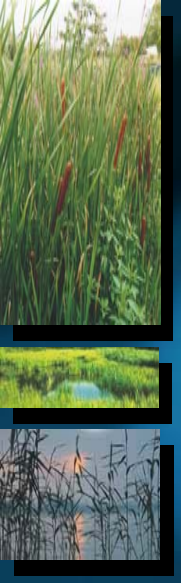

Purpose Of Mt. Holly ENS Pilot Project (continued)

- **Demonstrate the viability of using passive technologies at the Mt. Holly Site;**

- **Demonstrate the cost-effectiveness of ENS technologies; and**

- **Develop full-scale applications for Alcoa sites world-wide.**

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Zero Water Program Update

Goal: To develop/test/demonstrate zero water natural treatment systems, technologies, and minimization approaches for Alcoa use worldwide.

Focus on zero water discharge and protection of groundwater through chemical sequestration/degradation.

Partnerships between ATC, Primary Metals, Mt Holly, EHS Services, EHS Science & Technology

July 25, 2002

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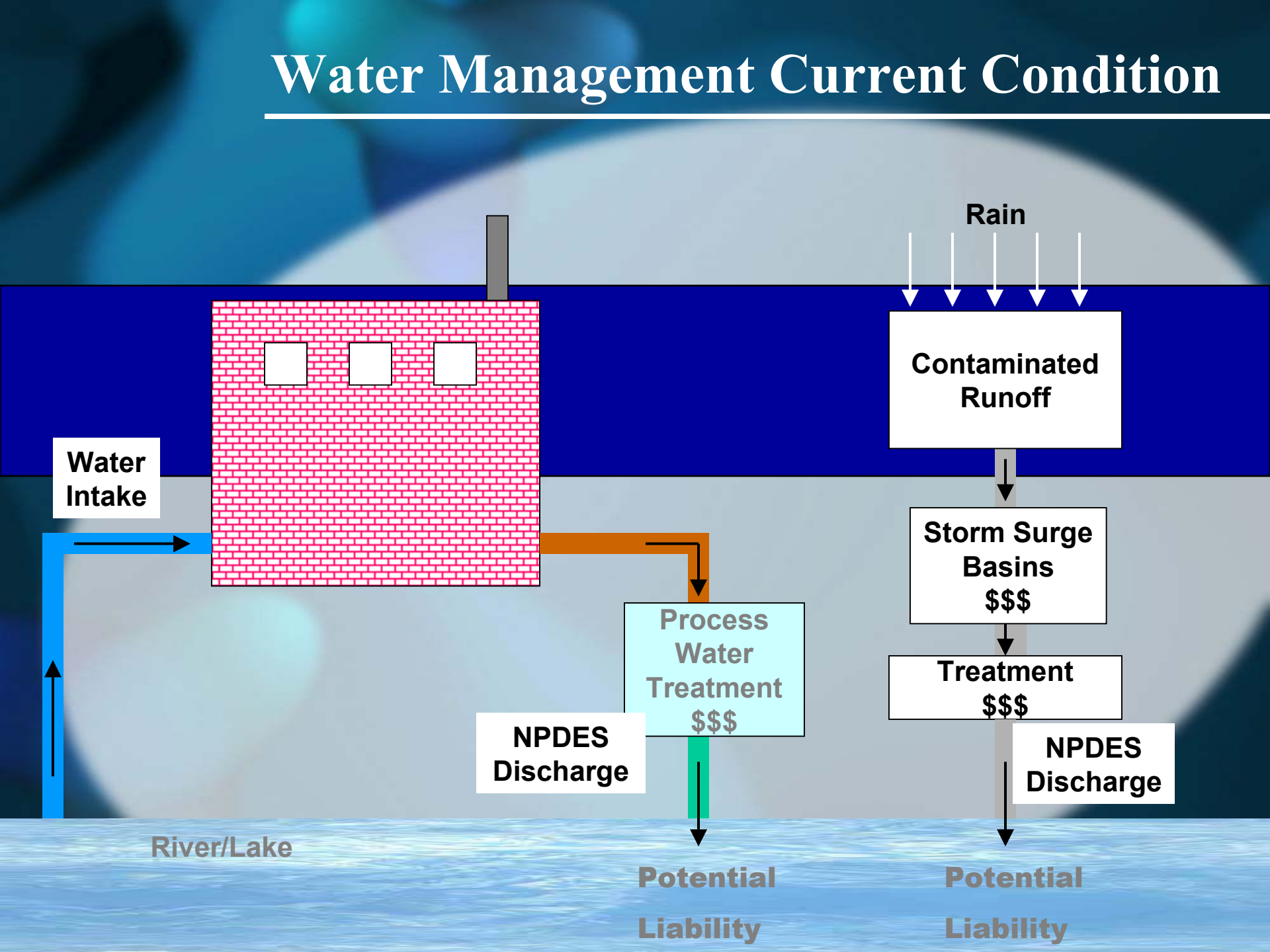
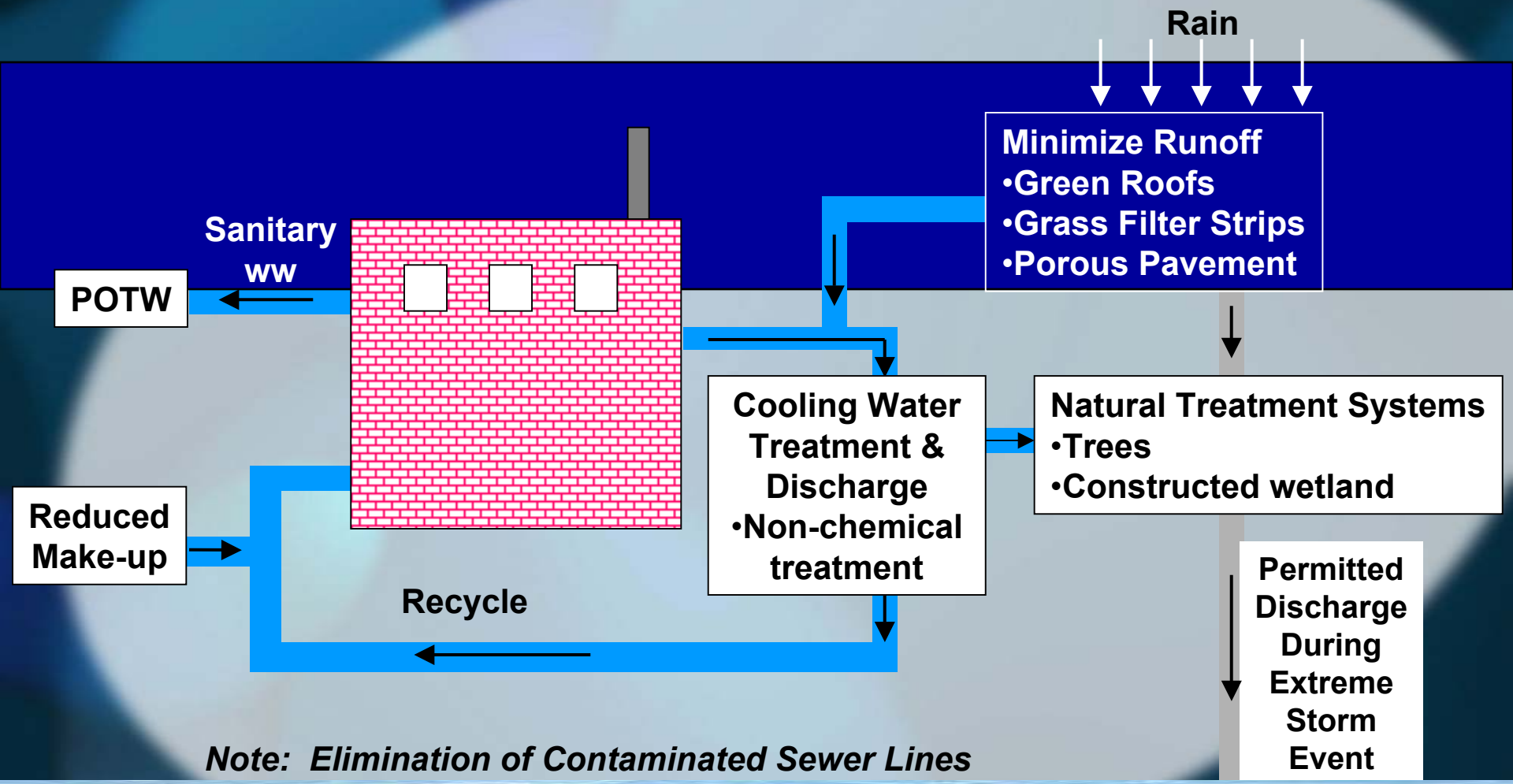
Water Management Current Condition

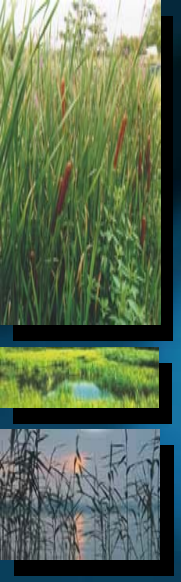


Alcoa's Zero Water Discharge Conceptual Approach (Process and Storm Waters) Future Condition



Note: Elimination of Contaminated Sewer Lines

Components Of Mt. Holly ENS Project



- **East Pond Area**
  - Constructed Treatment Wetlands (CTW
- **Former Spray Field Area**
  - Phyto Pilot Plot
  - Grass Pilot Plot
- **Pot Line Courtyard Areas**
  - Vegetative Filter Strip
  - Control Plot

