



# REHABILITATION OF PENNSYLVANIA PASSIVE TREATMENT SYSTEMS

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# OPERATION AND MAINTENANCE: PARTNERING FOR SUCCESS

- Considering the scope of the challenge and the resources required to mount a successful clean-up program, it is widely recognized that an active, cooperative partnership between involved citizens, academia, industry, and public agencies is essential to properly address acid mine drainage or abandon mine drainage (AMD) (2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report).



# OVERVIEW

- Operation and maintenance (O&M) basics
- Technical assistance program
- Why systems fail
- Diagnosing the problem
- Lutherlyn
- Mccaslin Road
- Laurel Run Reitz# 1

# OPERATION AND MAINTENANCE: THE BASICS

- Most AMD treatment facilities are built to a specific design life
- Over 300 publicly funded passive systems in PA
- Most of the passive treatment systems in PA are responsibility of grassroots watershed organizations.



# OPERATION AND MAINTENANCE: THE BASICS

- These watershed organizations donate their valuable time and limited resources to improving the environment and the quality of life in their communities.
- While their efforts have resulted in the improvement of many miles of streams, volunteers sometimes lack the technical knowledge to effectively maintain their passive treatment systems.



# OPERATION & MAINTENANCE TECHNICAL ASSISTANCE PROGRAM

- To help watershed groups, non-profits, conservation districts, etc.
- Initiated late 2011
- Includes both TA and PTS Snapshot
- Funding Sources
  - PA DEP Growing Greener Program
  - Foundation for PA Watersheds
    - Regular program sources
    - GenOn Settlement – Kiski-Conemaugh Basin
  - In-kind/match watershed groups

# WHY DO PASSIVE SYSTEMS “FAIL”?

- Design - undersized, wrong application/developing technology, etc.
- Construction - sloppiness, short-cuts, accidental errors
- Site conditions - not enough room, something vs. nothing
- Unanticipated issues - water quality or quantity changes
- Design life met and/or treatment media spent
- Lack of O&M

