Maintenance of a Vertical Flow Pond & Wetland System Used to Treat AMD

PRESENTER:

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ABSTRACT

- There are numerous abandoned mine drainage (AMD) passive treatment wetlands throughout Pennsylvania which are aging and in need of maintenance.

- This presentation provides a technical overview of the original design and recent maintenance done to refresh a vertical flow pond (VFP) and aerobic wetland.

PRESENTER: JOHN R. KLAMUT, PE, CFM, MS

ENGINEERING DIRECTOR
GAI Consultants

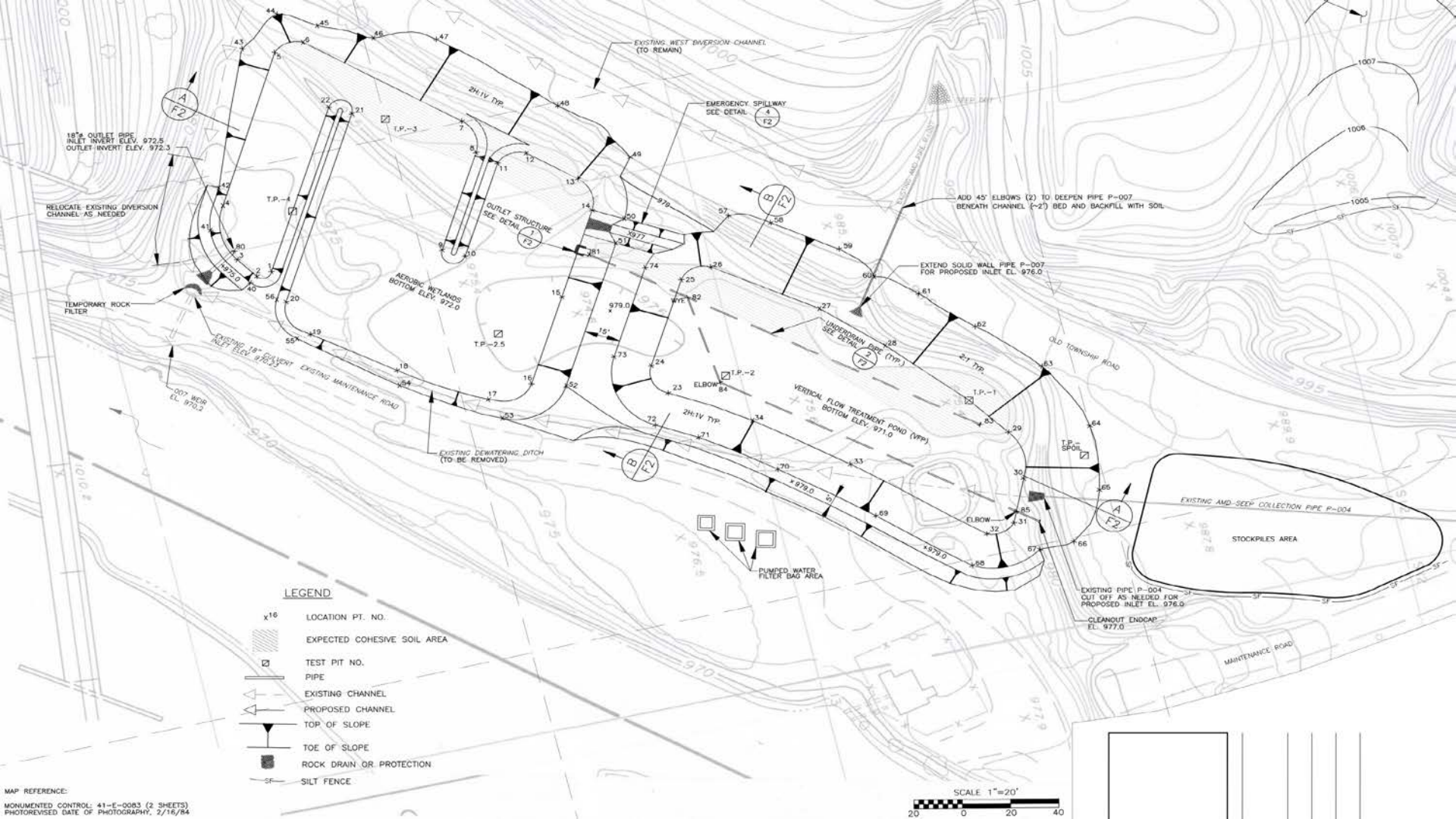
John R. Klamut, PE, CFM, MS is an Engineering Director at GAI Consultants based in Pittsburgh, Pennsylvania. He has worked on mine reclamation projects since 2002 and as a Project Manager for GAI's Bureau of Abandoned Mine Reclamation (BAMR) projects since 2018.