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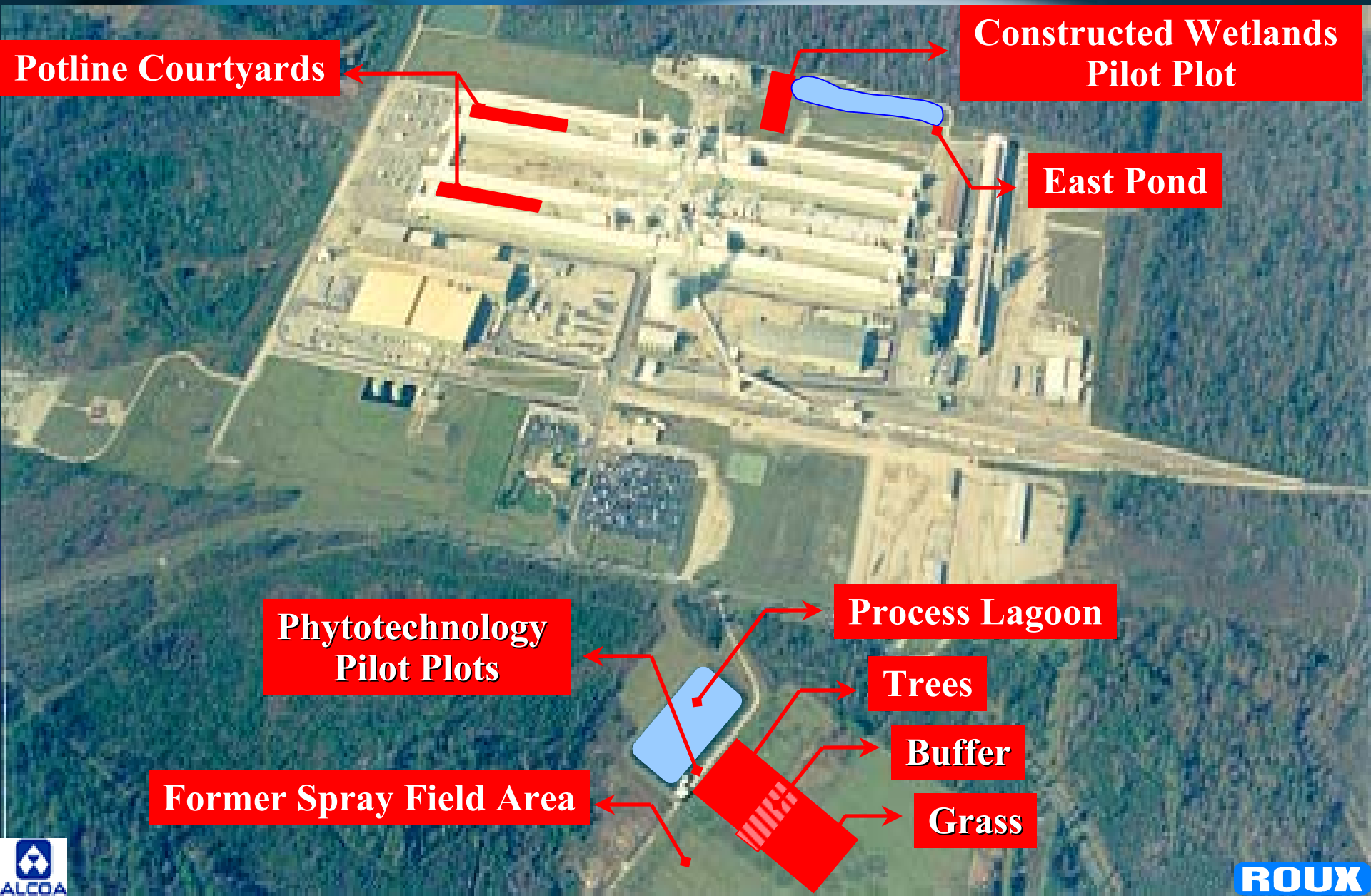
Locations Of Pilot ENS Components



East Pond ENS Pilot

CTW for Fluoride/Metals Removal

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East Pond CTW Design

Key Design Elements:

- **No. Test Cells:** 2
- **Cell Size (each):** 75' x 150' (11,250 ft²)
- **Cell Types:** Sub-Surface Flow
- **Constituents Of Interest:** Fl, As, Al, Mn, Ni, Zn
- **Treatment Sequencing and Removal Mechanisms:**
  - **Cell 1:** Fluoride removal via adsorption
  - **Cell 2:** Metals removal via sulfate reduction /co-precipitation
- **Design Flow:** 10 gpm (14,400 gpd)
- **Water Source:** East Pond
- **Discharge To:** East Pond

