Civil & Environmental Consultants, Inc.

Engineering, Partnerships, and Funding for Lyons Run Passive AMD Remediation

Presented By

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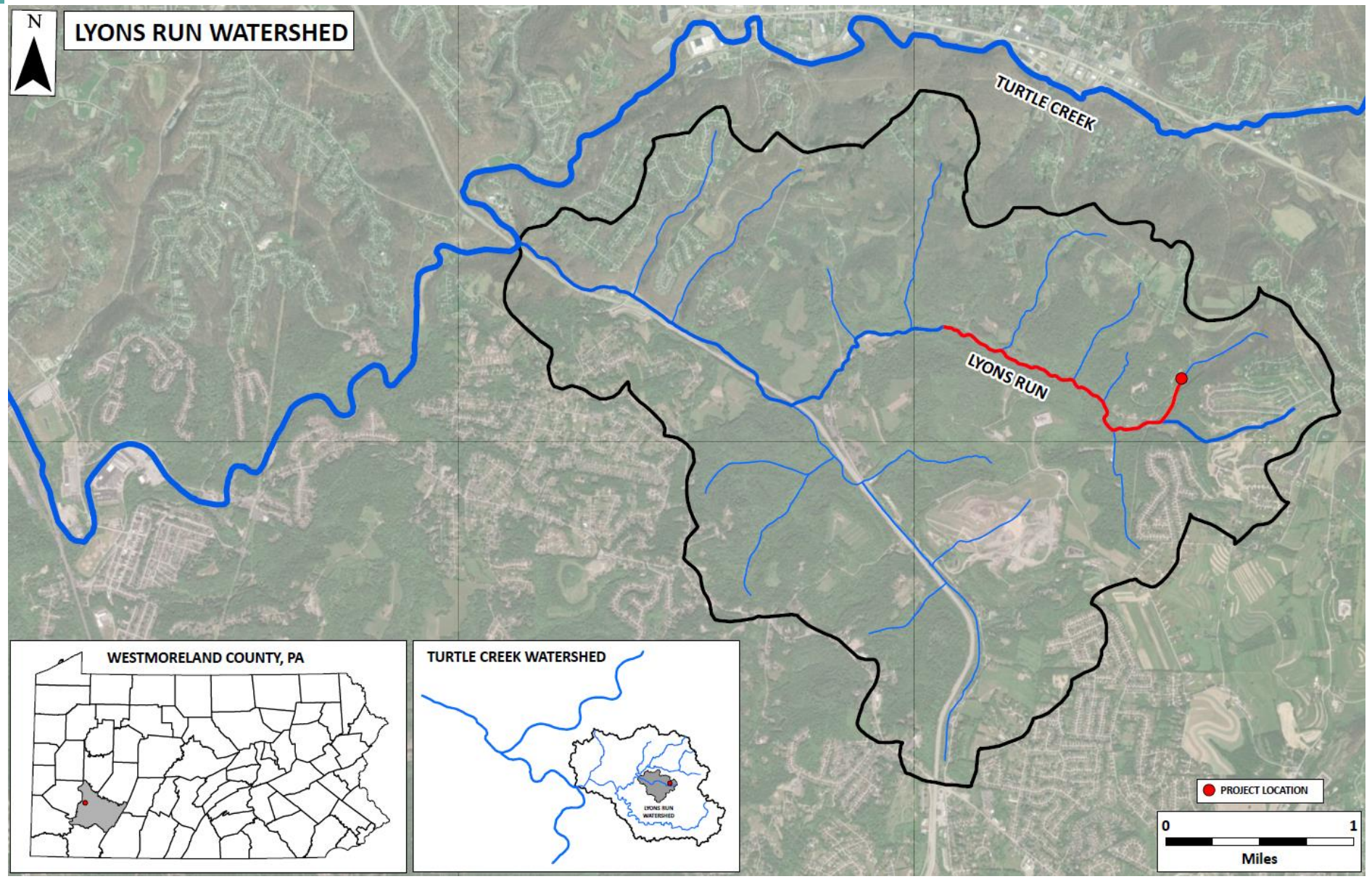
Civil & Environmental Consultants, Inc.

March 2025

Watershed



Lyons Run Watershed

Westmoreland County, Pennsylvania

- 5.1 miles (8.2 km)
- 5.7 mi^2 (14.7 km^2)

AMD impairment

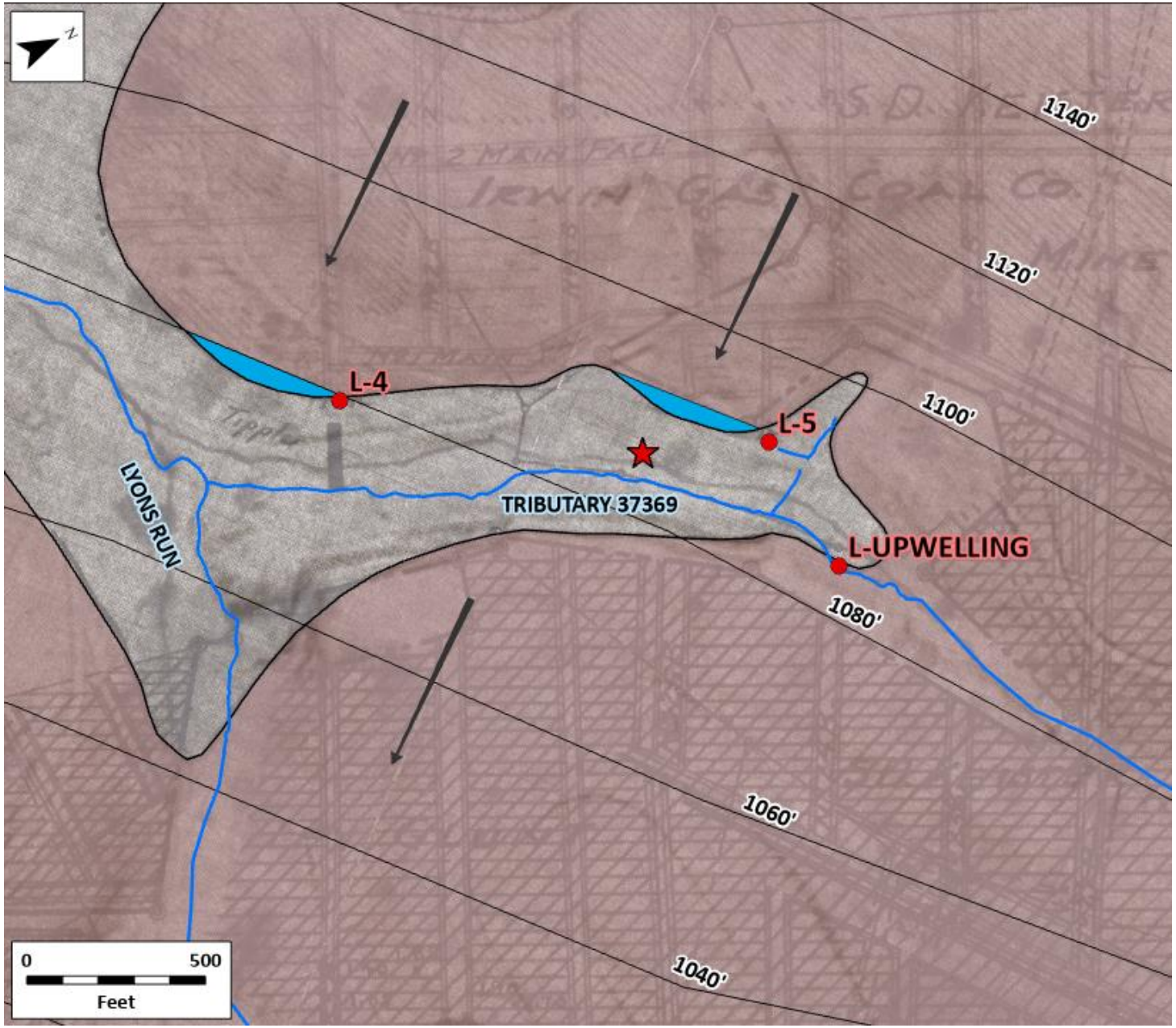
- ~2.5 miles

Larger Turtle Creek Watershed

Monongahela River Watershed

Mining

- Irwin Gas Coal Company Mine No. 2
- Operated 1917 - 1924
- Perched above-drainage mine pools
- Three AMD Sources
  - High acidity
  - High iron and aluminum
  - Seasonally influenced