John specializes in permitting and design of water resource and environmental projects, such as Coal Combustion Residual (CCR) disposal impoundments, CCR landfills, bottom ash settling ponds, municipal solid waste landfills, earthen dams, flood control structures, constructed wetlands, lined evaporation ponds, sediment basins, mine tailings impoundment closures, mine overburden stockpile closures, groundwater monitoring, and National Pollutant Discharge Elimination System (NPDES) permitting and reporting for industrial facilities.

John holds and MS in Civil Engineering from San Jose State University and a BA in Forest Engineering from SUNY College of Environmental Science and Forestry.

gai consultants

- Working on AML Reclamation Projects for past 30 years
- 24 Locations in 12 States
- 55+ Engineering Excellence Awards
- 800+ Total Staff



MAP REFERENCE:

MONUMENTED CONTROL: 41-E-0083 (2 SHEETS)
PHOTOREVISED DATE OF PHOTOGRAPHY, 2/16/84

ORIGINAL DESIGN

- Design Chemistry

Flow	pH	Alk	Acid	Fe	Mn	Al
gpm	SU	mg/L as $CaCO_3$	mg/L as $CaCO_3$	mg/L	mg/L	mg/L
15	3.3	0	150	40	2	6

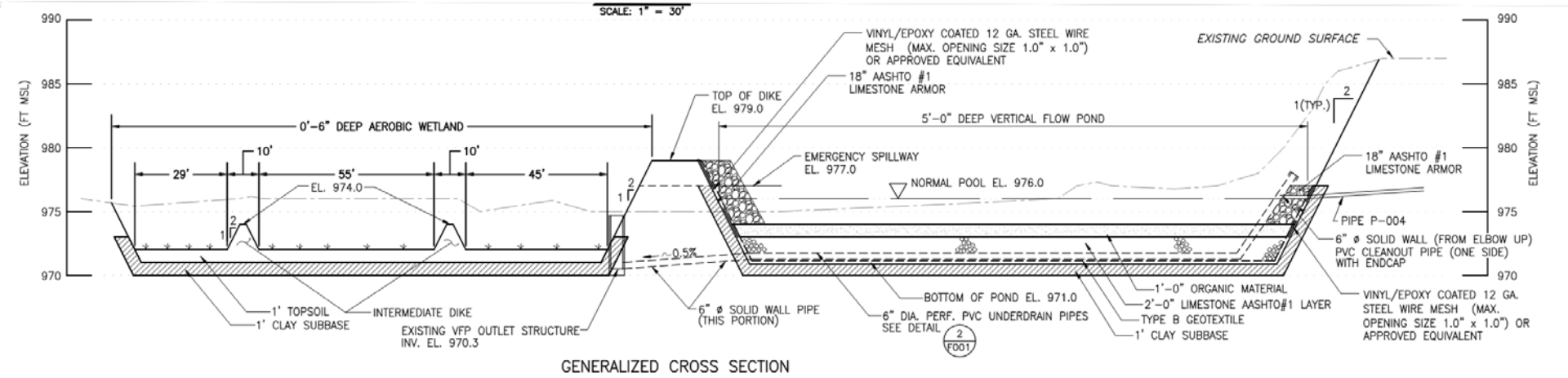
- Typical Performance – First 20 Years

	Flow	pH	Alk	Acid	Fe	Mn	Al	SO_4	TSS
	gpm	SU	mg/L as $CaCO_3$	mg/L as $CaCO_3$	mg/L	mg/L	mg/L	mg/L	mg/L
VFP In	5	3-5	<5	40-60	1-3	1	1-2	150	2
VFP Out	5	7.0	75	-52	0.3	1	0.2	100	1
Wet Out	5	7.0	70	-50	0.3	1	0.2	120	1

