



# Case Study: Baird Wetland Mitigation

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2016 American Society of Mining & Reclamation  
Spokane, Washington

# Site Location



# History

- Site was previously mined for coal within a portion of the permit area in the mid 1950's to early 1960's
  - Several mine discharges formed
  - Unreclaimed highwalls
- Oil wells
  - 6 oils wells were onsite along with related facilities (pipelines, tanks, etc.)
    - Plugged prior to mining



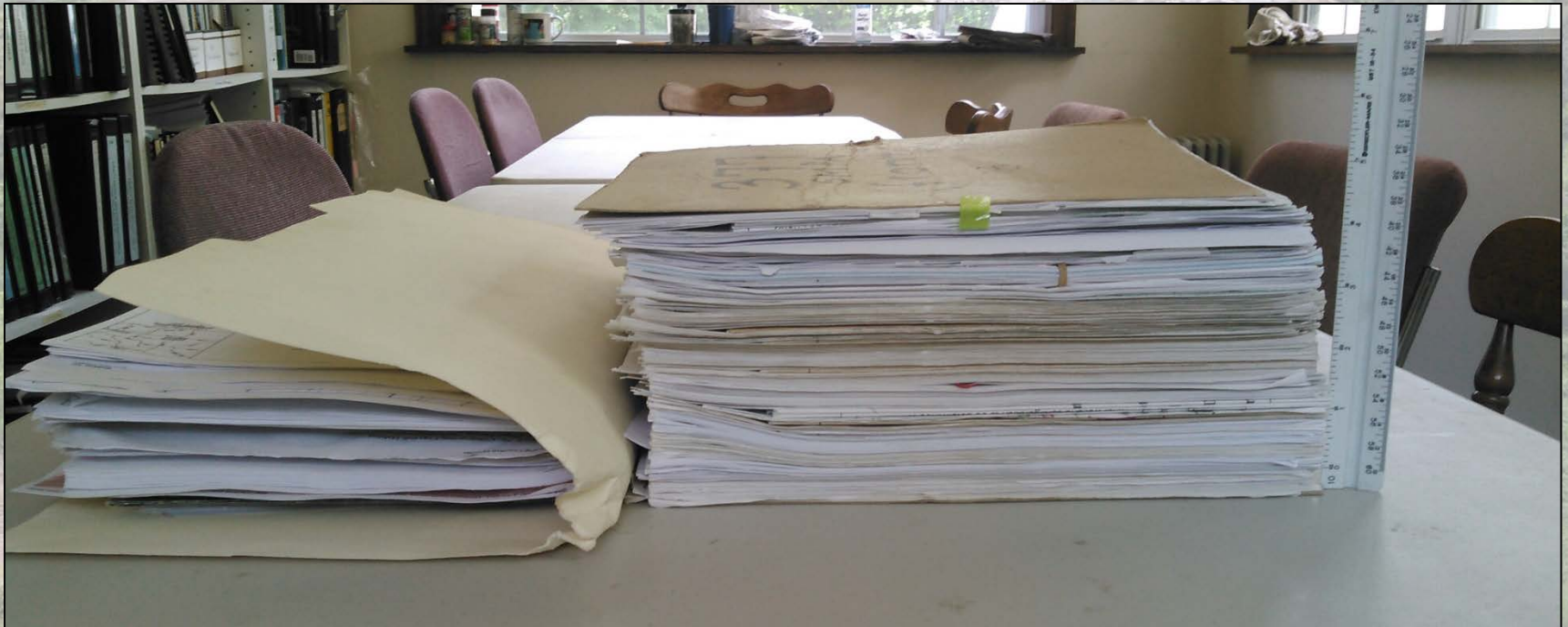
1939



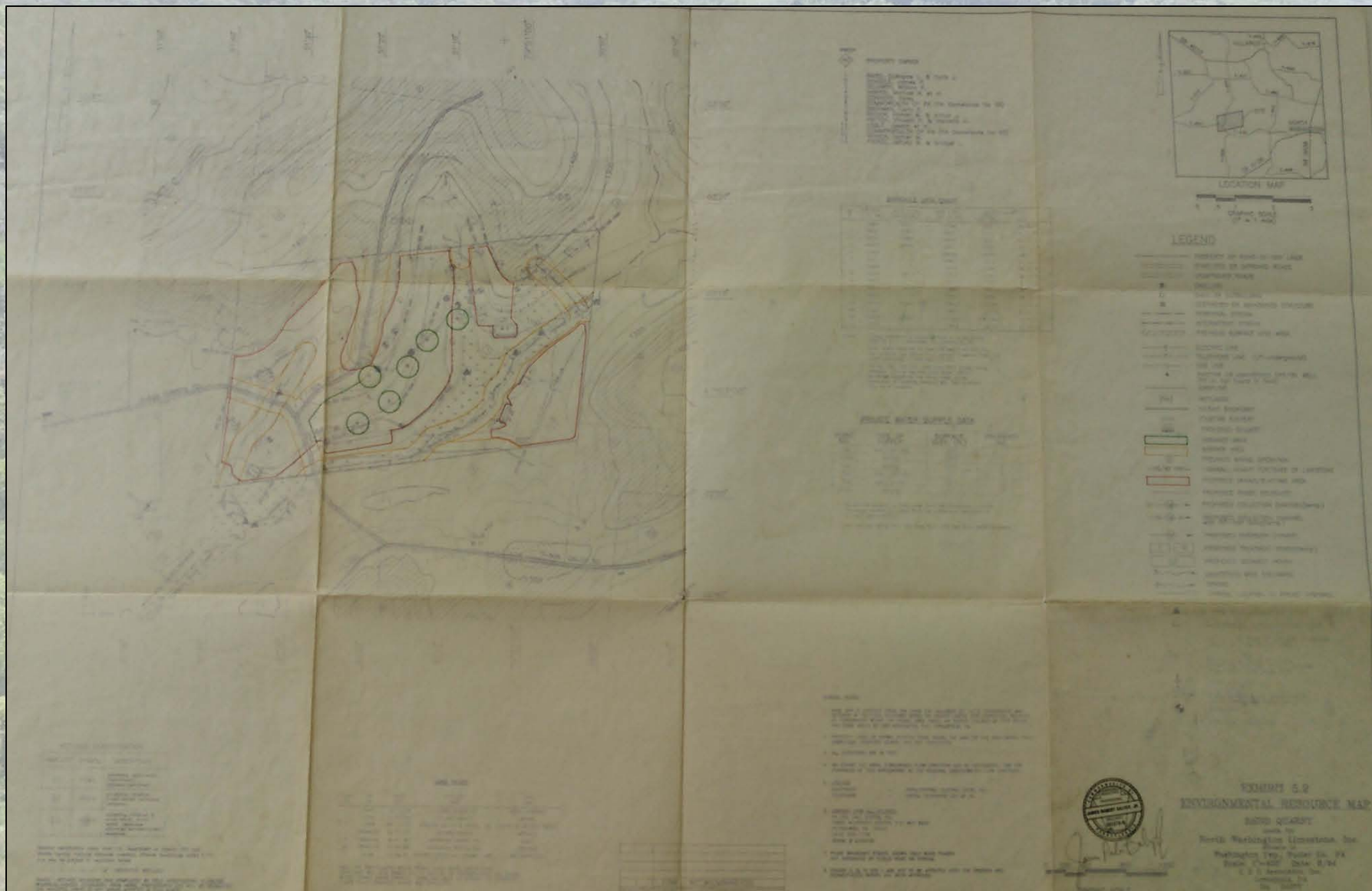
1967

# Permitting

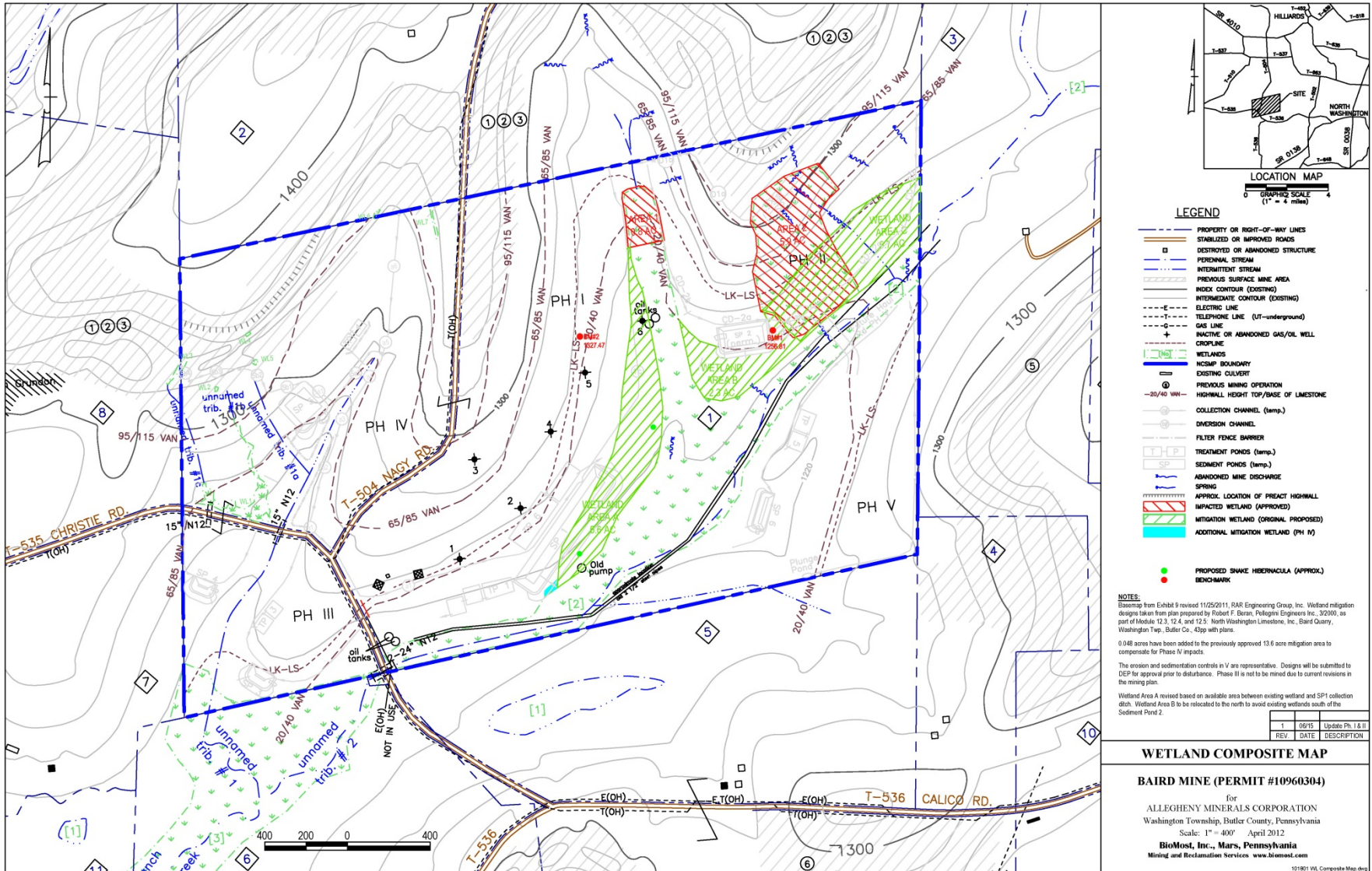
- Permit was originally issued in 1997.
  - Split into 5 separate phases.
  - Originally only permitted mining for Phase I.
  - Phase II required wetland mitigation.



# Permit Map



# Permit Map





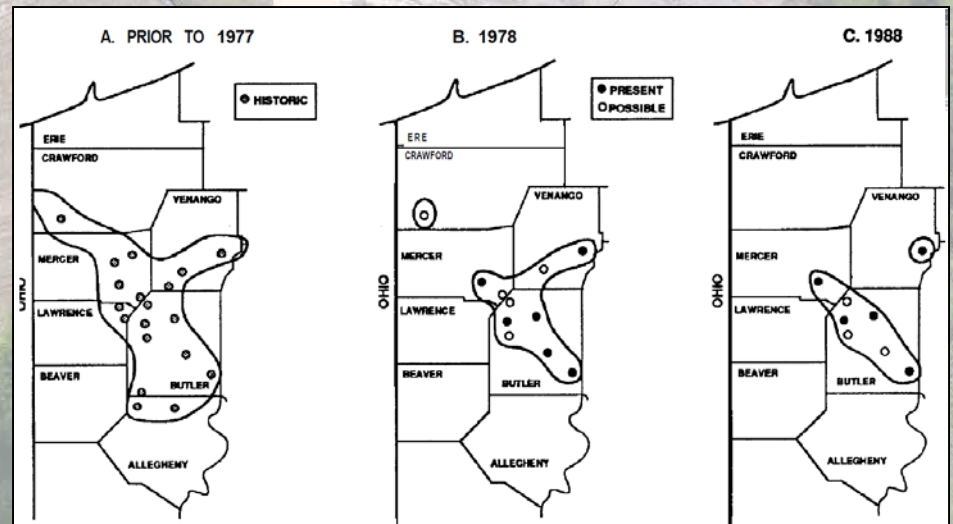
# Massasauga Rattlesnake



MTCarriek

# Massasauga Rattlesnake

- State endangered species
  - Not federally protected
- Not really a PA species
  - Prefers prairies of the Midwest and around the Great Lakes in Canada
- Few isolated populations remaining in relic prairie, large wetland systems, old agricultural fields
  - One known site approximately 1 mile to the west of mine site