AMD Sources

L-4

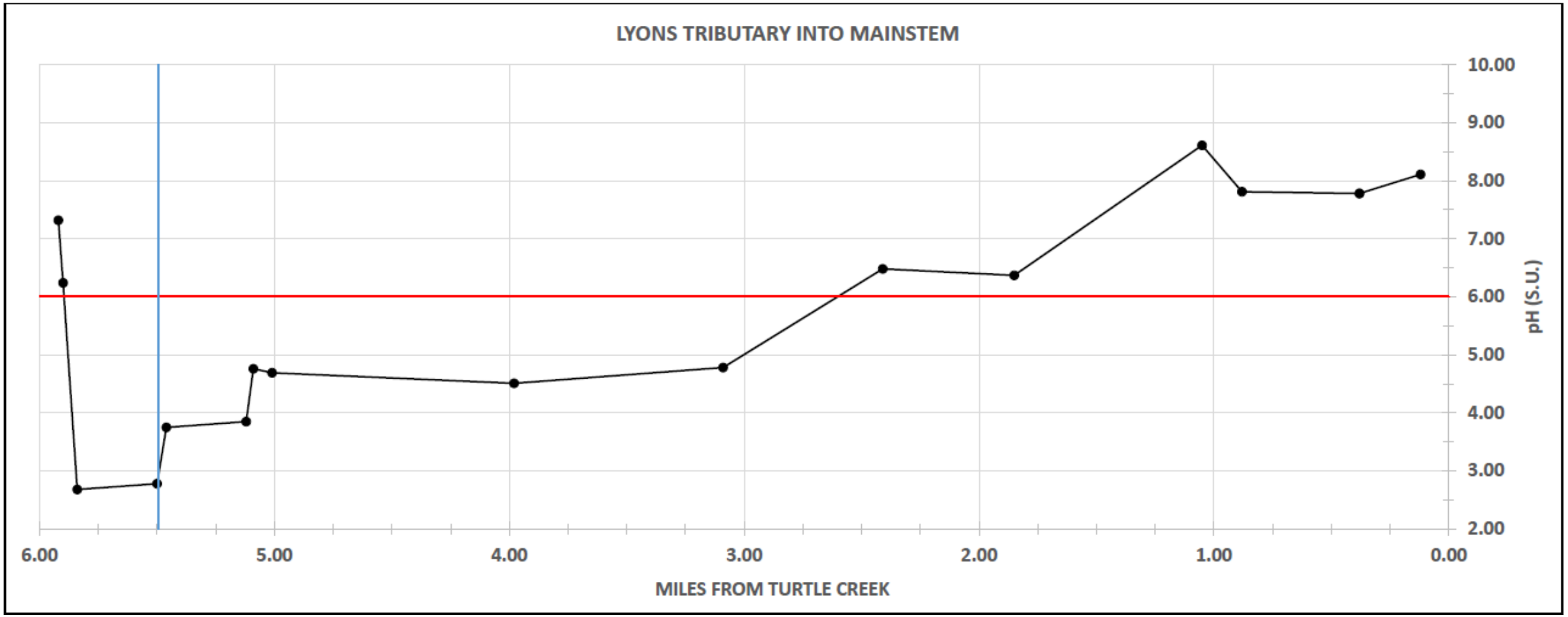
L-5

L-UPWELLING

Water Quality

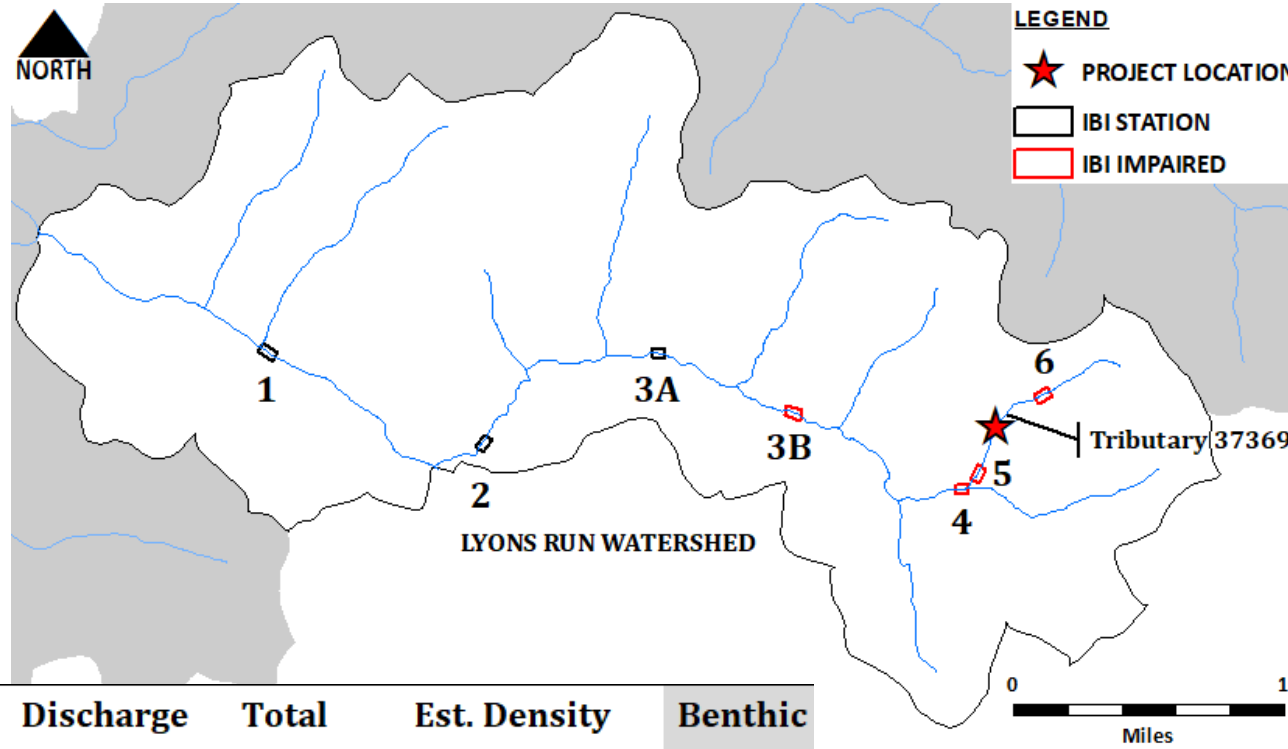
Date	AMD Source	pH	Specific Conductance	Dissolved Oxygen	Discharge Q	Hot Acidity	Total Alkalinity	Ca Total	Fe Total	Fe Dis	Al Total	Al Dis	Mn Total	Mn Dis	Mg Total	SO4 Total
m/d/y			µS/cm	mg/L	L/s	mg/L as CaCO3		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/1/2023	L-4	2.71	2017	9.14	1.20	336	0	97.3	28.6	28.7	32.7	33.1	3.1	2.9	32.3	816
3/1/2023	L-5	2.58	2809	9.69	1.78	490	0	83.1	42.8	41.9	49.3	48.0	4.5	4.4	28.5	988
3/1/2023	L-UPWELL	2.69	2190	7.13	1.80	335	0	65.4	30.9	29.7	31.0	36.1	3.2	3.0	22.9	732

Watershed Impact



Index of Biotic Integrity (IBI)

- Low score upstream (Site 6)
  - Ephemeral and circum-neutral pH
- Low score below AMD (Sites 4, 5)
  - Perennial low pH
- Moderate score downstream mainstem (Site 3B)
  - Dilution and precipitation
- Good score lower watershed (Sites 1, 2, 3A)
  - Dilution, neutralization, attenuation

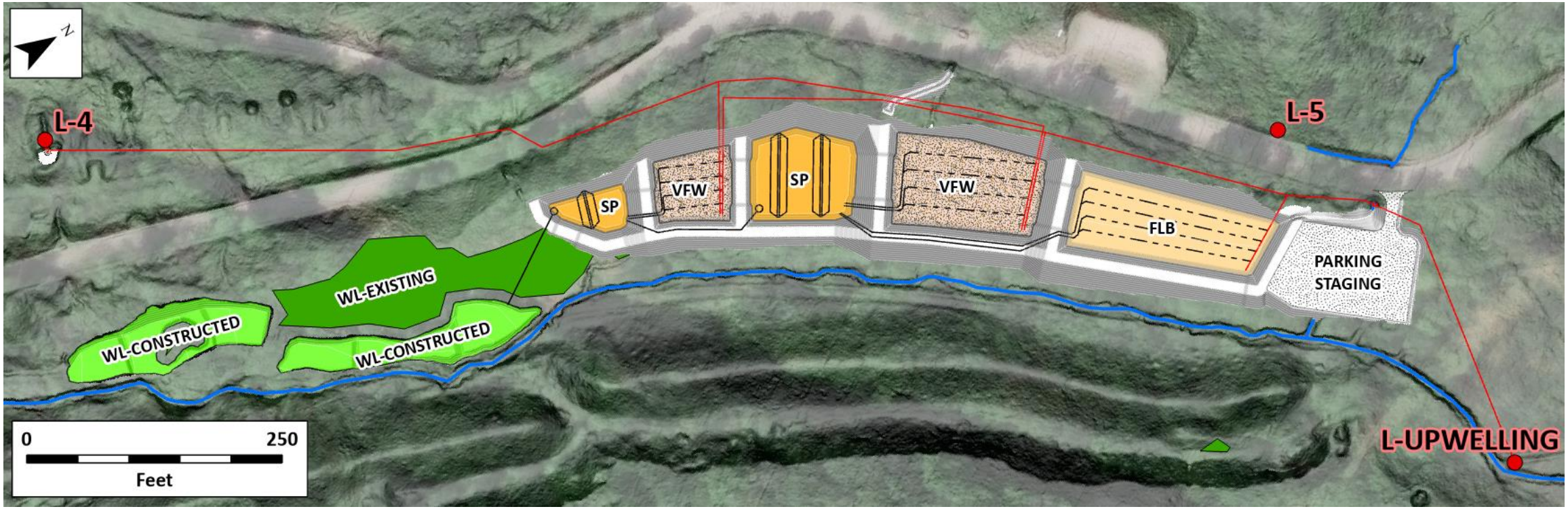


Station No.	pH	Specific Conductance µS/cm	Dissolved Oxygen mg/L	Discharge Q gpm	Total Taxa	Est. Density #Organisms/m2	Benthic IBI Score
1	8.49	568	15.5	1,168	25	409	60.9
2	8.24	390	14.5	606	33	280	68.7
3a	7.61	483	13.7	257	24	96	65.0
3b	5.23	595	13.9	154	13	28	44.5
4	2.78	1,108	14.0	63	8	27	14.7
5	2.70	1,065	13.9	62	4	265	11.3
6	6.03	295	13.7	30	11	124	24.6

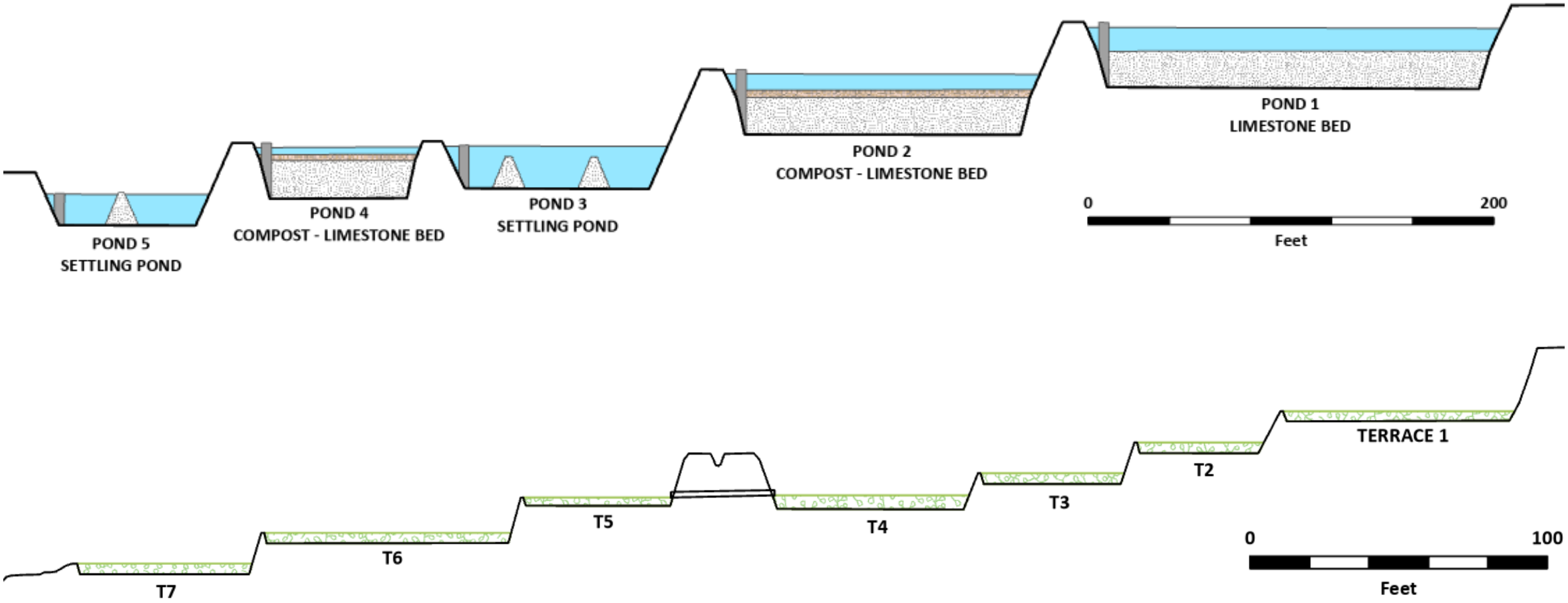
Proposed Project

Successive alkalinity producing system (SAPS)

- Flushable limestone beds – vertical flow wetlands (compost-over-limestone)
- Settling ponds
- Polishing wetlands