OPERATION PLAN RECOMMENDATIONS

- Replace VFP Compost Every 5 to 7 Years
- Replace Limestone Every 10 to 20 Years

CROSS SECTION



GENERALIZED CROSS SECTION

- **Vertical Flow Pond**
- **Aerobic Wetland**

MAINTENANCE ISSUES

- **2010**
  - VFP Flow Low – Assume Plugging
  - Muskrat Burrows

- **2020**
  - VFP Flow and Elevation Dropping
  - Suspected Dike Leak into Wetland
  - Wetland Treatment Chemistry Declining
  - Seeps Identified in Wetland
  - Short Circuiting

MAINTENANCE PERFORMED

- **2010 VFP Maintenance**
  - Repaired 1’ Clay of Base
  - Replaced Limestone
  - Replaced Compost
  - Cleaned Underdrain Pipes
  - Installed 12-guage Wire Mesh
- **2020 VFP Maintenance**
  - Same as 2010
  - Used GCL
- **2022 Wetland Maintenance**
  - Replaced 1’ Topsoil
  - Regraded and Changed Berm Geometry
  - Installed Manganese Removal Rock Drain
  - Replaced Vegetation

2020 MAINTENANCE

- GCL Installation

2020 MAINTENANCE

- VFP Replacement of Limestone

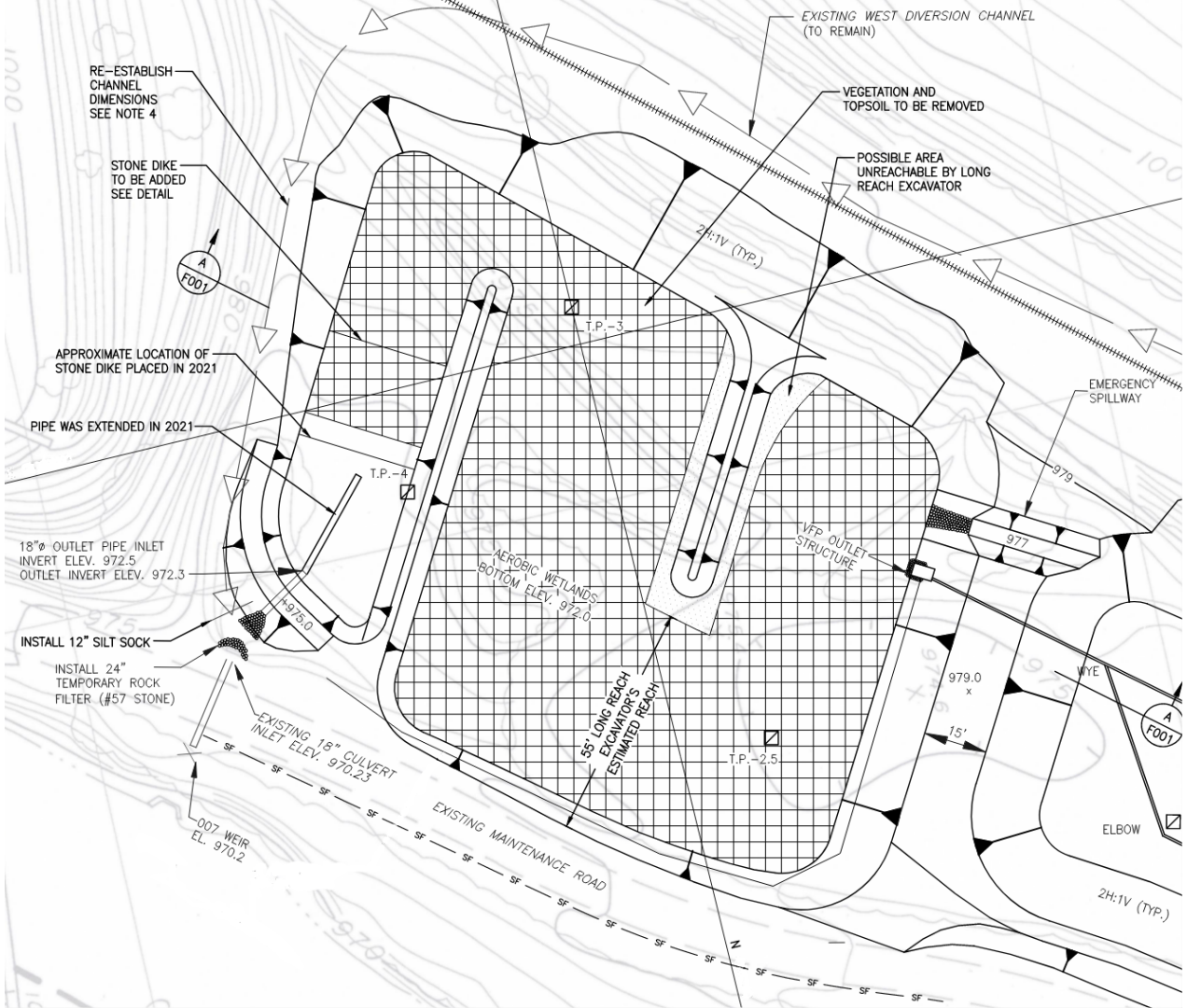
2020 MAINTENANCE

- Compost Placement

POST-CONSTRUCTION

WETLAND PRIOR TO MAINTENANCE

PLAN VIEW



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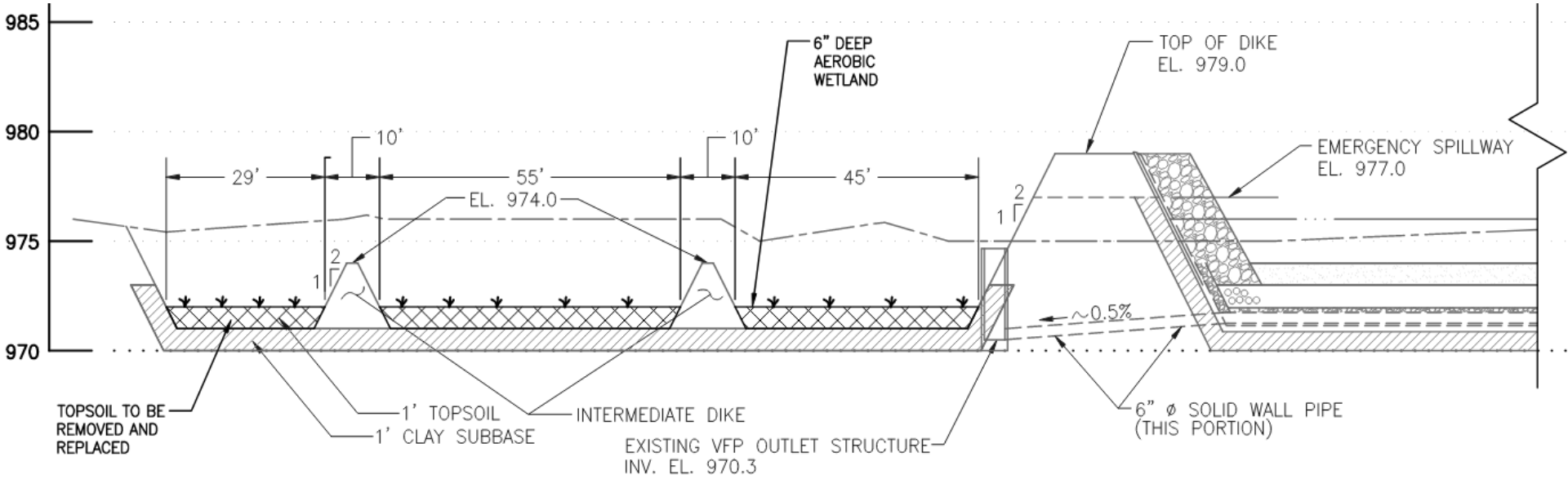
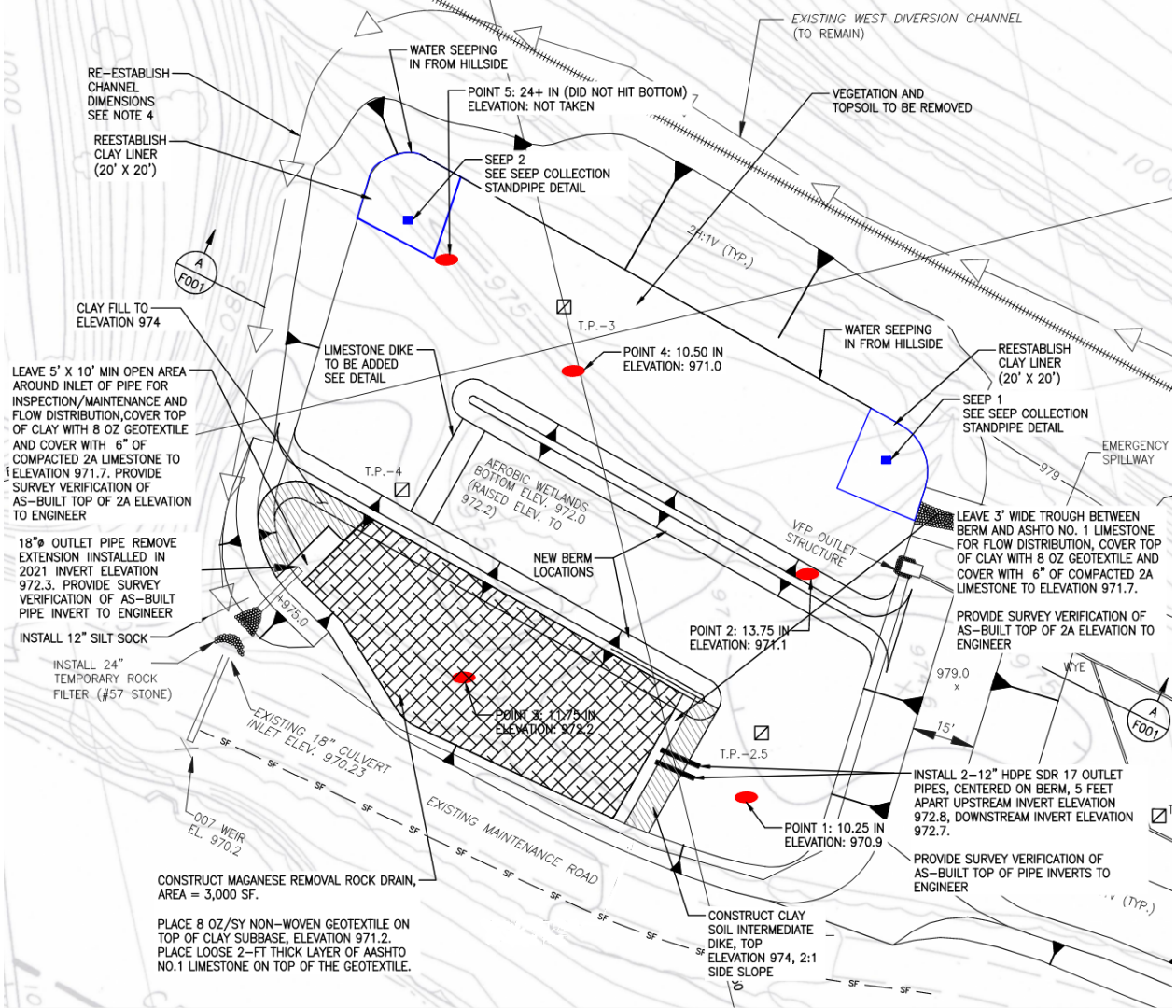