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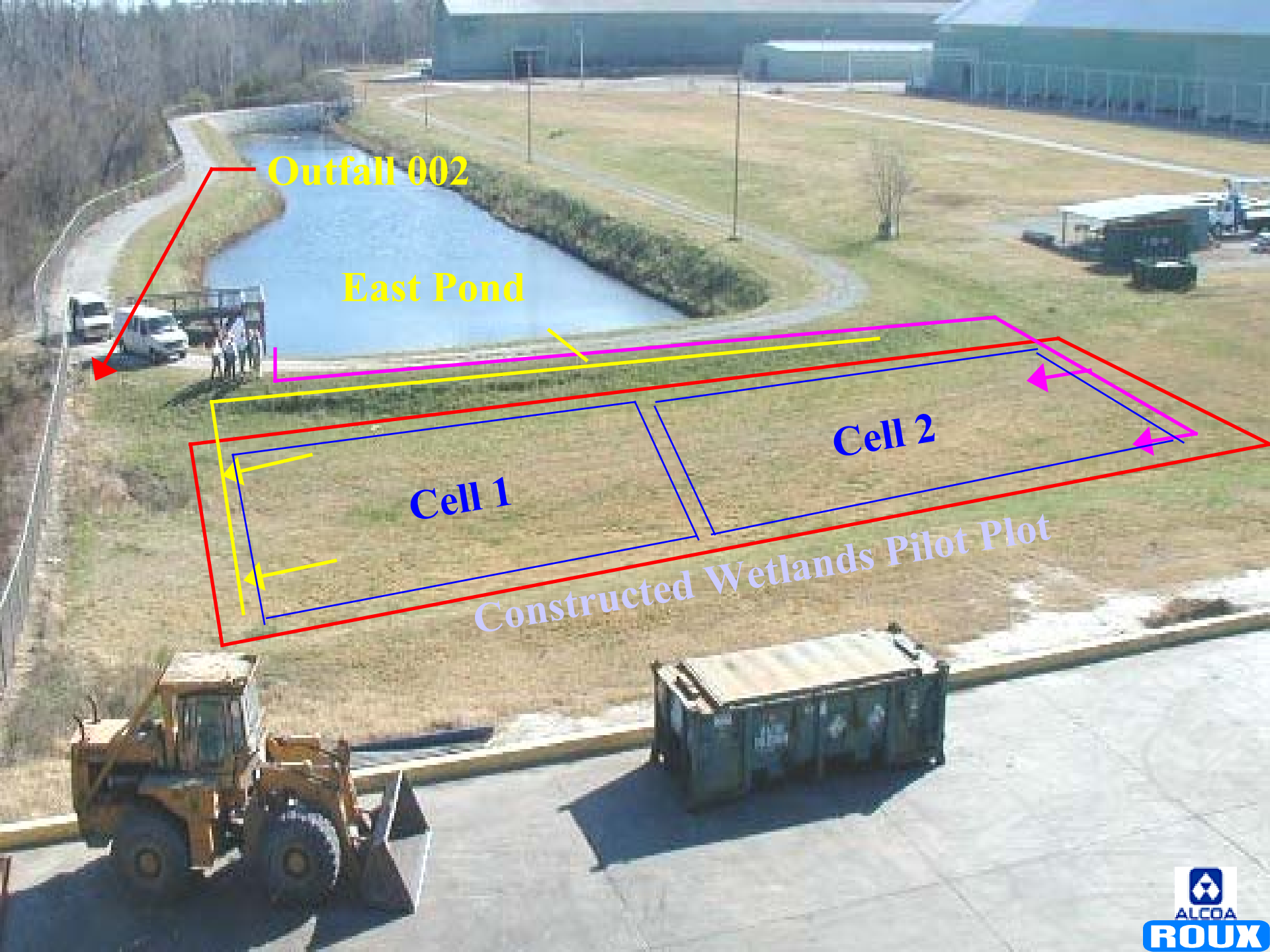
Outfall 002
East Pond
Cell 1
Cell 2
Constructed Wetlands Pilot Plot
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Basis For Design

Bench Testing To Evaluate:

- ✓ **the effectiveness of experimental media to remove fluoride from stormwater;**
- ✓ **the effectiveness of spent-mushroom comp as a metals treatment media;**
- ✓ **design hydraulic retention times;**
- ✓ **pilot cell sizing requirements; and**
- ✓ **sequencing requirements.**

