Dechlorination of Effluent Using Engineered Wetlands

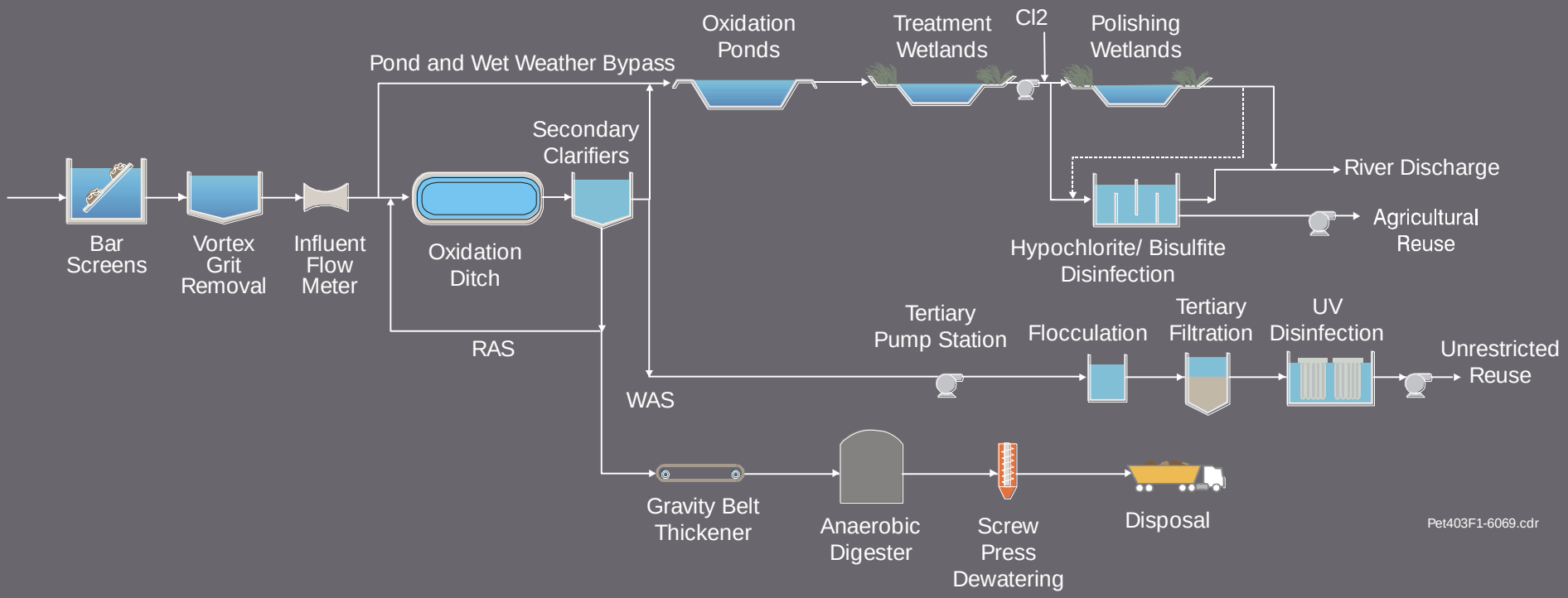
Ellis Creek Water Recycling Facility, City of Petaluma

- Historical Timeline
- Facility Treatment Processes / Flow Schematics
- Challenges of Wetlands
- Dechlorination Mode of Operation
- Benefits of Natural Dechlorination

HISTORICAL TIMELINE

- 1938: Original Plant Built on Hopper St.
- 1972: Oxidation Ponds Built
- Late 70's / early 80's: Prohibition of summer discharge & start of agricultural reuse
- 2002: Ellis Creek WRF @ 50% Design
- 2004: Purchase 261 Acres for New Plant
- Oct 2005: Construction Contract Awarded
- Jan 2009: Plant Operational