WETLAND TOPSOIL REMOVAL & REPLACEMENT

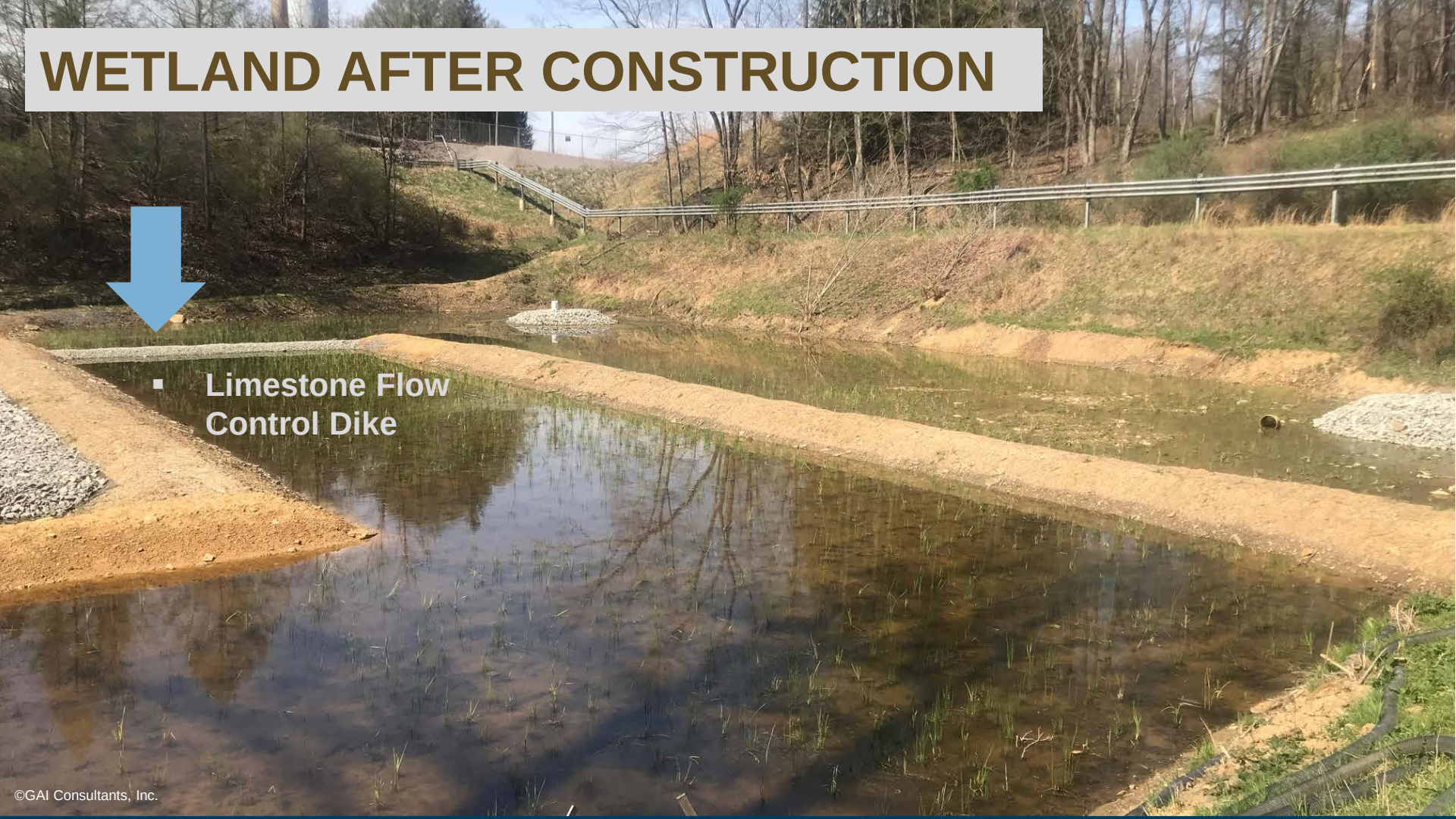
WETLAND MAINTENANCE: SEEP IDENTIFIED DURING CONSTRUCTION

DESIGN MODIFICATION



WETLAND AFTER CONSTRUCTION

WETLAND AFTER CONSTRUCTION



WETLAND AFTER CONSTRUCTION

- Manganese Removal Rock Drain

WETLAND AFTER CONSTRUCTION

- Berm Cut
  - To Lower Water Level During Vegetation Establishment

WETLAND AFTER CONSTRUCTION

KEY POINTS

- Regular Maintenance Expected
- 20 Years of Operation
  - Minimal Armoring of Limestone
  - Pipes Were Not Clogged
- Flow Conditions Change Over Time
  - Seeps, Short Circuiting
- Excellent Water Quality Post-Construction

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