Proposed Project



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CONSTRAINTS

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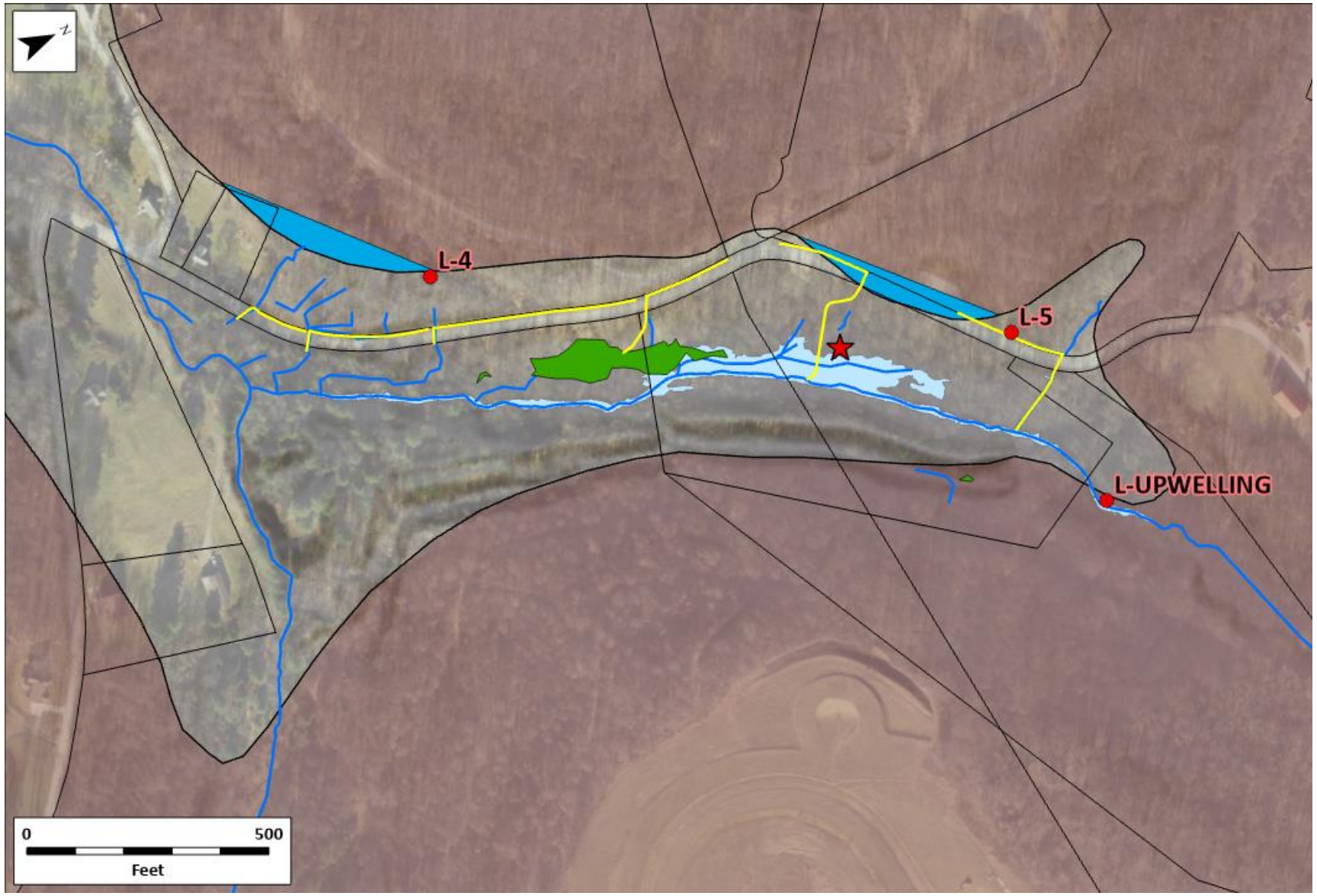
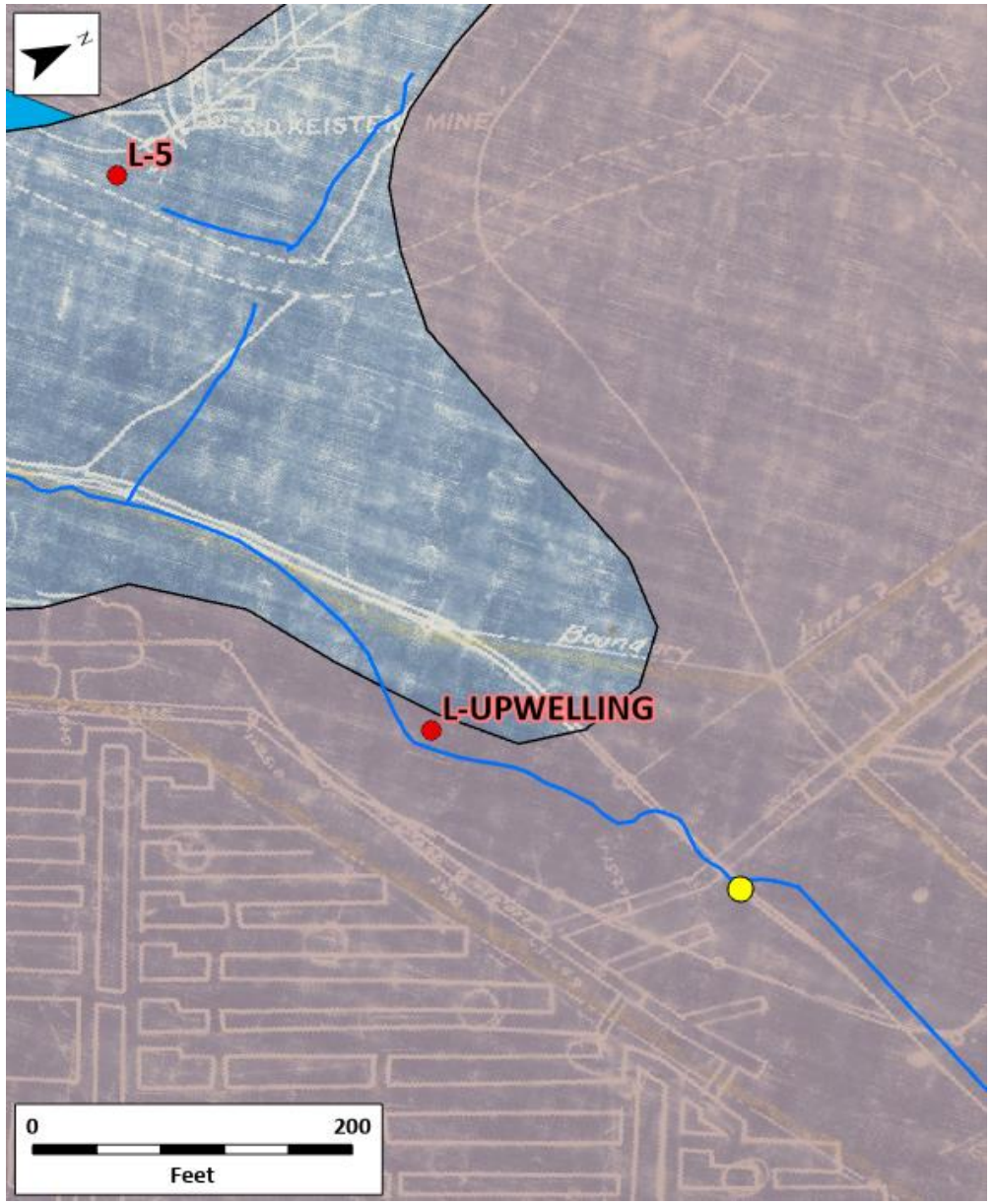
Property and Aquatic Resources

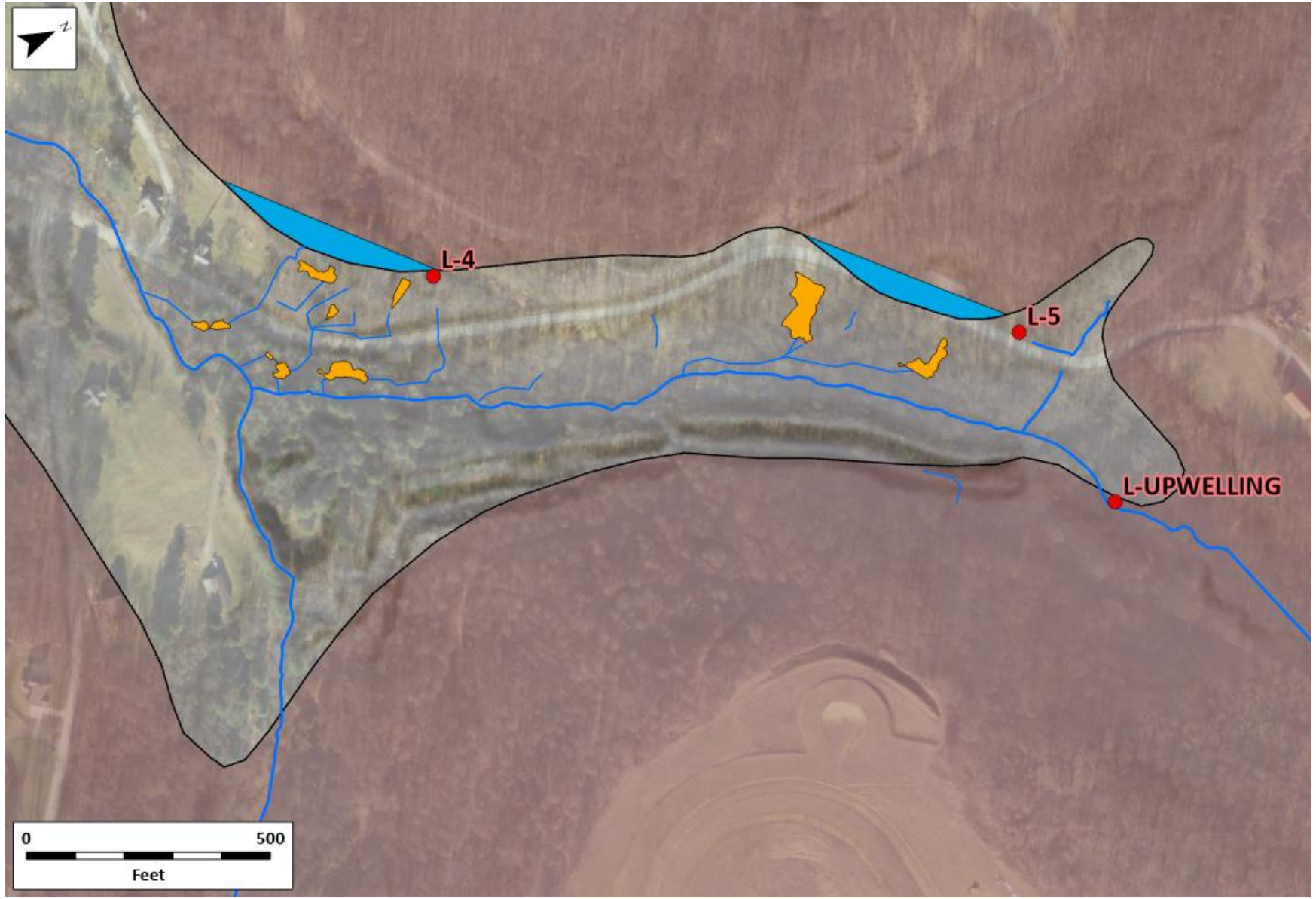


- Property Boundaries
- Delineated Streams
- Delineated Wetlands
- Modeled 100-yr Floodway
- Public Road
  - Ditches and Culverts
  - Stormwater Mgmt.