# Massasauga Rattlesnake Habitat



# Massasauga Rattlesnake Habitat



# Symbiotic Relationship

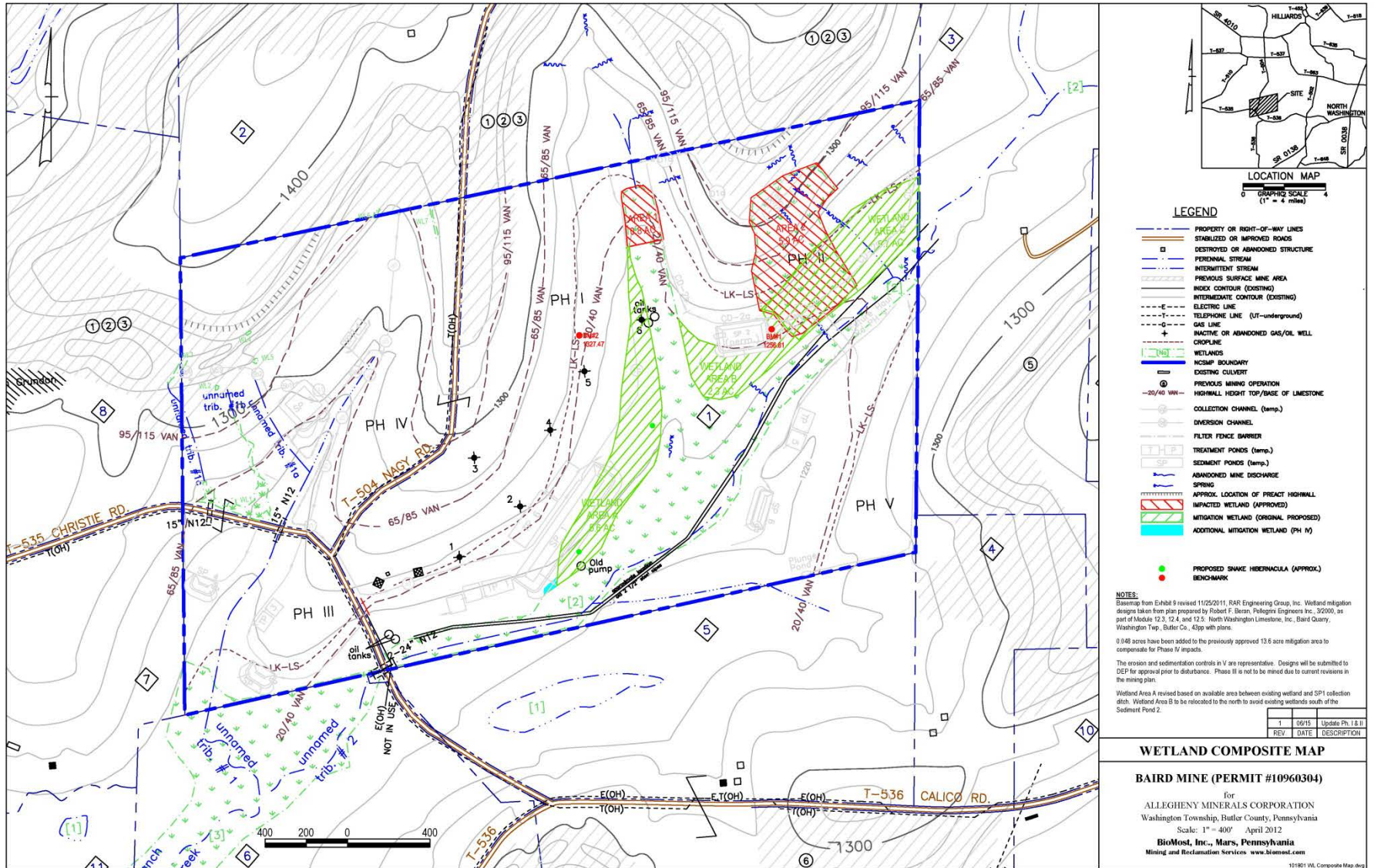
- Hibernates in crayfish burrows
  - *Cambarus thomai* (Little Brown Mudbug)
  - Roger Thoma, OSU