PROCESS FLOW SCHEMATIC



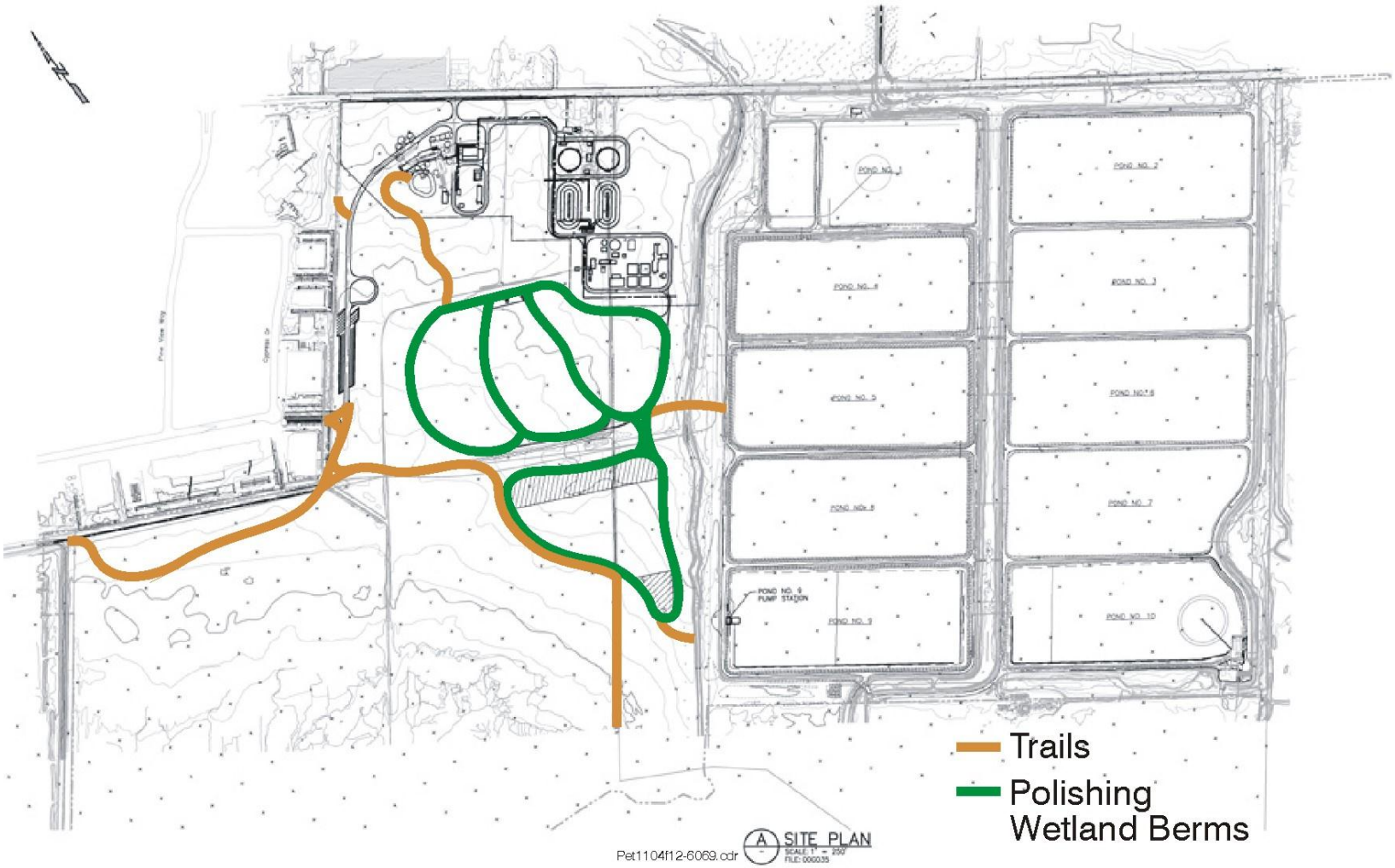
Facility Treatment Process

- Design Criteria
  - ADWF 6.7 mgd, Peak Flow 36 mgd
  - INF BOD 275 mg/L; INF TSS 275 mg/L
  - 18,600 lbs/day BOD loading to Orbals
- Secondary Treatment Process
  - Activated Sludge – Siemens Orbal Process (<16mgd)
  - Aerated Lagoon/Oxidation Ponds (>16mgd)
- Advanced Secondary Treatment Process
  - Treatment Wetlands (30 acres)
    - Re-purposed two existing storage ponds
  - Polishing Wetlands (31 acres)
- Anaerobic Digestion of Waste Activated Sludge
- Tertiary Treatment
  - Continuous Upflow Sand Filters
  - UV Disinfection
  - Users: City Parks, Golf Courses, Vineyards, Pasture Irrigation

Multi-Purpose Objectives Accomplished with Wetlands

- Algae removal
- Enhanced secondary treatment
  - metals and nutrients
- Reduced energy & chemical costs versus DAFT
- Conservation of 200 acres of wetland/upland habitat along Petaluma River
- Integration of 4 miles of recreational trails
- Recreational activities; bird watching, hiking…
- Educational opportunities including interpretive signage