Undermining and Water Losses

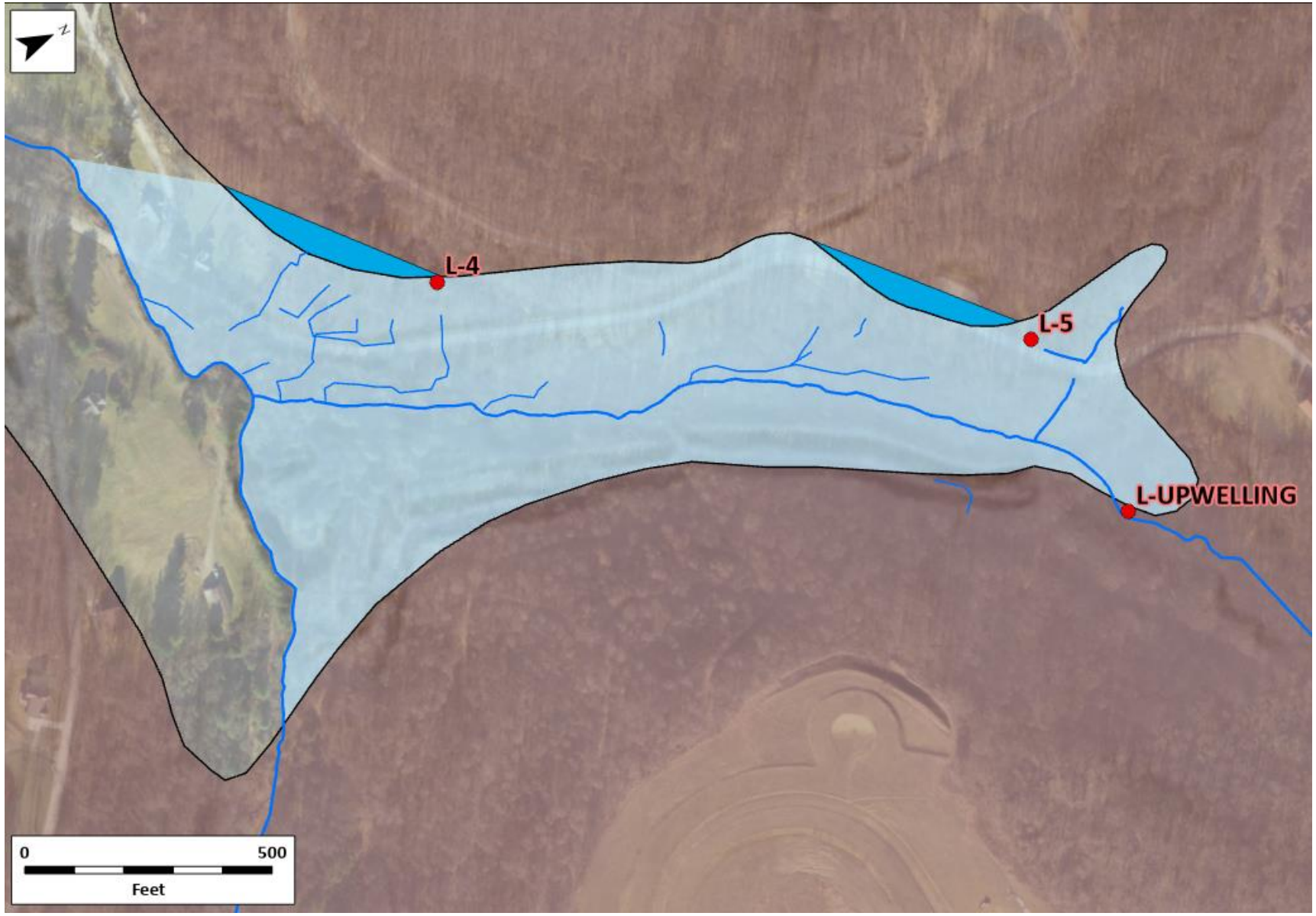


Acidic Seeps



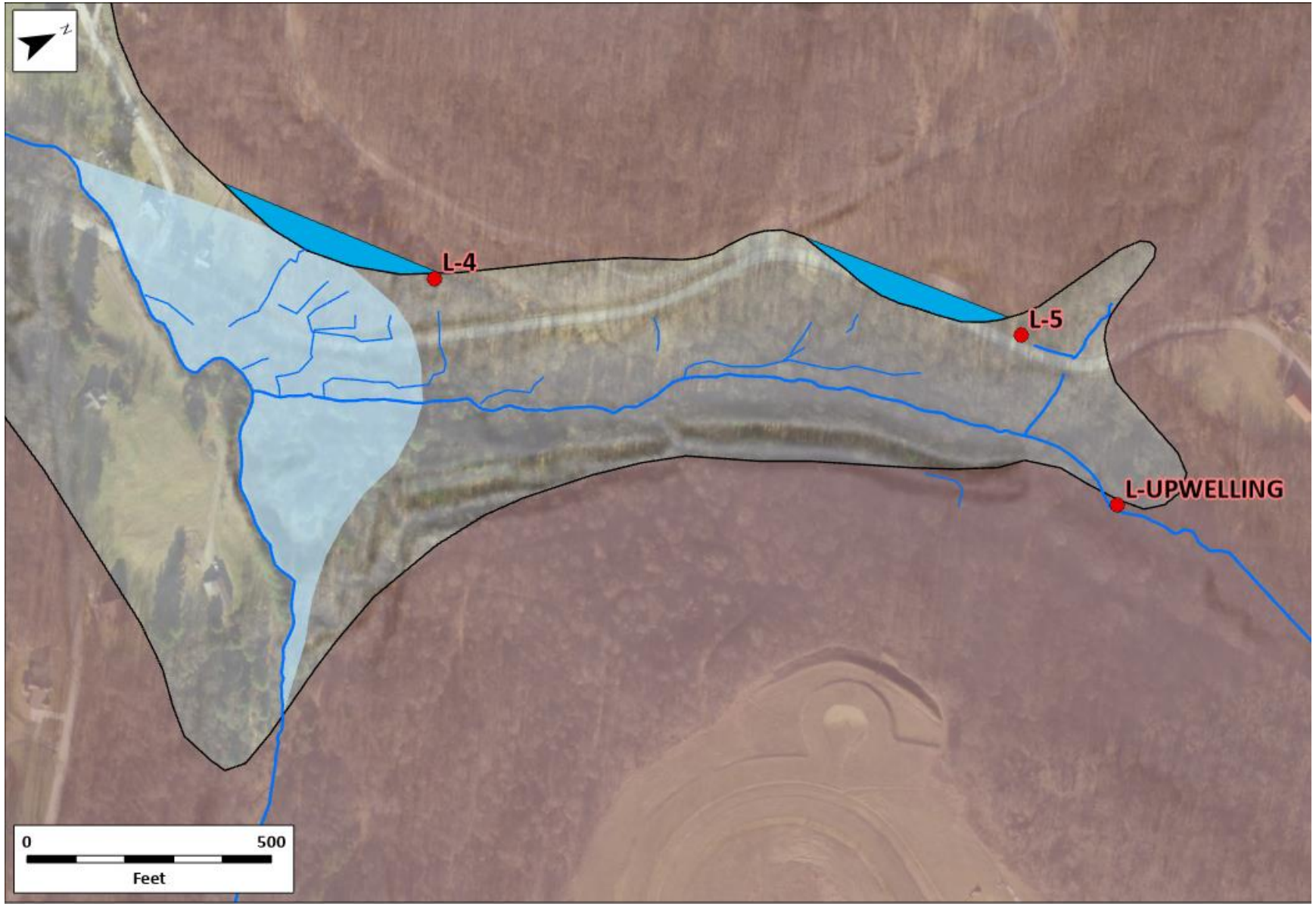
Seep Name	Acres	pH
Seep #1	0.001	2.70
Seep #2	NA	2.20
Seep #3A	0.057	2.82
Seep #3B	0.143	2.72
Seep #5	0.051	3.33
Seep #7	0.021	3.03
Seep #8	0.022	3.26
Seep #9	0.037	2.81
Seep #10	0.009	2.90
Seep #11	0.021	2.94

Seasonal Variation and Aquifer Depletion



- Wet season
- Saturated watershed
- AMD sources at maximum discharge
  - Combined ~200 gpm
  - Higher concentrations and contaminate loads

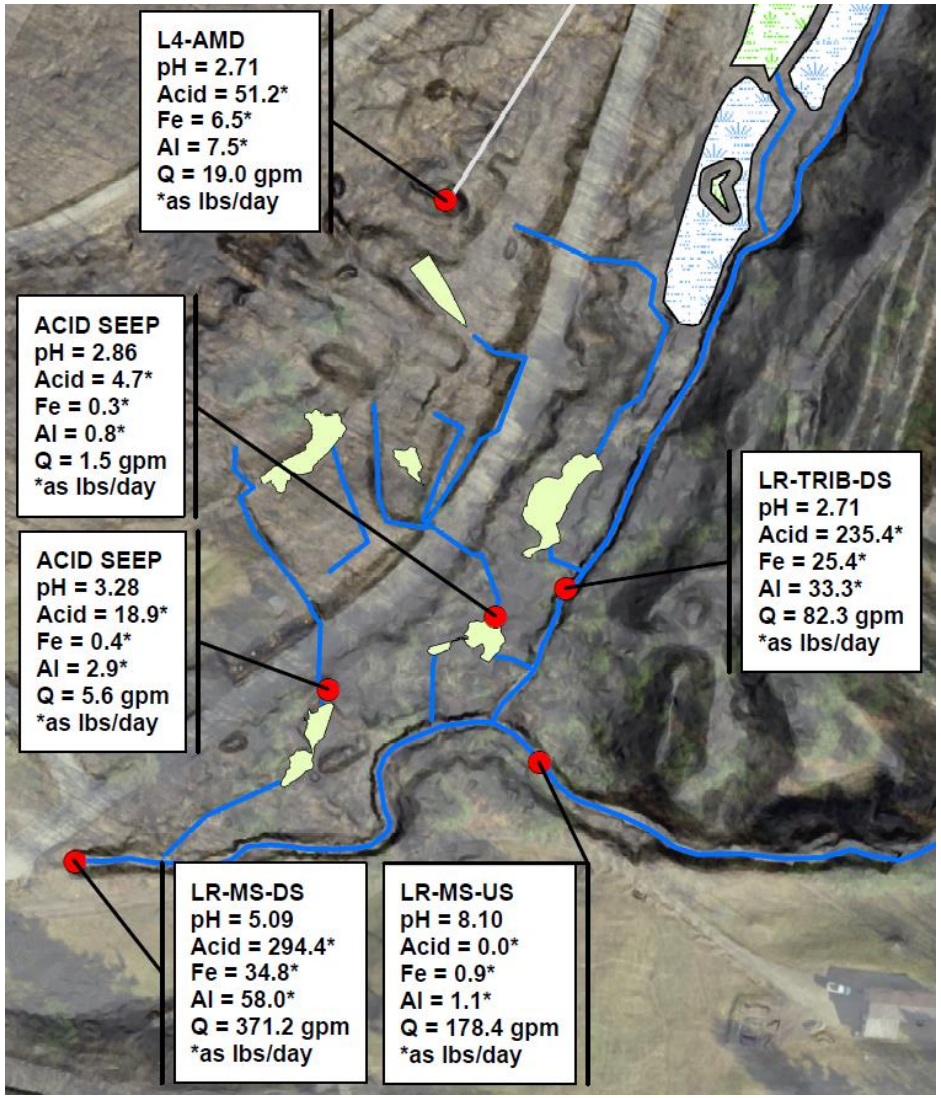
Seasonal Variation and Aquifer Depletion