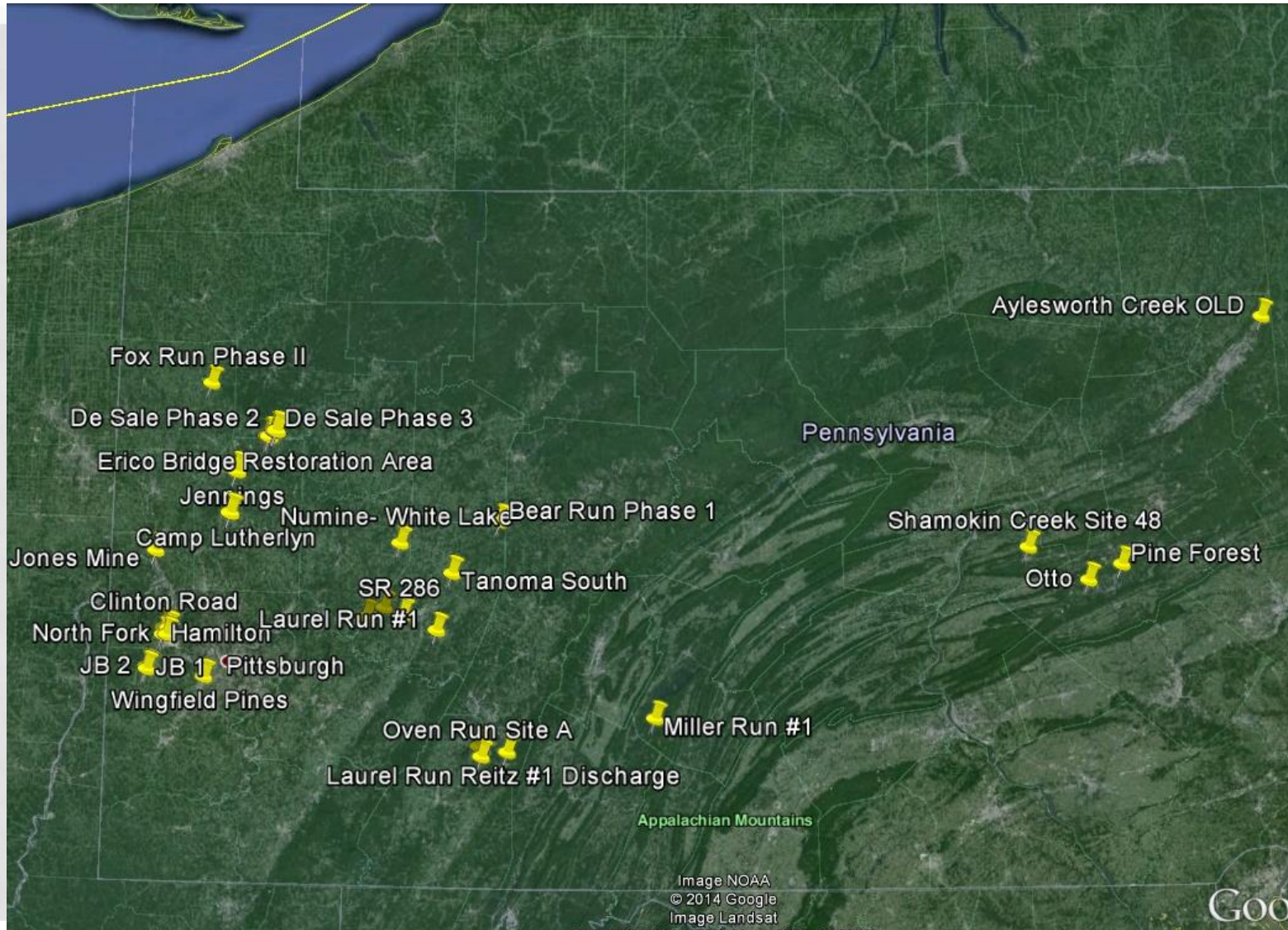
# DIAGNOSING THE PROBLEM

- Bear Run Phase 1
- Grate plugged with Fe & debris
- Sometimes getting a bit dirty makes for a simple fix!