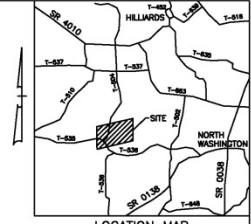
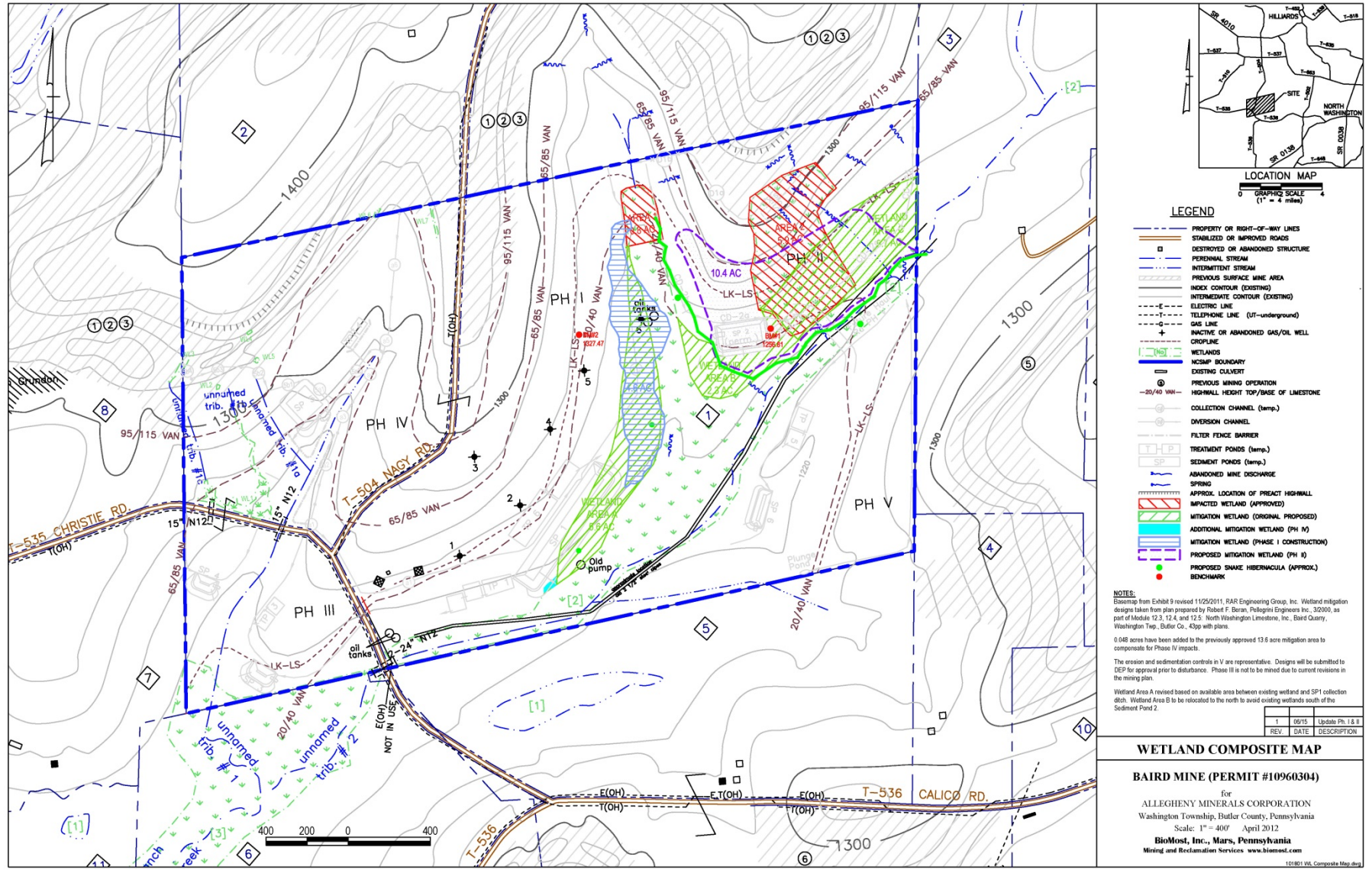
# Wetland Impacts

- Two wetland impacts on Phase II
  - 0.8 AC for crossing
  - 5.9 AC sloped wetland formed as a result of AMD overflowing old sediment pond
  - Small impacts to Phase IV
- Required to construct a total of 13.6 acres of wetlands (2:1)
  - Required to be prior to or concurrent with impacts

# Proposed Mitigation Plan



# Revised Mitigation Plan



- LEGEND**
- PROPERTY OR RIGHT-OF-WAY LINES
  - STABILIZED OR IMPROVED ROADS
  - DESTROYED OR ABANDONED STRUCTURE
  - PERENNIAL STREAM
  - INTERMITTENT STREAM
  - PREVIOUS SURFACE MINE AREA
  - INDEX CONTOUR (EXISTING)
  - INTERMEDIATE CONTOUR (EXISTING)
  - ELECTRIC LINE
  - TELEPHONE LINE (UT-underground)
  - GAS LINE
  - INACTIVE OR ABANDONED GAS/OIL WELL
  - + CROPLINE
  - WETLANDS
  - NCSMP BOUNDARY
  - EXISTING CULVERT
  - PREVIOUS MINING OPERATION
  - HIGHWALL HEIGHT TOP/BASE OF LIMESTONE
  - COLLECTION CHANNEL (temp.)
  - DIVERSION CHANNEL
  - FILTER FENCE BARRIER
  - TREATMENT PONDS (temp.)
  - SEDIMENT PONDS (temp.)
  - ABANDONED MINE DISCHARGE
  - SPRING
  - APPROX. LOCATION OF PROECT HIGHWALL
  - IMPACTED WETLAND (APPROVED)
  - MITIGATION WETLAND (ORIGINAL PROPOSED)
  - ADDITIONAL MITIGATION WETLAND (PH IV)
  - MITIGATION WETLAND (PHASE I CONSTRUCTION)
  - PROPOSED MITIGATION WETLAND (PH II)
  - PROPOSED SNAKE HIBERNACULA (APPROX.)
  - BENCHMARK