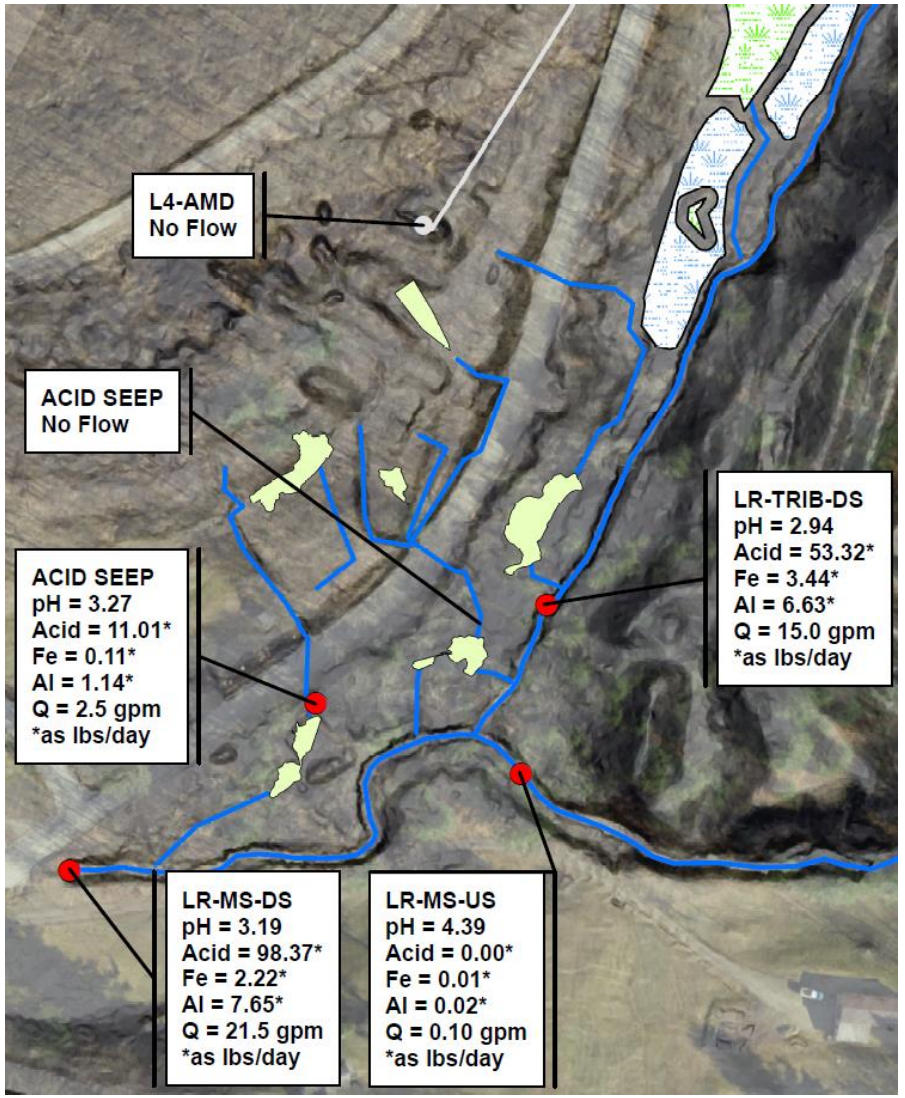
- Dry Season
- Dry AMD sources
- Dry upper watershed
- Saturated lower watershed
  - pH = 3.2
  - Acidity = 300 mg/L
  - Fe = 10 mg/L
  - Al = 40 mg/L

Contaminate Loads

Wet Season



Dry Season



Wet Season

Additional:

- Q: 103 gpm
- Acid: 35 lbs/day
- Fe: 8 lbs/day
- Al: 20 lbs/day

Dry Season

Additional:

- Q: 4 gpm
- Acid: 34 lbs/day
- Fe: -1.3 lbs/day
- Al: 0.14 lbs/day

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APPROACH

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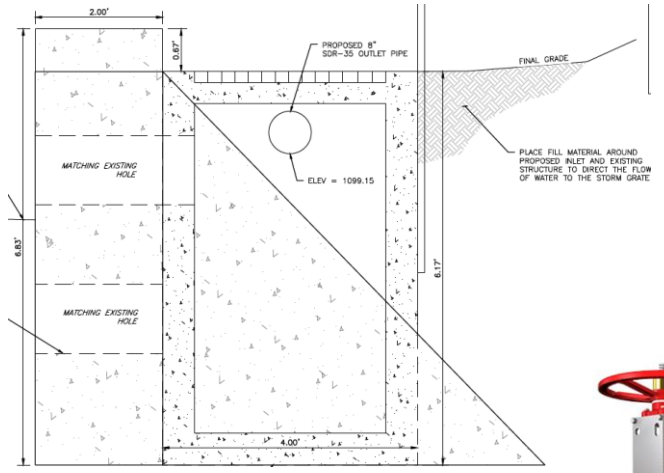
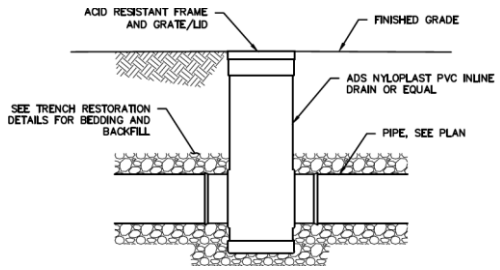
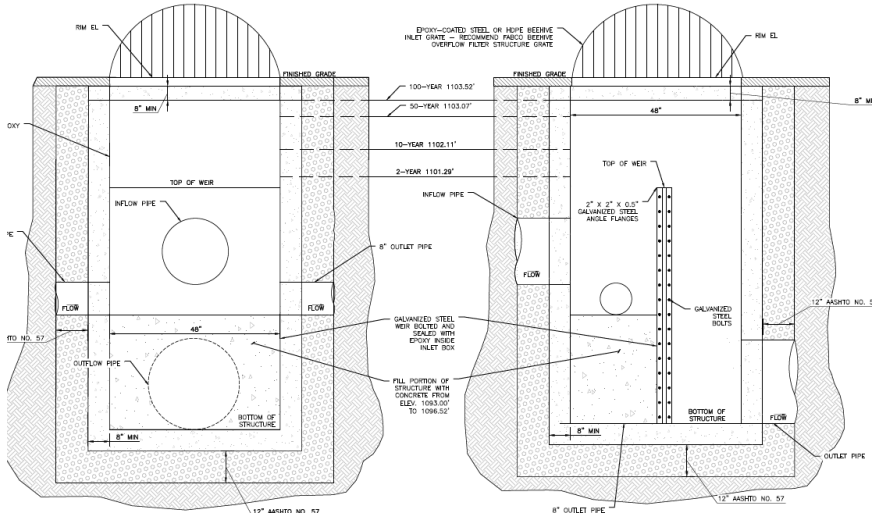
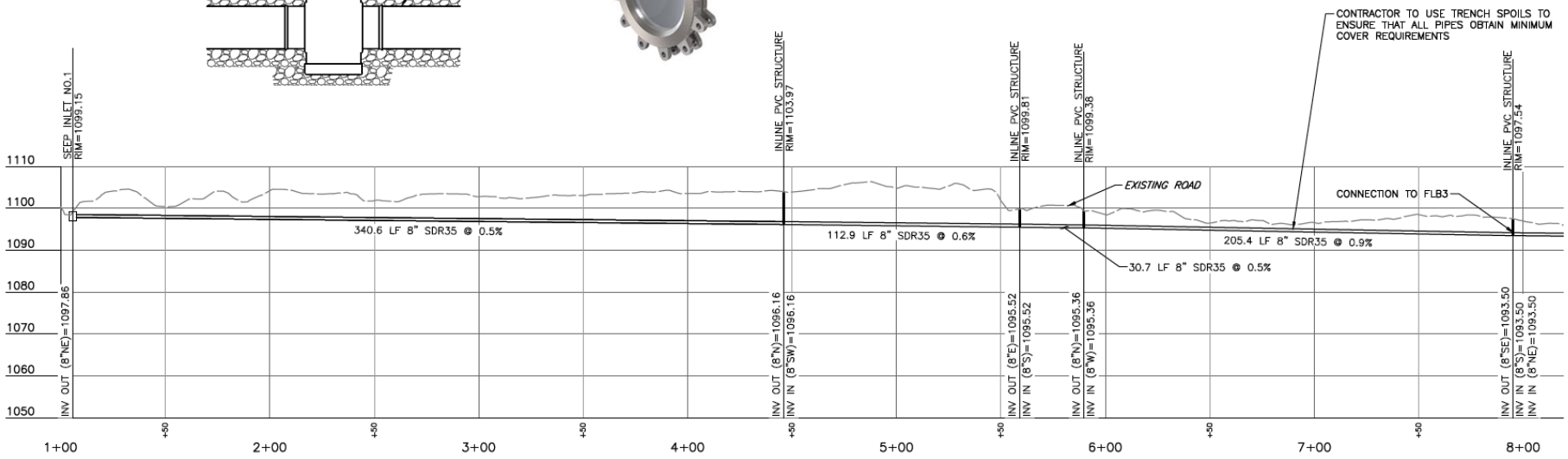
Design – Collection and Conveyance









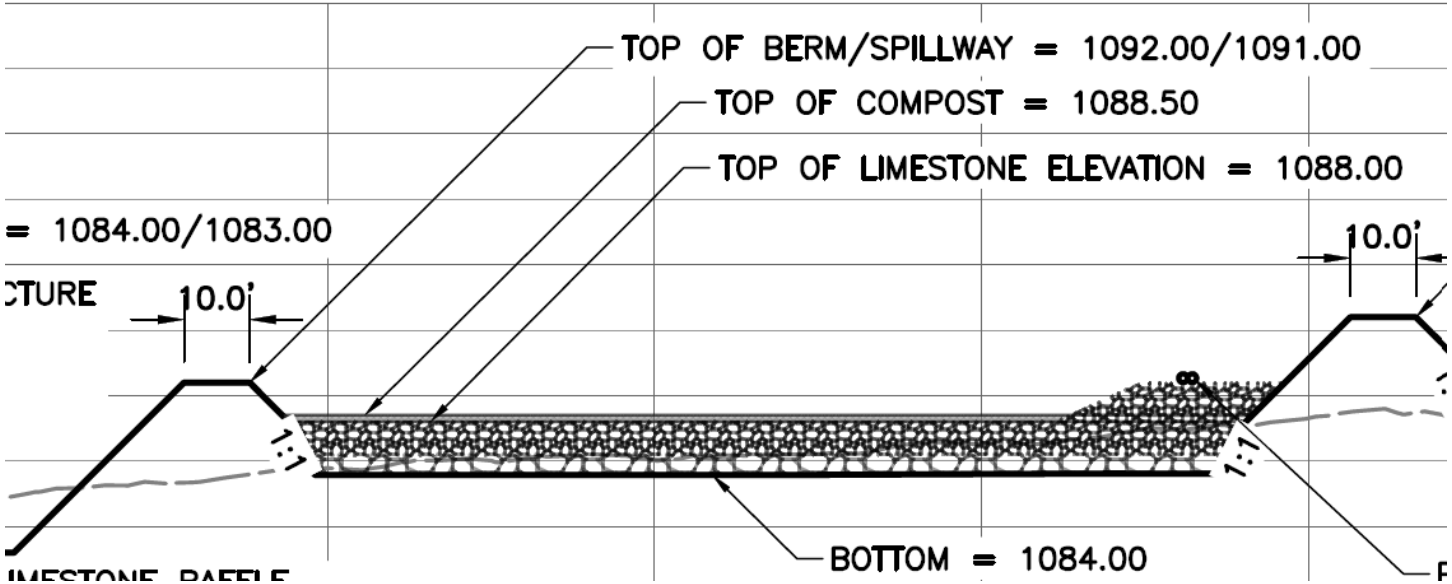
Catch Basins

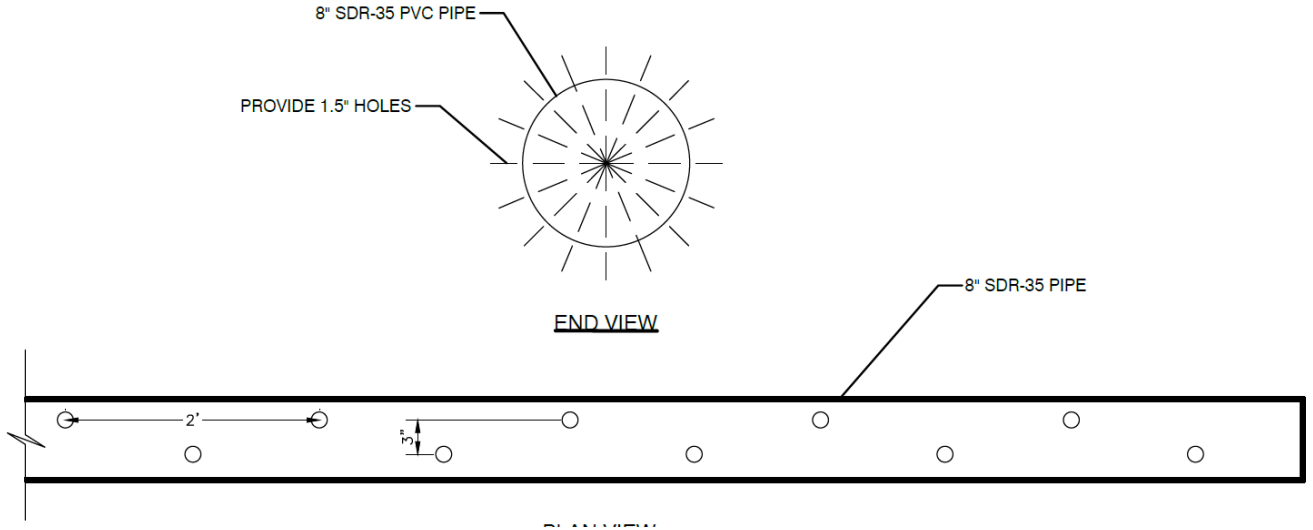
- L4 – prevents AMD bypass through subsurface
- L5 – bypasses >2-year storm event
- L-Upwell – identified subsurface terracotta pipe