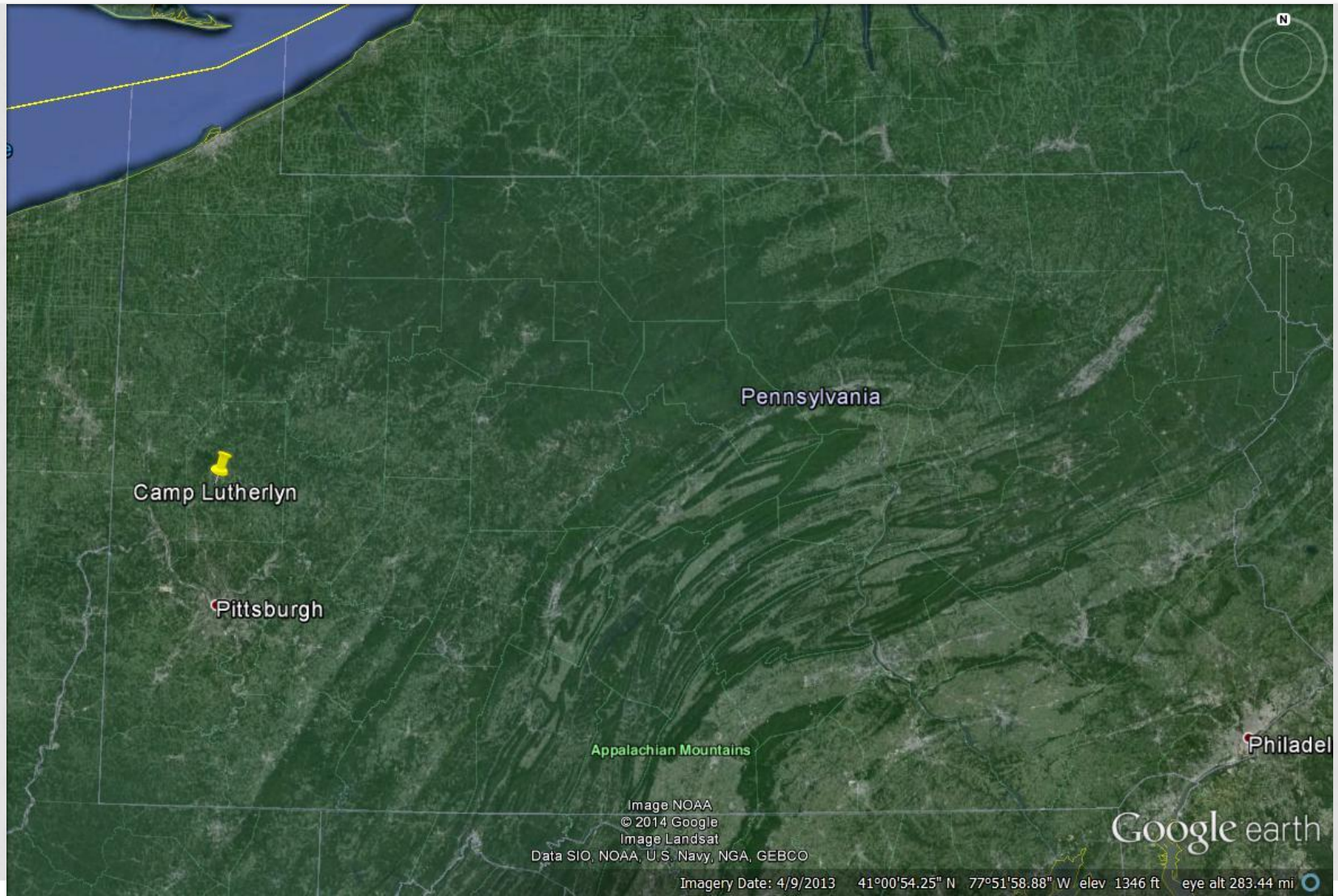




# O&M TO DATE



# O&M- CAMP LUTHERLYN



# CAMP LUTHERLYN

**AMD Source:** Underground  
**Watershed:** Semiconon Run  
**City:** Connoquenessing Twp  
**County:** Butler  
**State:** Pennsylvania  
**Primary Funding Partners:** OSM  
Watershed Cooperative  
Assistance  
**Stream:** Semiconon Run



## Water Quality (Avg.)

Parameter	Coll. Pool	WL Effluent
pH	6.4	6.8
alkalinity	106	81
acidity	neg.	neg.
Fe	18.5	3.3
Mn	3.8	3
Al	<1	<1

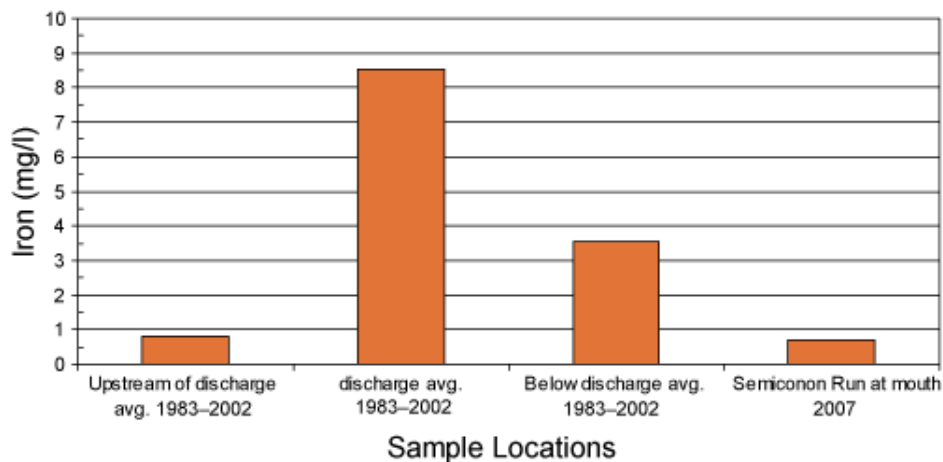
Total metals mg/L, acidity and alkalinity as CaCO<sub>3</sub> mg/L