**NOTES:**  
 Drawing from Exhibit 9 revised 11/25/2011. RAR Engineering Group, Inc. Wetland mitigation designs taken from plan prepared by Robert F. Beran, Paleogini Engineers Inc., 32000, as part of Module 12.3, 12.4, and 12.5. North Washington Limestone, Inc., Baird Quarry, Washington Twp., Butler Co., 43pp with plans.

0.048 acres have been added to the previously approved 13.6 acre mitigation area to compensate for Phase IV impact.

The erosion and sedimentation controls in V are representative. Designs will be submitted to DEP for approval prior to disturbance. Phase III is not to be mined due to current revisions in the mining plan.

Wetland Area A revised based on available area between existing wetland and SP1 collection ditch. Wetland Area B to be relocated to the north to avoid existing wetlands south of the Sediment Pond 2.

REV	DATE	DESCRIPTION
1	09/15	Update Ph. I & II

## WETLAND COMPOSITE MAP

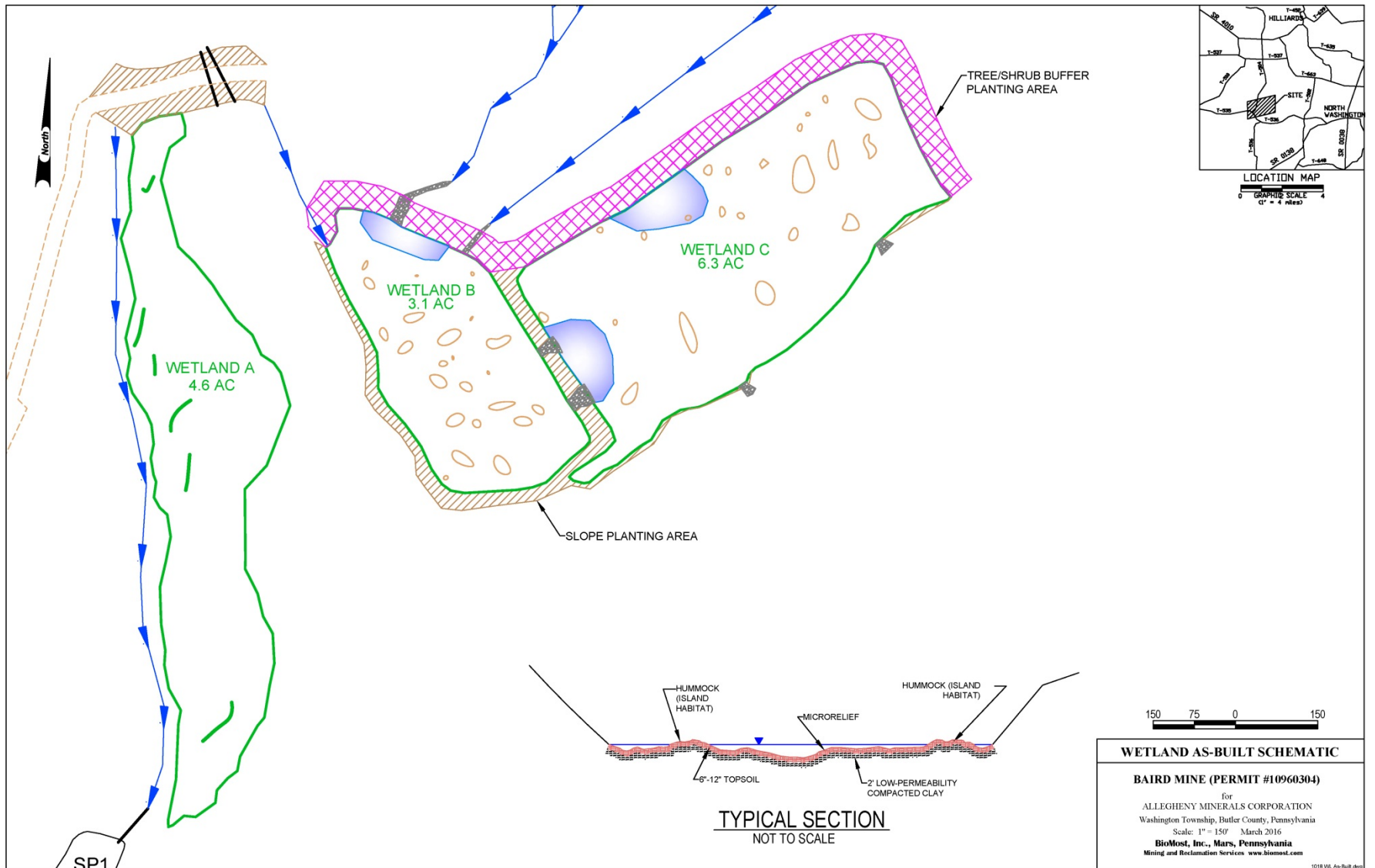
**BAIRD MINE (PERMIT #10960304)**

for  
**ALLEGHENY MINERALS CORPORATION**  
 Washington Township, Butler County, Pennsylvania  
 Scale: 1" = 400' April 2012

**BioMost, Inc., Mars, Pennsylvania**  
 Mining and Reclamation Services [www.biomost.com](http://www.biomost.com)

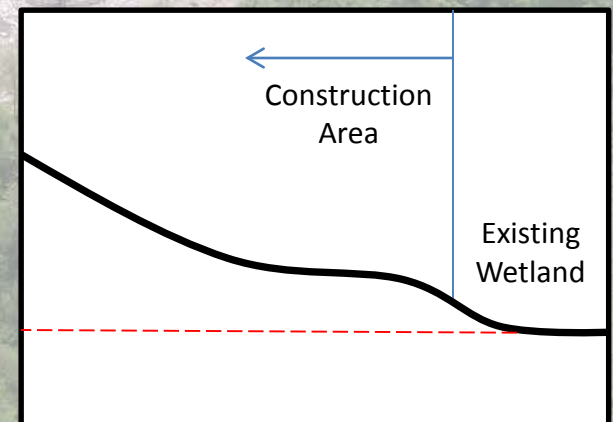


# As-Built Schematic



# Wetland A Construction

- Constructed in 2012
  - Created 4.6 acres of wetland
- Constructed outside of mining area
- Proposed a different type of wetland construction
  - Minimize disturbance
  - Encourage terrestrial crayfish