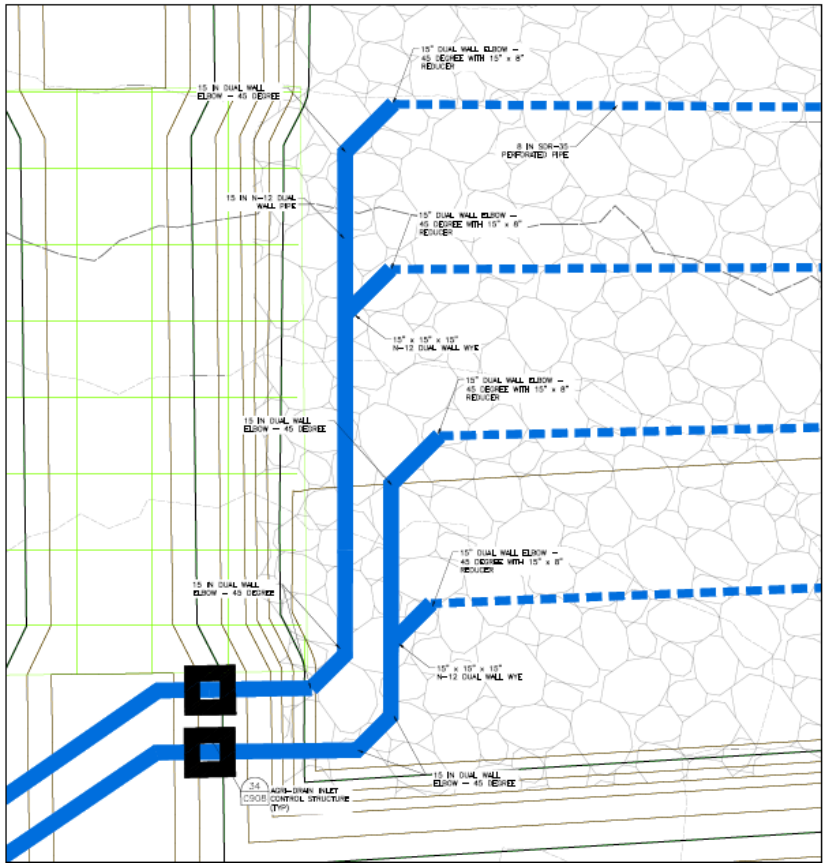
Piping

- Civil 3D Pipe Networks
- Maintain ground cover
- Assess conflicts
- Inline access structures
- 2205 stainless steel

Design – Limestone Beds



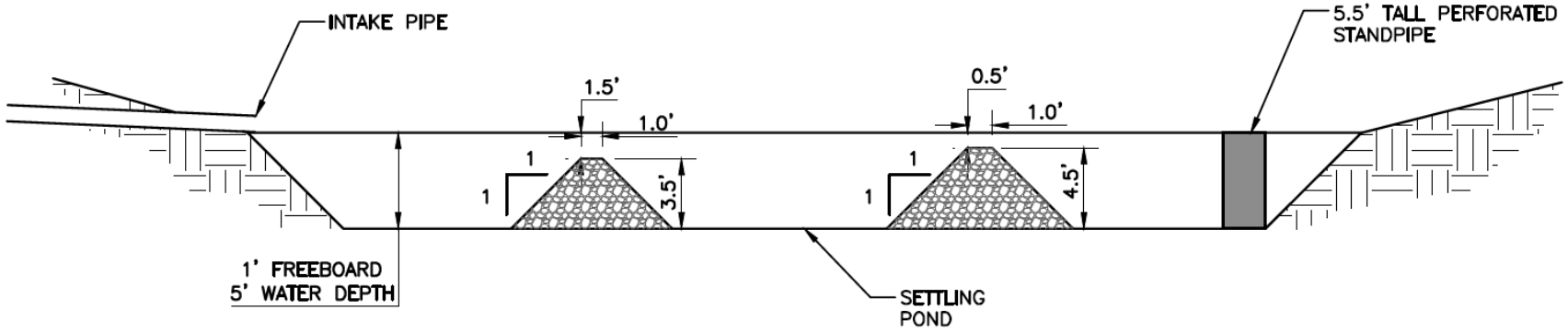




- Rip-rap limestone near piping
- Four main trunk lines
- Custom pipe perforation pattern
- Standing water of 2.0 feet

Design – Settling Ponds

- Settling pond sized for full flush volume of FLBs
- Gravel baffles
  - Velocity reduction
  - Zone of settling
  - Robust structure
- Perforated standpipe outlet



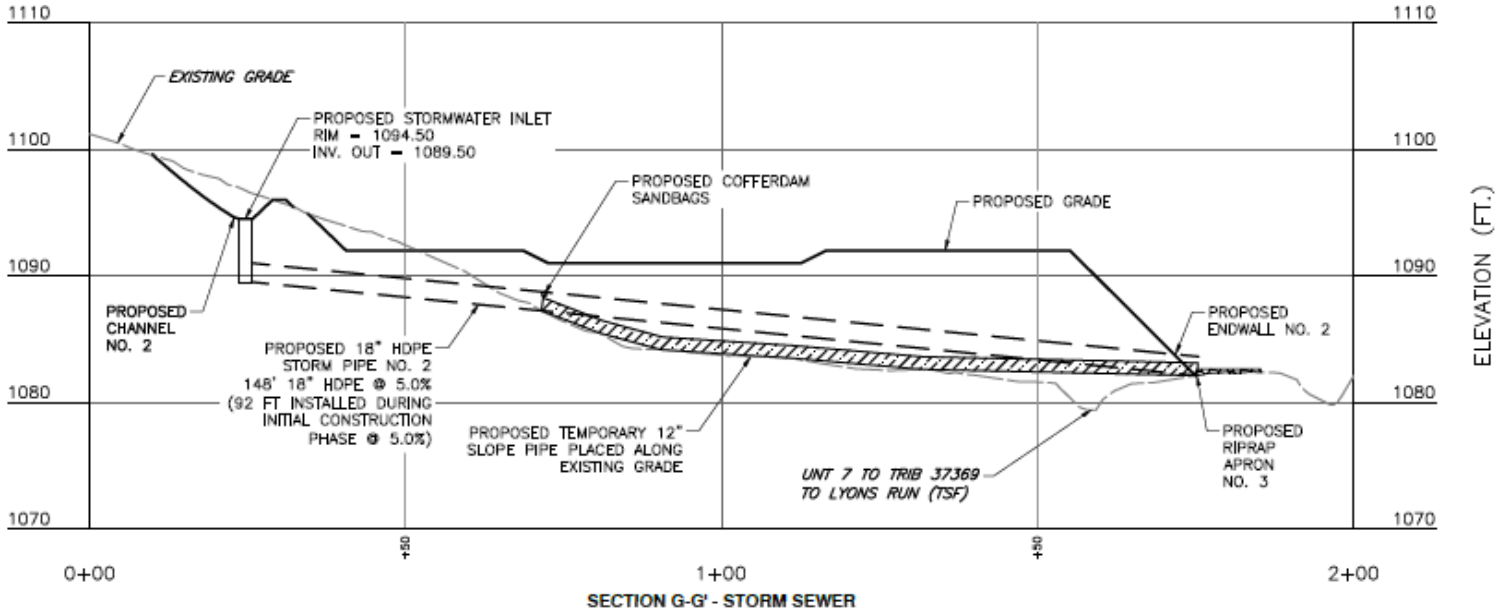
Design – Polishing Wetlands

FACW WETLAND MEADOW MIX (ERNMX-122)*		
Plant Species		Seed Mix Composition
Scientifc Name	Common Name	
Carex vulpinoidea, PA Ecotype	Fox Sedge	29.8%
Elymus virginicus, Madison-NY Ecotype	Virginia Wildrye	16.0%
Carex lupulina, PA Ecotype	Hop Sedge	11.0%
Carex scoparia, PA Ecotype	Blunt Broom Sedge	11.0%
Carex lurida, PA Ecotype	Lurid Sedge	8.5%
Cinna arundinacea, PA Ecotype	Wood Reedgrass	5.2%
Verbena hastata, PA Ecotype	Blue Vervain	4.0%
Juncus effusus	Soft Rush	3.0%
Asclepias incarnata, PA Ecotype	Swamp Milkweed	2.0%
Heliopsis helianthoides, PA Ecotype	Oxeye Sunflower	2.0%
Bidens cernua, PA Ecotype	Nodding Bur Marigold	1.0%
Onoclea sensibilis	Sensitive Fern	1.0%
Eupatorium perfoliatum, PA Ecotype	Boneset	0.8%
Helenium autumnale, PA Ecotype	Common Sneezeweed	0.8%
Iris versicolor	Blueflag	0.8%
Zizia aurea	Golden Alexanders	0.7%
Aster novae-angliae, PA Ecotype	New England Aster	0.3%
Aster prenanthoides, PA Ecotype	Zigzag Aster	0.3%
Eupatorium fistulosum, PA Ecotype	Joe Pye Weed	0.3%
Lobelia siphilitica, PA Ecotype	Great Blue Lobelia	0.3%
Scirpus cyperinus, PA Ecotype	Woolgrass	0.3%
Aster puniceus, PA Ecotype	Purplestem Aster	0.2%
Aster umbellatus, PA Ecotype	Flat Topped White Aster	0.2%
Penthorum sedoides, PA Ecotype	Ditch Stonecrop	0.2%
Solidago rugosa, PA Ecotype	Wrinkleleaf Goldenrod	0.2%
Mimulus ringens, PA Ecotype	Square Stemmed Monkeyflower	0.1%
*application rate 20 lb./acre		

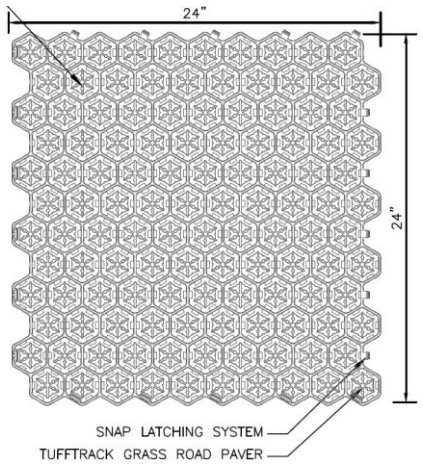
WETLAND PLANTING SPECIFICATIONS						
Plant Community	Plant Species		Type of Plant Material	Unit	Planting Density (units/acre)	Stem Spacing (feet)
	Scientific Name	Common Name				
Shrub and Sedge Wetland Establishment	*Salix interior*	Sandbar Willow	Live Stake	plant	545	4 X 4
	Salix sericea	Silky Willow	Live Stake	plant	545	
	Cornus amomum	Silky Dogwood	Live Stake	plant	545	
	Cephalanthus occidentalis	Button Bush	Live Stake	plant	545	
	Sambucus	Elderberry	Live Stake	plant	545	
	FACW Wetland Meadow Mix (ERNMX-122)		seed	pound	20	