# CAMP LUTHERLYN

- Successful Passive Treatment resulted in removal of Semiconon Run from the 303(d) list in 2008

Figure 4. Measurements of iron concentrations.

## Iron levels in Semiconon Run



# CAMP LUTHERLYN



- Channels within the wetland caused short circuiting = increased Fe in effluent

# CAMP LUTHERLYN

- Successful vegetation led to overgrown level spreaders increasing channelization and adding to the problem rather than preventing



# CAMP LUTHERLYN



# CAMP LUTHERLYN

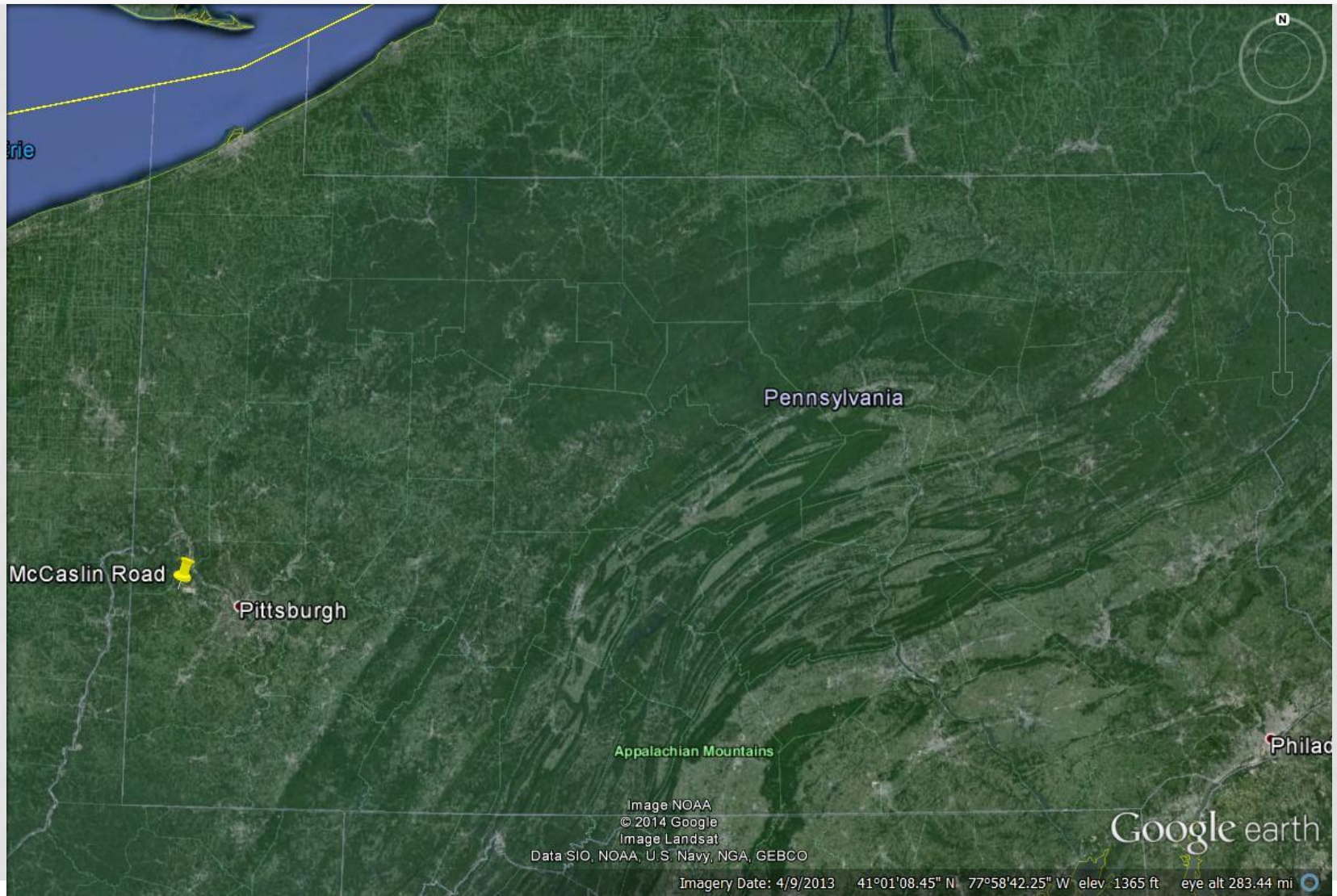
## Pre- and Post- O&M Effluent Field Water Quality Data