# Wetland A Construction



# Wetland A Construction



# Wetland A Construction

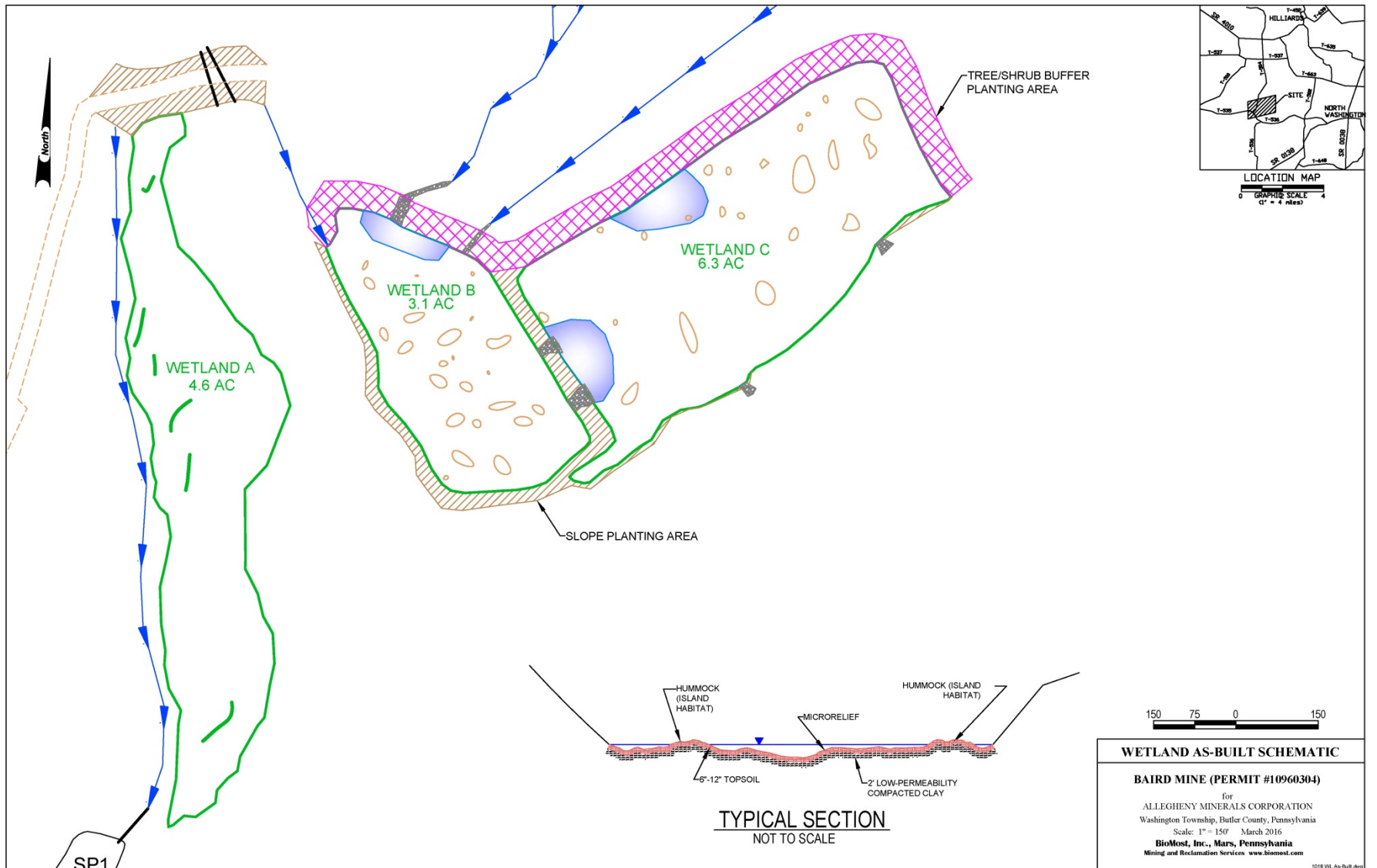


# Wetland A Hydrology

- No Water!!
  - Collection ditch upgradient of wetland
    - Cuts off surface runoff
  - Elevation of Wetland A is higher than the adjacent existing wetlands
  - No springs
- Lower elevation portions of Wetland A dominated by hydrophytic vegetation



# As-Built Schematic



# Wetland A Post-Construction





# Wetland A Post-Construction



# Wetland A Post-Construction



# Wetland A Post-Construction



# Wetland B & C Construction

- Constructed within the mining area
  - Took precautions:
    - Spoil tends to settle
    - 2' layer of onsite clay compacted with a roller
    - Another 1-2' of “wetland substrate” over compacted clay



# Wetland B & C Construction

- Water Sources
  - Surface runoff
  - Abandoned mine discharge
    - Previously fed a majority of wetlands at the site
    - Flows through limestone ditch



# Wetland C Construction



# Wetland C Construction



# Wetland C Construction





# Wetland Habitat Creation

- Microtopography/  
Hummocks
- Deep Pools
- Snags
- Woody Debris
- Rock Piles
  - Crevices sometimes  
used by Massasauga  
Rattlesnakes



# Wetland C Construction



# Wetland C Construction



# Wetland C Construction



# Wetland B Construction



# Wetland B Construction



# Wetland B



# Planting

- Used a combination of seed, live stakes, and bare root
- Seeded in fall of 2015
  - Ernst Obligate Wetland Seed Mix
    - Supplemented with additional seed from a small supplier
      - Reduce costs
      - Hydrologic conditions