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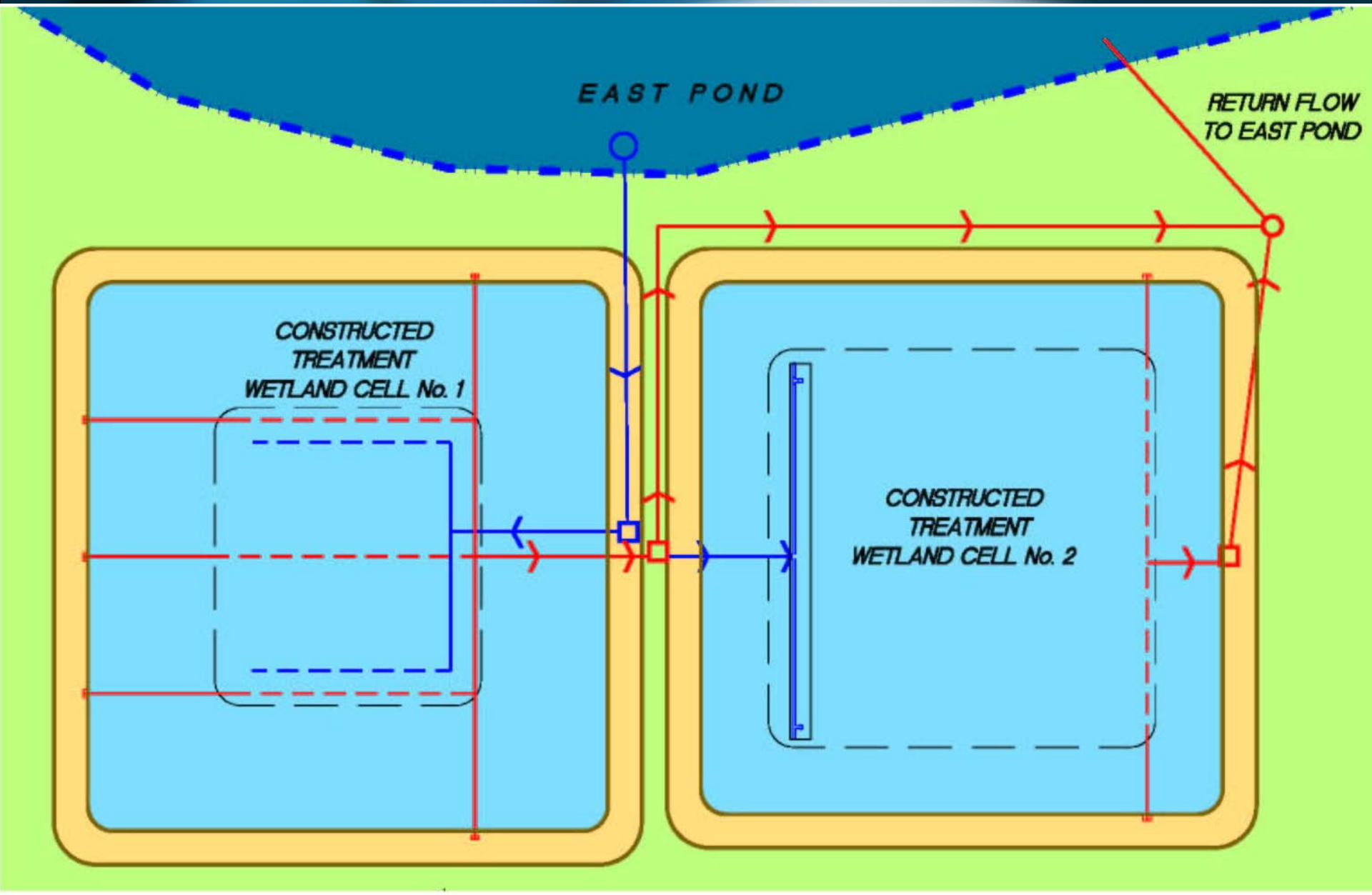
East Pond Bench Testing Program

East Pond CTW Pilot Layout



Potline Courtyard

Grass Filter Strips
For
Fluoride Removal

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Potline Courtyard ENS Design

Key Design Elements:

- **No. Test Plots: 2**
  - **ENS Plot (3 grass filter strips)**
  - **Control Plot (gravel)**
- **Plot Size: 750' x 60' (45,000 ft²)**
- **Vegetation: Buffalo and Bahia Grass**
- **Water Source: Roof Drainage from Potline Area**
- **Constituents Of Interest: Fluoride, Aluminum, TSS**
- **Treatment Objective:**
  - **Enhance storm water runoff quality and reduce quantity of runoff**

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Courtyard Vegetated Filter Strips

Vegetated Grass Filter Strip Pilot Plot

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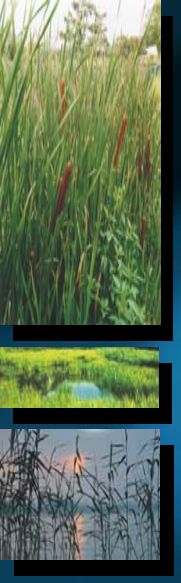
Sprayfield