Parameter	Pre-O&M	Post-O&M
pH	7.0	6.9
alkalinity	~60	~70
Fe (mg/l)	4-8	0.5 - 1

Total metals mg/L, acidity and alkalinity as CaCO<sub>3</sub> mg/L



# O&M- MCCASLIN ROAD



# MCCASLIN ROAD

**AMD Source:** Underground

**Watershed:** Montour Run

**City:** Findlay Township

**County:** Allegheny

**Primary Funding Partners:**

Foundation for PA Watersheds  
PADEP Growing Greener

**Stream:** West Fork of Enlow Run



## Water Quality (Avg.)

Parameter	Raw	Effluent
pH	3.6	6.6
alkalinity	0	28
acidity	263	neg.
Fe	39	1
Mn	15	6
Al	15	2

Total metals mg/L, acidity and alkalinity as CaCO<sub>3</sub> mg/L

# MCCASLIN ROAD

- Reduced treatment performance after several years of operation
- Water quality decreased due to plugged media
- BMI stirred & flushed the limestone media within the VFP in 2011



# MCCASLIN ROAD



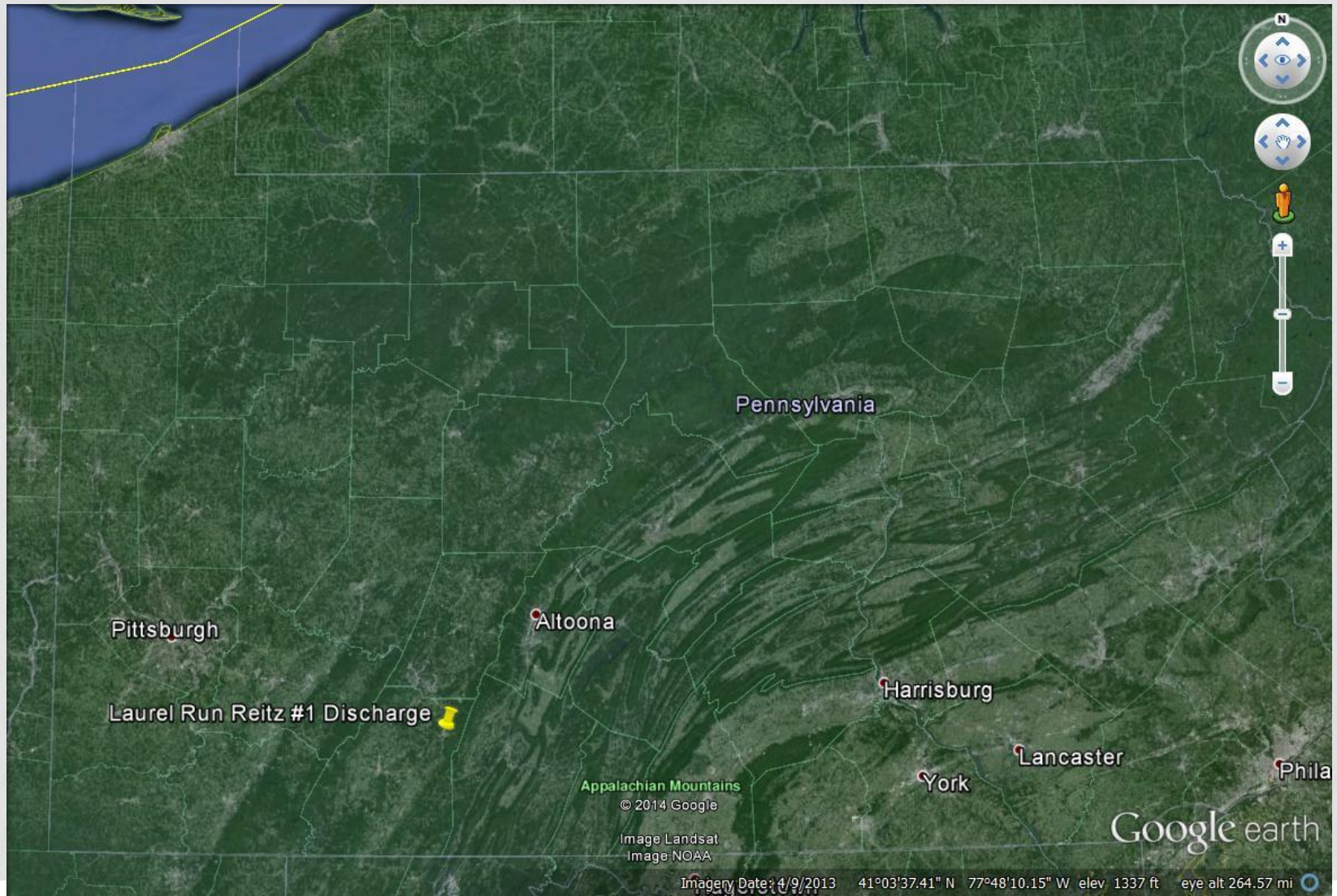
# MCCASLIN ROAD

## Pre- and Post- O&M Effluent Water Quality Data

Parameter	Pre-O&M	Post-O&M
Date	5/15/12	12/4/12
pH	4.3	6.2
alkalinity	0	22
acidity	113	-8
Fe	0.4	0.4
Mn	5.2	3.8
Al	20.9	1.0

Total metals mg/L, acidity and alkalinity as CaCO<sub>3</sub> mg/L

# O&M- REITZ #1



# REITZ #1

**Components:** VFP, SP

**AMD Source:** Underground

**Watershed:** Dark Shade Creek

**City:** Central City

**County:** Somerset

**State:** Pennsylvania

**Stream:** Laurel Run



## Water Quality (Avg)

Parameter	Raw	Effluent
pH	3.5	6.7
alkalinity	0	150
acidity	113	-74
Fe	27	10
Mn	8	6
Al	7	2

Total metals mg/L, acidity and alkalinity as CaCO<sub>3</sub> mg/L

# REITZ #1

- Unknown event pushed compost across system causing significant variation in compost depth = short-circuiting & reduced performance