      - Increased diversity
        - » *Scirpus acutus* (Hardstem Bulrush)
    - Spread at rate of 12 Lbs/acre (Ernst recommends 20 Lbs/acre)
- Experiment – Only seeded Wetland C. No seed used within Wetland B.
  - Spent >\$6,500 on seed for Wetland C
- Approximately 800 trees planted as buffer upgradient of wetland
  - Black Locust, Red Oak, Red Maple, Gray and Silky Dogwood



# Student Volunteers

- Students from Geography, Geology and Environment Club at Slippery Rock University
- First time students had been on a mine site
  - Toured facilities prior to planting
- Planted 2400 livestakes
  - Purchased 2100 livestakes from local supplier
    - Mixture of willows and dogwood
  - Supplemented with 300 *Spiraea alba* cuttings (Meadowsweet) from adjacent wetland

# Quarry Tour



# Livestakes



# Meadowsweet Cuttings



# Monitoring

- Monitoring will begin in June 2016
  - Photo points have been established throughout the wetlands.
  - Establish quadrats in each of the wetlands
- 2 monitoring events for 3 years and 1 monitoring event for the final 2 years
  - Comprehensive vegetative survey in 3<sup>rd</sup> year
- Possibility of reducing monitoring based on conditions of wetland

# Plant Growth



Wetland B



Wetland C

# Livestakes



# Wetland Visitors





# Wetland Visitors



# Fresh Crayfish Burrows



# UAV Monitoring



- Allegheny Mineral recently purchased a “drone”
  - DJI Phantom
    - HD photos and video
    - On-board GPS
    - Inexpensive
  - Hoping to use the drone for stockpile volume calculations
- Historically took aerial photos of their mines annually





# UAV Video Monitoring



[Video Link](#)