Phyto Plots For Water Consumption/Metals Retention

Alcoa-Mt. Holly Sprayfield Area & Process Lagoon

Spray Field Phyto Pilot Plot Design



Key Design Elements:

- **No. Test Plots:** 2
- **Plot Size (each):** 258' x 225' (58,000 ft²)
- **Vegetation:**
  - Plot 1: Tree/Grass Mix
  - Plot 2: Grass
- **Irrigation Water:** Retrofit of Existing Lagoon System
- **Preliminary Application Rate**
  - 16,000 gpd/plot
- **Constituents Of Interest (COIs):** Fl, Cu, Mn, Ni, Zn
- **Treatment Mechanisms:**
  - Consumptive water use through ET Loss
  - COIs are retained in root zone

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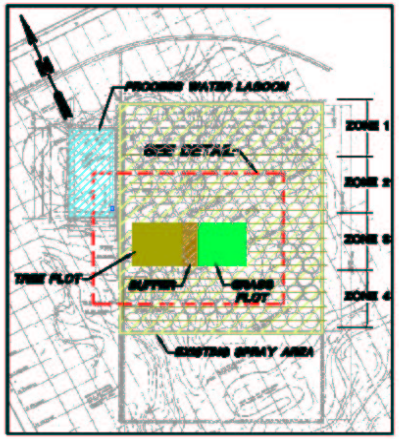
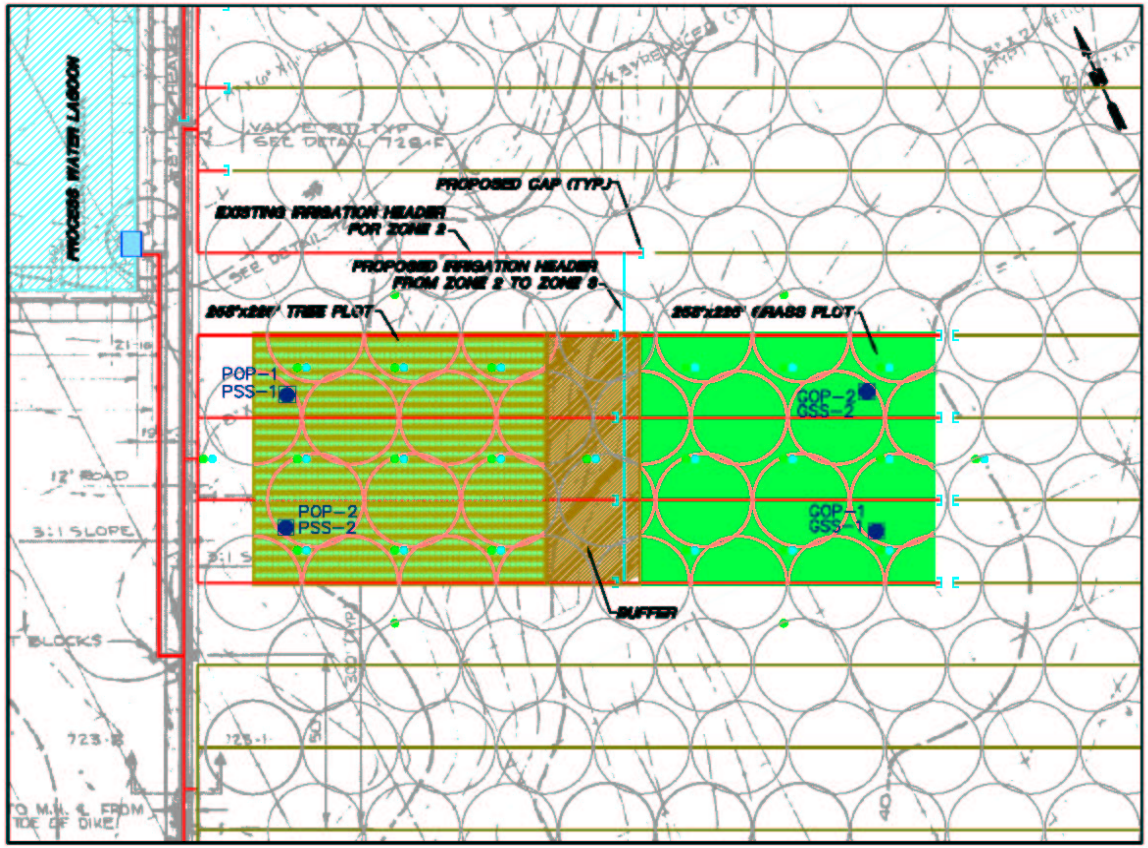
Spray Field Phyto Plot Layout