Polishing Ponds / Site – Trails

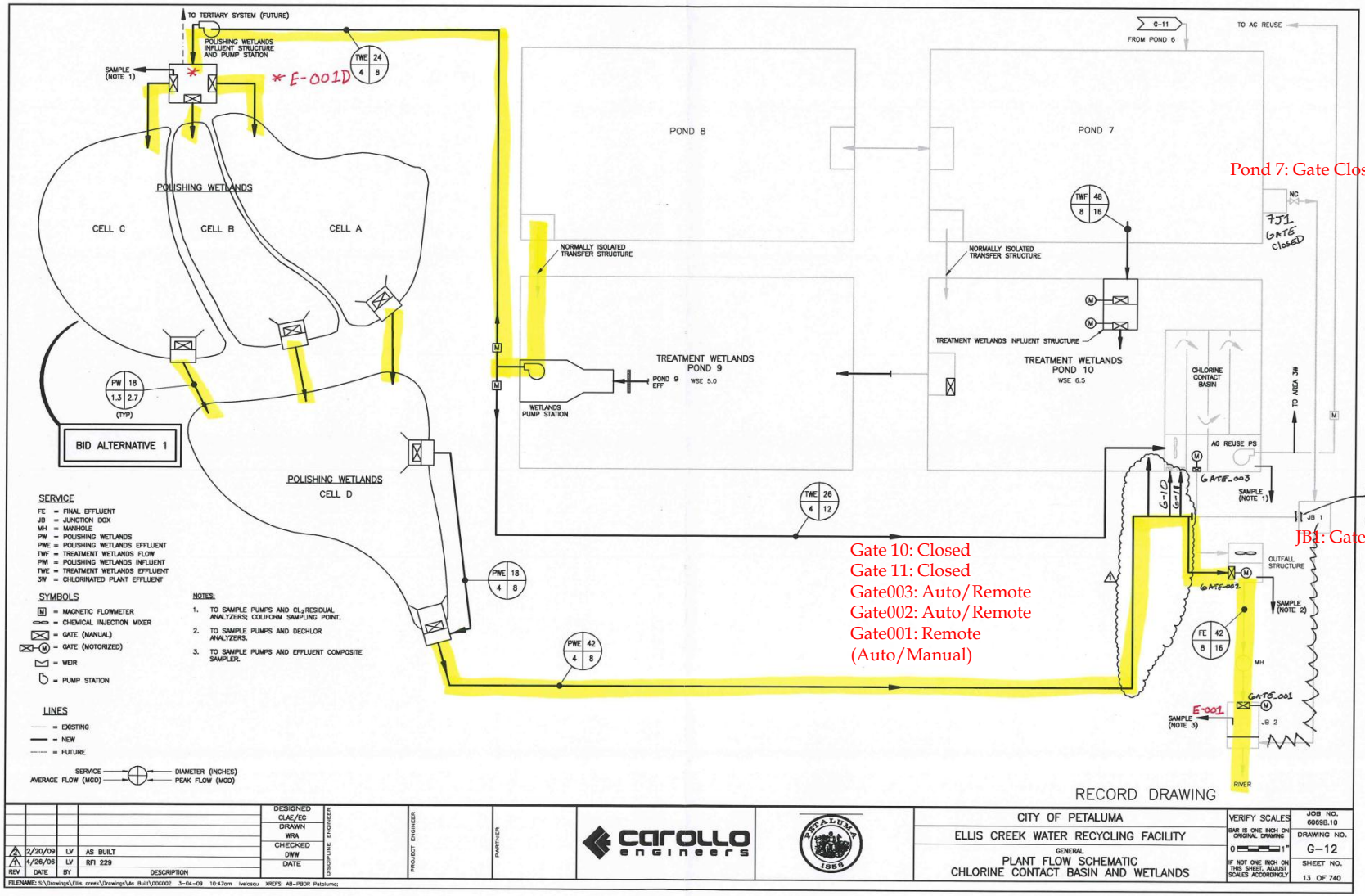


Challenges of Engineered Wetlands

- Presence of Endangered Species
  - California red-legged frog
  - California clapper rail
  - Salt marsh harvest mouse

- Wetlands are an Ideal Mosquito Habitat
  - MSMVCD – manages mosquito abatement program
- Vegetation Management

Wetlands Mode of Operation



Pond 7: Gate Closed

JB2: Gate Closed

Gate 10: Closed
Gate 11: Closed
Gate003: Auto/Remote
Gate002: Auto/Remote
Gate001: Remote
(Auto/Manual)