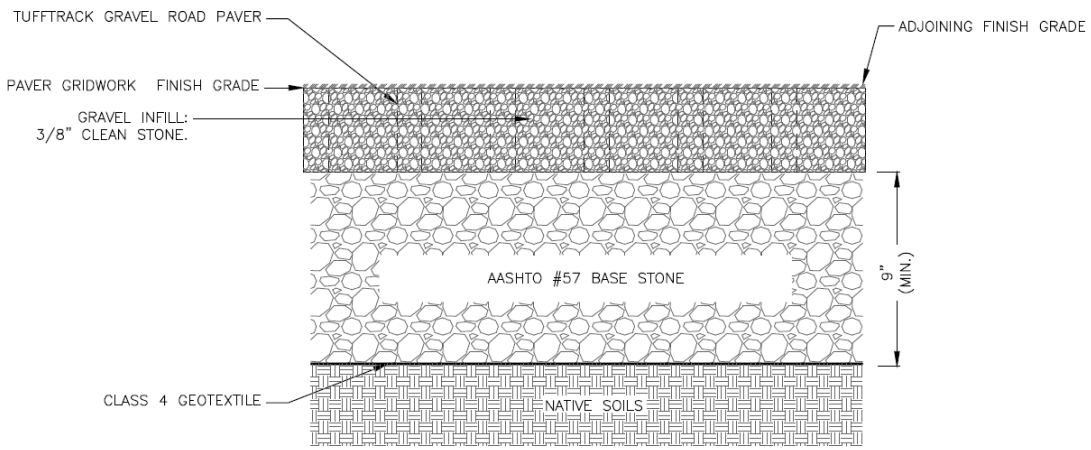
- Terraced wetlands
- Native revegetation
- Intercept groundwater

Design – Stormwater



SECTION G-G' - STORM SEWER

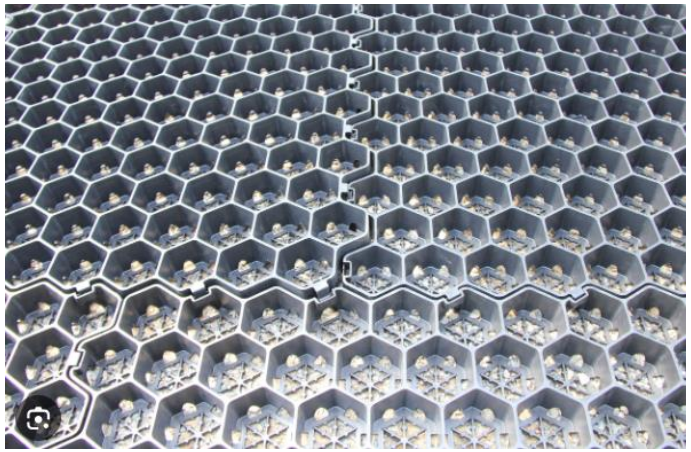




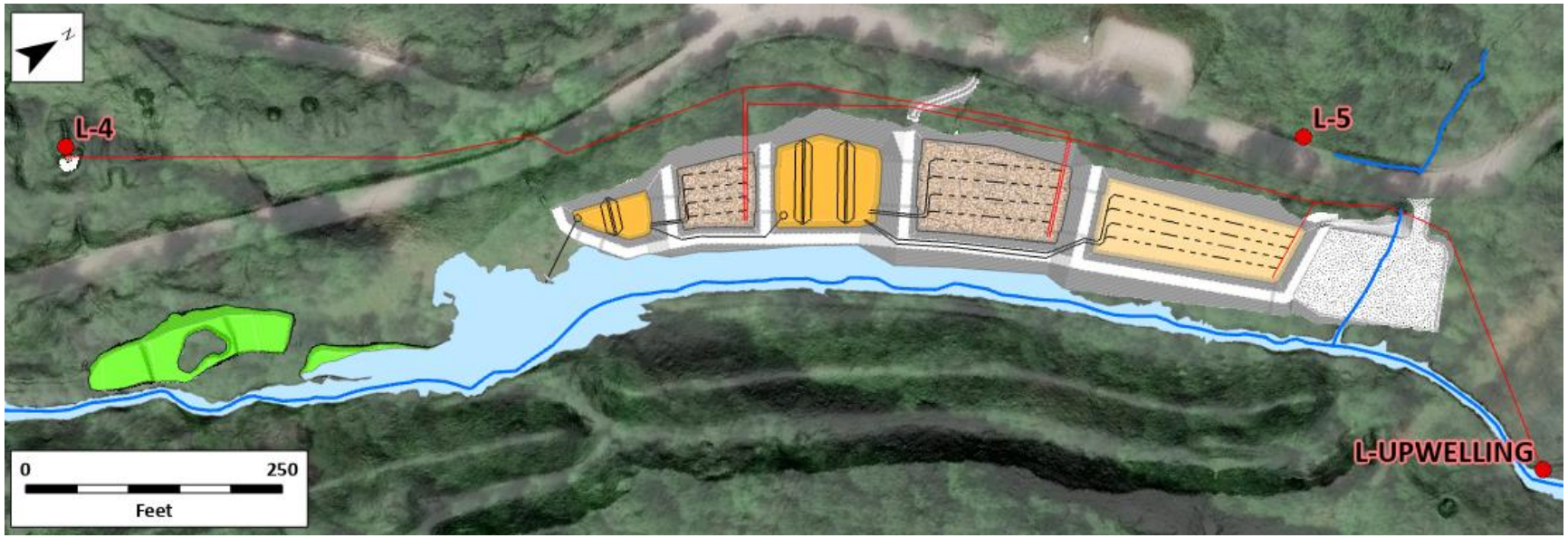
Stormwater collection and diversion through earthwork

Tuff-Track infiltration pavers

- Reduce stormwater runoff to maintain permit compliance

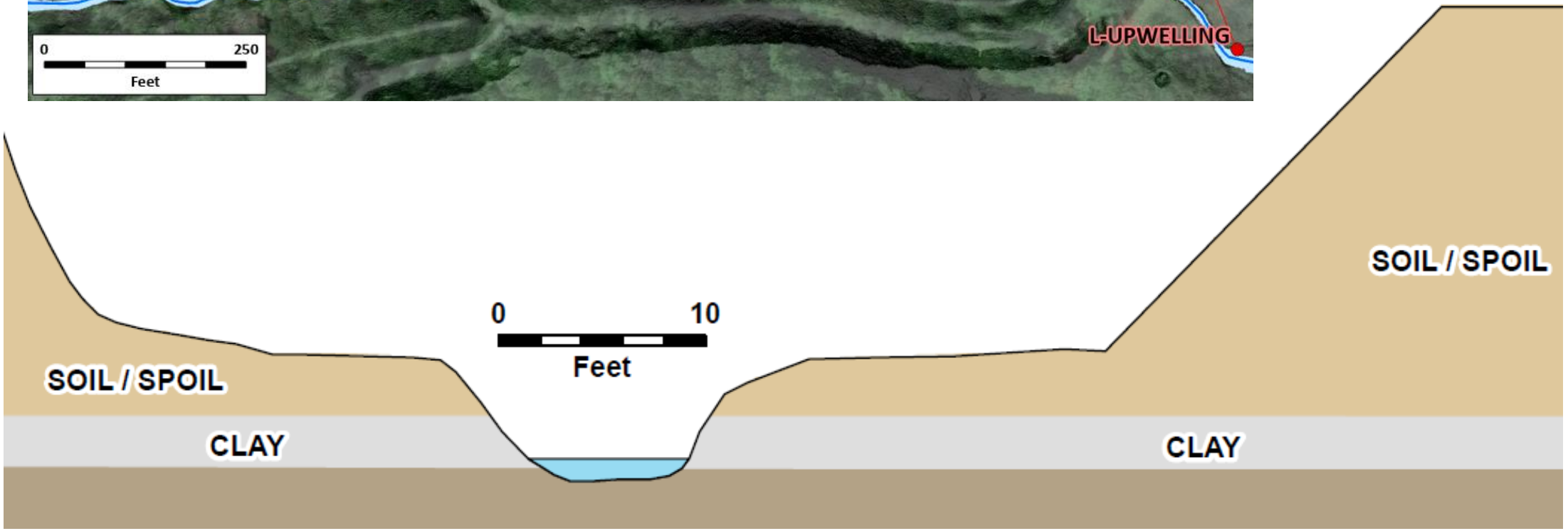


H&H Modeling of Proposed 100-yr Floodway



Entrenchment ratio >2.2

- Access to floodway
- Rise < 1 ft.



Stream Shear Stresses / Site Stabilization

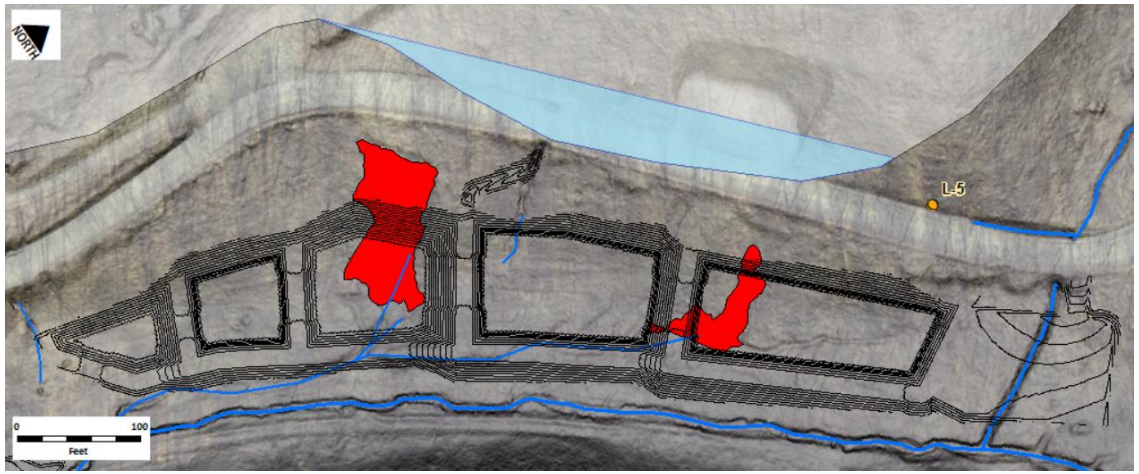
Turf reinforcement matting

- Resist high shear stresses
- Floodways and spillways

Coir fiber matting

- Slope stabilization

Hydrogeology

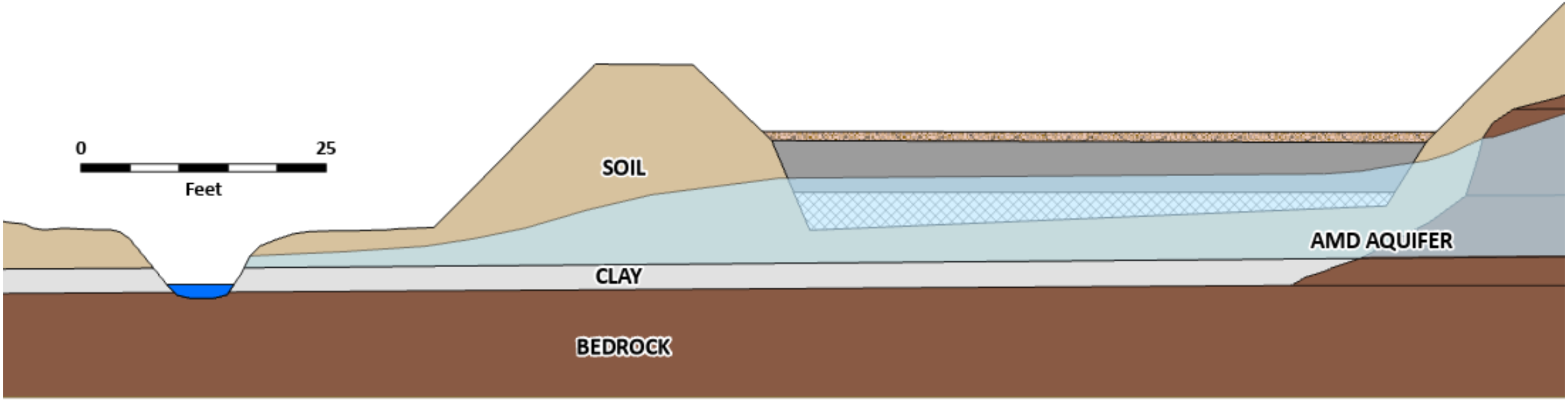


- BMPs excavated into shallow aquifer
- Intercept AMD contaminated groundwater
  - Photo - contaminated groundwater in settling pond
- Conveys through alkaline BMPs as part of treatment process