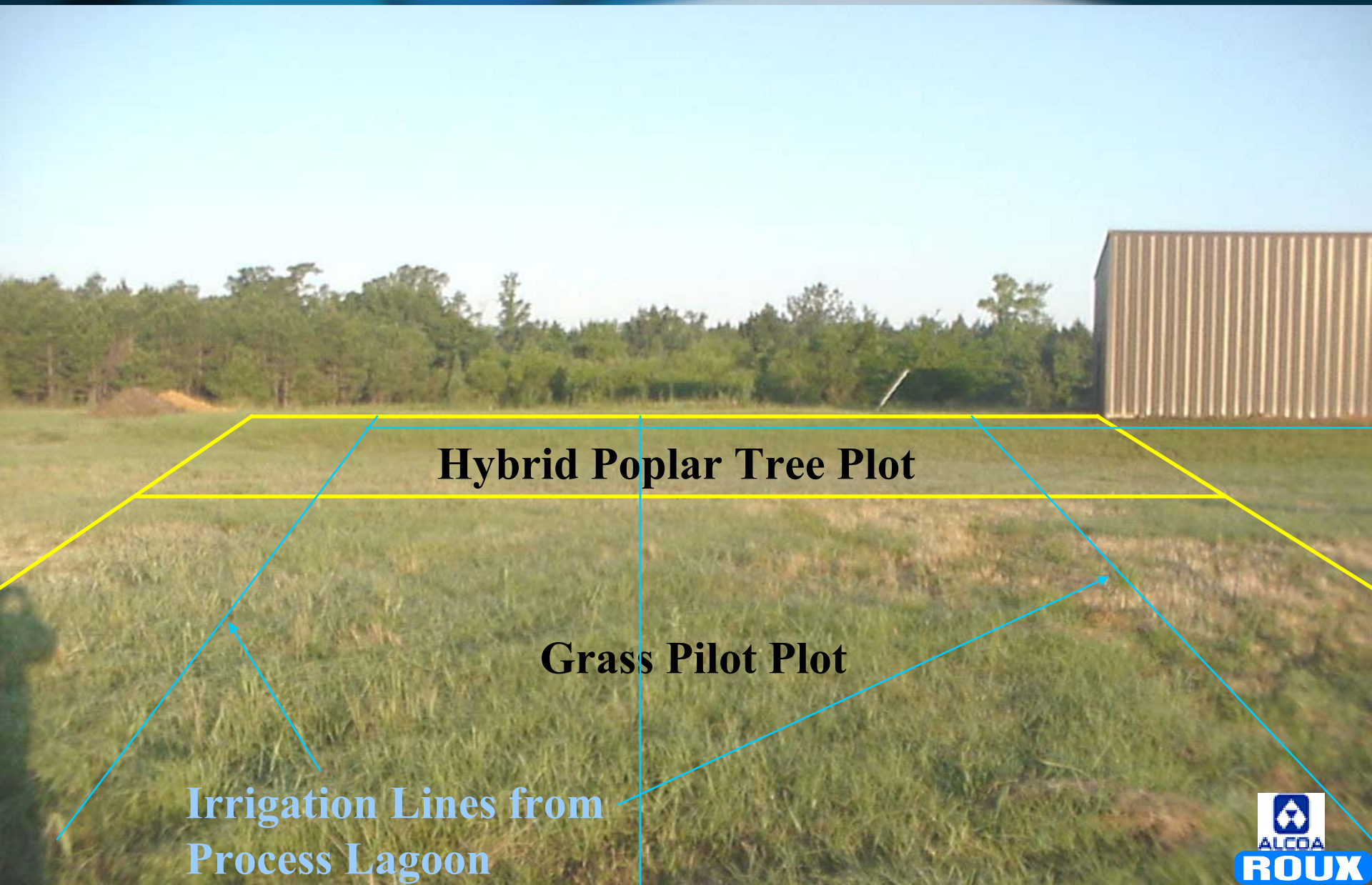


PLAN VIEW OF EXISTING SPRAY FIELD AREA

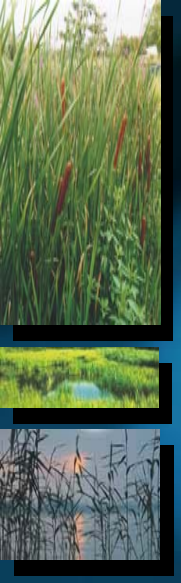


DETAILED PLAN VIEW OF SPRAY FIELD PILOT PLOT

Sprayfield Phytotechnology Pilot Plots



Basis For Design



Rooting Test Experiments To Determine:

- ✓ **the ability of site soils to support and sustain a viable vegetative community;**
- ✓ **be appropriate tree and grass species to at the site; and**
- ✓ **the form and amount of soil supplements specified to support the selected**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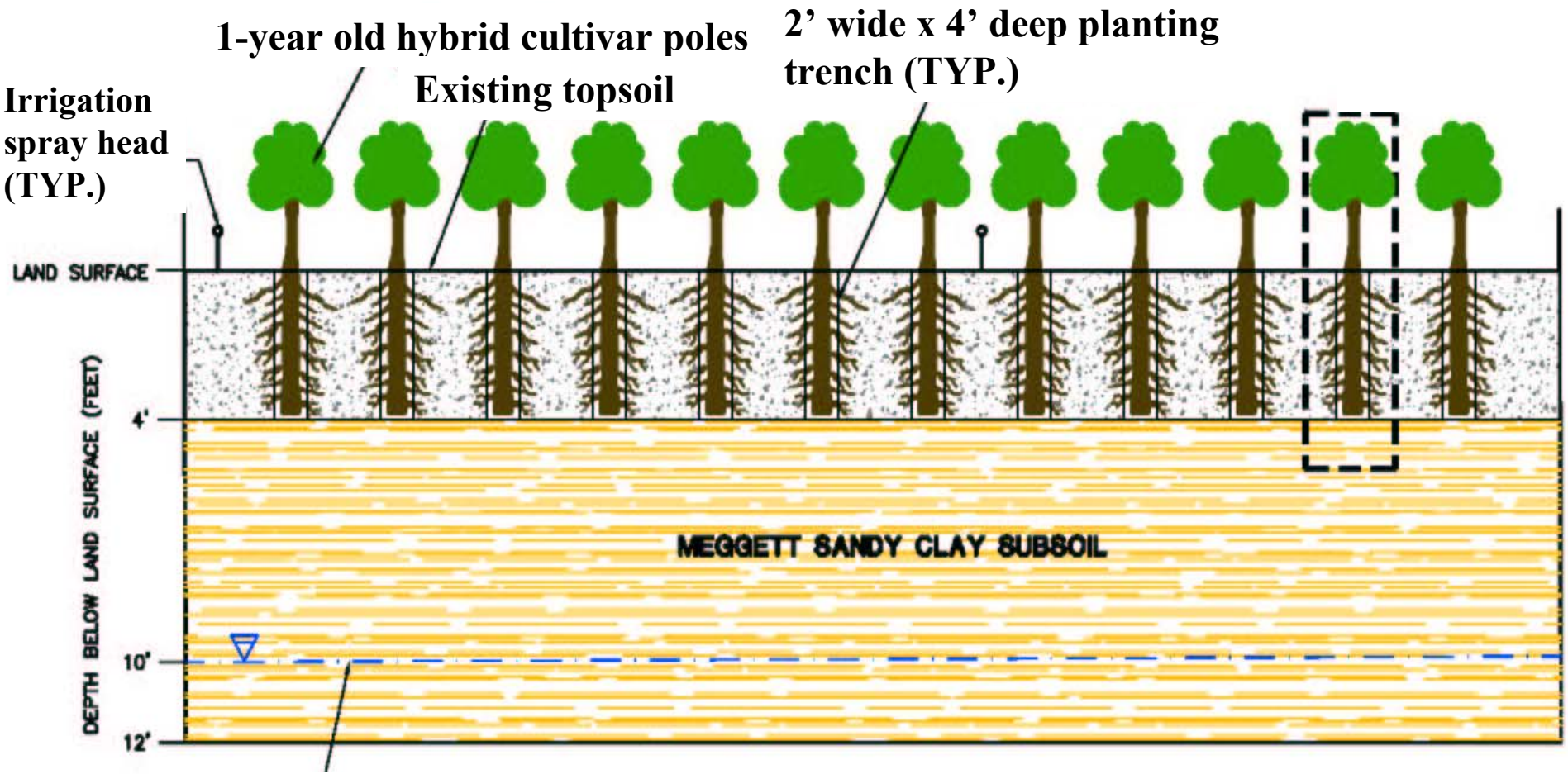
Spray Field Phytotechnology (Tree) Plot Cross Section



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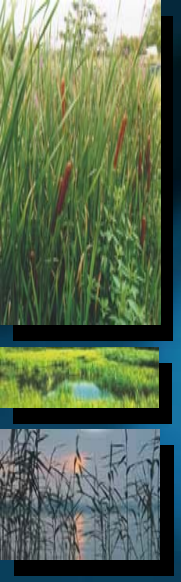
Projected ENS Benefits



- **Cost Advantages:**
  - ✓ Cost savings of 50-80% can be realized in capital investment stage; and
  - ✓ Cost savings exceeding 90% are typical in the operation & maintenance stage.
- **Other Advantages Include:**
  - ✓ Simplicity of operation and maintenance;
  - ✓ Tolerance to wide fluctuations in hydraulic and constituent loading rates; and
  - ✓ Aesthetic attributes.

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The Far Side

“Well, actually, Doreen, I rather resent being called a ‘swamp thing.’

…I prefer the term ‘wetlands-challenged mutant.’”