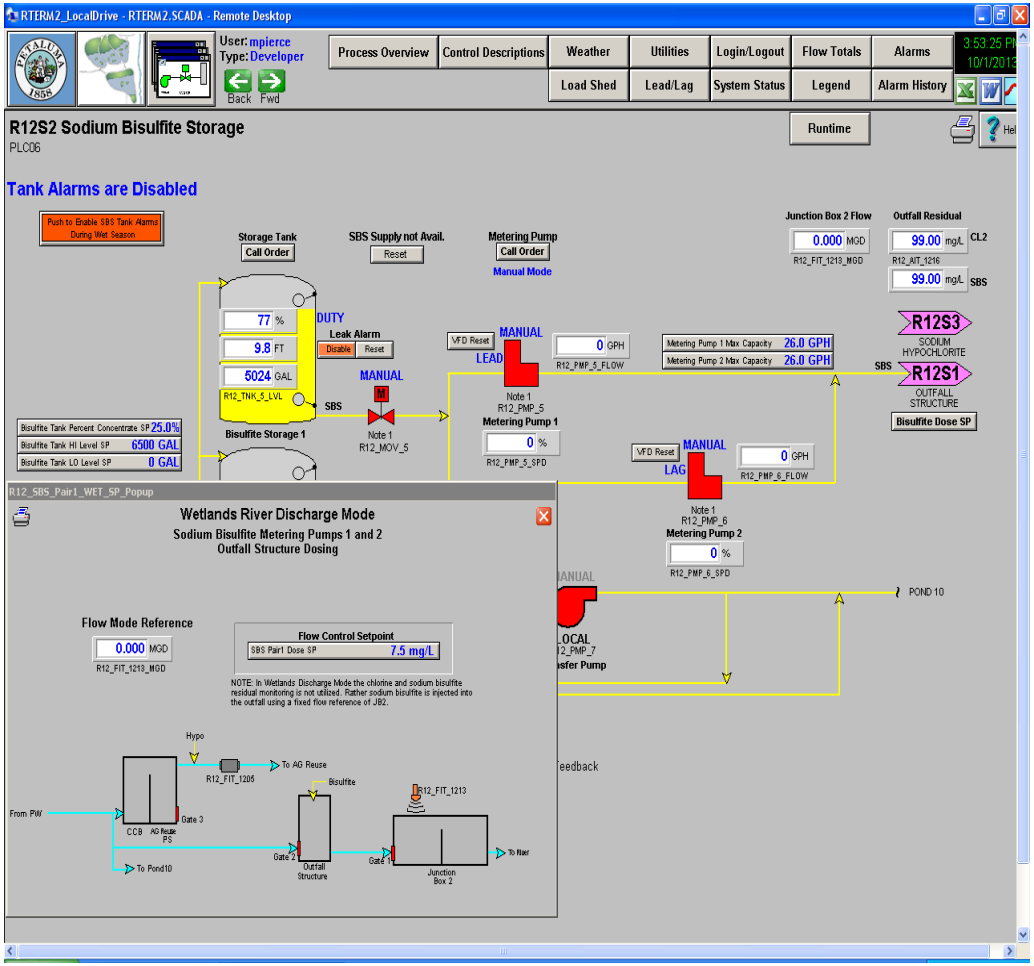
Disinfection and Dechlorination

- CCB Mode of Operation: Use chlorine contact chamber followed by chemical dechlorination
  - Sodium bisulfite used to dechlorinate final effluent
  - Continuous monitoring of chlorine residual

- Natural De-chlorination Mode: Chlorinate between Treatment Wetlands and Polishing Wetlands followed by natural de-chlorination
  - Naturally dechlorinate through Polishing Wetlands
  - Monitor chlorine residual 2x/day

- Use CCB mode and natural dechlorination mode in parallel operation
  - Sodium bisulfite used to dechlorinate
  - Continuous monitoring of chlorine residual

Natural Dechlorination



- Testing has shown no chlorine is present at the vegetative/open water interface in first series of Polishing Ponds
- Prove a 0.0 mg/L chlorine residual by dosing bisulfite, and by titrating a negative chlorine residual (bisulfite residual)
- Compliance location is E-001
- NPDES permit requires two chlorine titrations per day, minimum 4 hours apart.
- Target residual 1.5 – 2.0 mg/L
- SCADA will log a “99” in the historian to indicate the DeOx 2000 analyzers are disabled in Wetlands Mode
- Flow paced dosing of sodium bisulfite, residual control is not available

Operation Benefits to Natural Dechlorination

- Reduced bisulfite costs (approx 75%)
- Reduced reliance on chemicals
- Reduced staff time maintaining DeOx 2000 analyzers
- Reduced call-outs & alarms for dechlorination system
- Eliminated the potential for chlorine violations
- Reduce operational stress

Summary

- Optimized existing infrastructure
- Reduced operating costs
- Improved operational reliability
- Maintained treatment performance
- Maintained recreational and educational opportunities for the public