Hydrogeology

Unlined flushable limestone bed, vertical flow wetlands, settling ponds, and wetlands

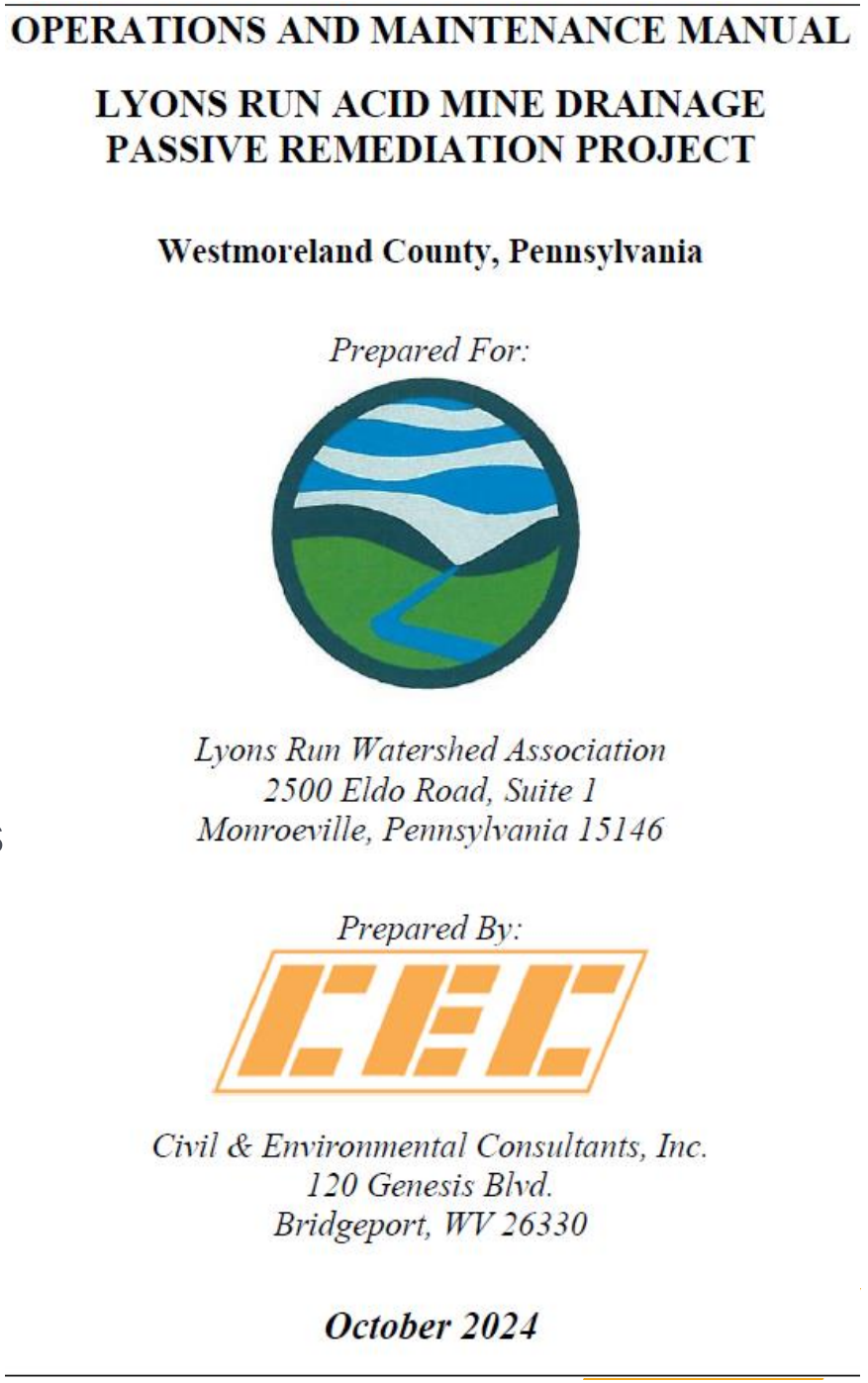
- Intercepts AMD contaminated groundwater flow
- Neutralizes then leaches alkaline water into shallow aquifer and through treatment process
- Ultimately conveys to Tributary 37369 (UNT Lyons Run)



Seasonal Operation

Seasonally controlled releases from treatment ponds

- High flow season flush FLB and VFWs on a two-week cycle
- Moderate flow season flush FLB and VFWs on monthly cycle
- Dry season drain BMPs at 10 gallons per minute (GPM)
  - Full capacity ~1.5 million gallons
  - 10.5 GPM treated water discharge for minimum three months



OPERATIONS AND MAINTENANCE MANUAL

LYONS RUN ACID MINE DRAINAGE PASSIVE REMEDIATION PROJECT

Westmoreland County, Pennsylvania

Prepared For:

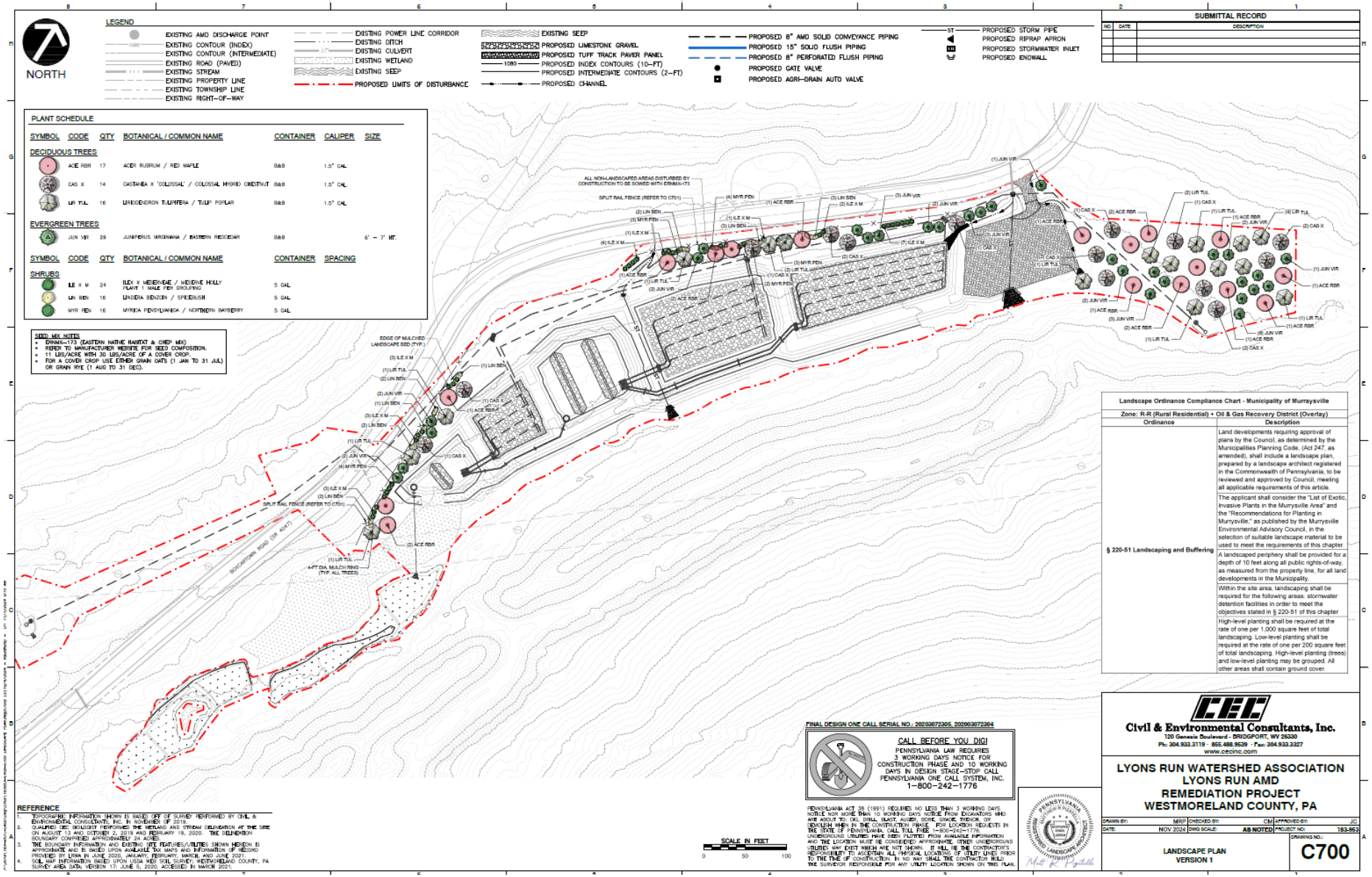
Lyons Run Watershed Association
2500 Eldo Road, Suite 1
Monroeville, Pennsylvania 15146

Prepared By:

Civil & Environmental Consultants, Inc.
120 Genesis Blvd.
Bridgeport, WV 26330

October 2024

Landscape Plan



Deciduous Trees

- Red Maple
- Tulip Poplar
- Hybrid Chestnut

Evergreen Trees

- Eastern Red Cedar

Shrubs

- Holly
- Spicebush
- Northern Bayberry

Public Private Partnership

- Lyons Run Watershed Association (LRWA)
- Municipality of Murrysville
- Pennsylvania Dept. of Env. Protection Bureau of Abandoned Mine Reclamation (BAMR)
- Private Professional Services
  - Legal – Land Purchases
  - Survey – Boundary Retracement
  - Engineering
    - Existing conditions
    - Design
    - Regulatory
    - Construction Quality Assurance

Lyons Run Watershed Association

501(c)(3) non-profit watershed association

- AMD remediation
- Greenway development
- Conservation
- Watershed monitoring / stewardship
- Water quality apps and databases
- Watershed ArcGIS mapping
- Collaborates with public entities and non-profits
- Community events

LRWA / Murrysville

- Lyons Run Watershed Association
  - Privately funded 15 years of background data collection and conceptual planning
  - Executed land purchase of 8-acres required for treatment
  - Negotiated rights-of-entry with adjacent landowners
  - Privately funded engineering and regulatory process ($450,000)
  - Acted as sponsor for AML/AMD grant program construction funding
    - $1.5 million
- Municipality of Murrysville
  - Supportive of project and ecological benefits
  - Conforms to Murrysville Comprehensive Parks, Recreation, and Open Space Plan
  - Provided construction funding through grant award
    - $500,000

Bipartisan Infrastructure Law

- Reauthorized Surface Mining Control and Reclamation Act (SMCRA, 1977)
- Office of Surface Mining Reclamation and Enforcement (OSMRE)
- Pennsylvania Dept. of Environmental Protection Bureau of Abandoned Mine Reclamation (PADEP-BAMR)
  - AML/AMD Grant Program
- Success derived from multi-partner collaboration

Civil & Environmental Consultants, Inc.

Thank You

Lyons Run Watershed Association
Municipality of Murrysville
Westmoreland Conservation District
Bureau of Abandoned Mine Reclamation

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