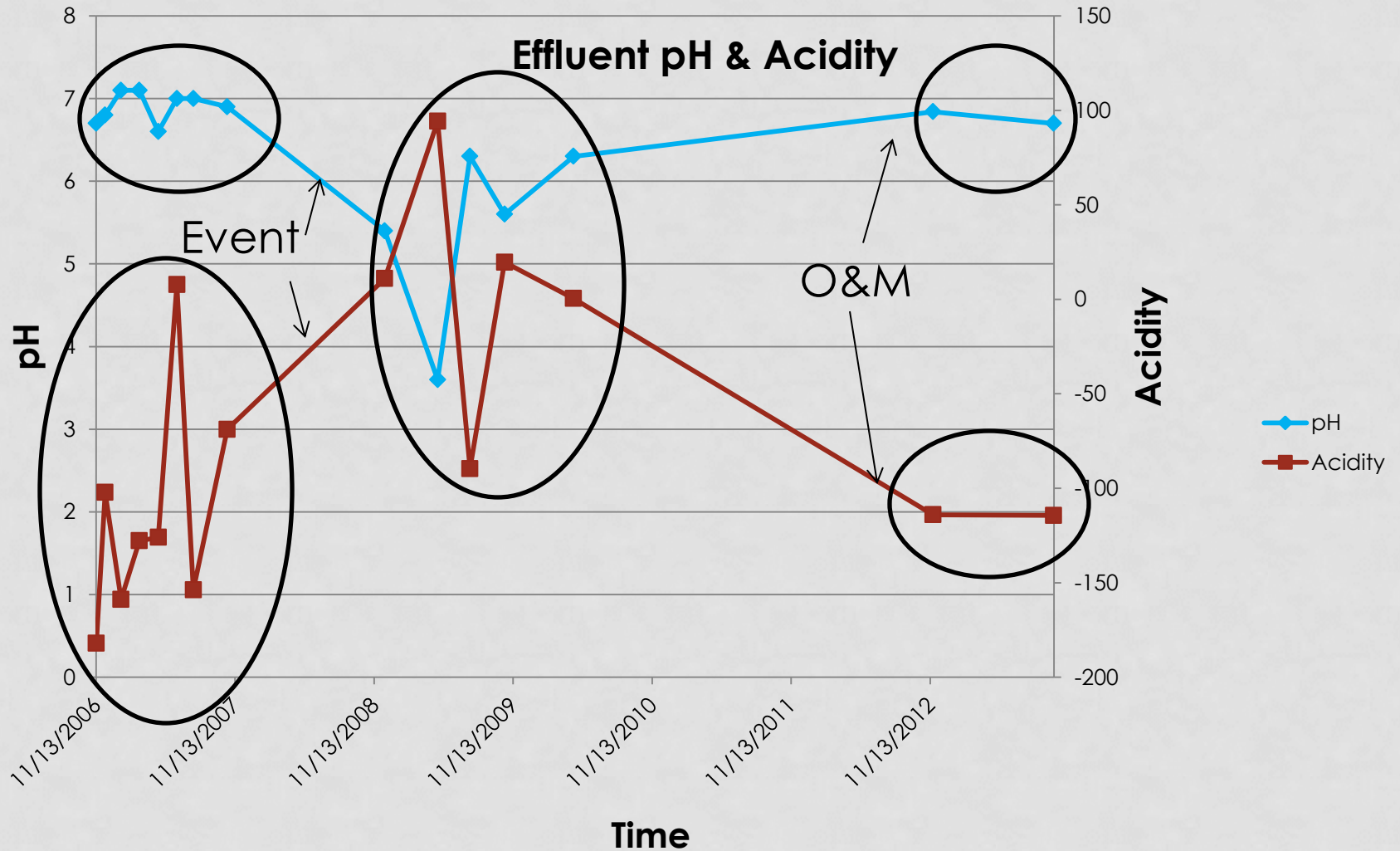


# REITZ #1

- Compost redistributed across VFP
- Compost then mixed into top foot of stone
- Created access points into various parts of system
- Removed logs and debris from Settling Pond



# REITZ #1 PH & ACIDITY



# CONCLUSIONS

- Passive treatment is usually not maintenance free;
- Regular inspections and occasional maintenance may be needed for a treatment system to reach it's design life;
- Poor water quality does not always mean the system is a failure or has reached its design life;
- Treatment performance can often be restored through maintenance activities that rejuvenate the system instead of replacing the treatment media or rebuilding the system and thus saving money

# ACKNOWLEDGEMENT

- Thanks to PA DEP, Foundation for PA Watersheds for funding, and conservation districts, Watershed volunteers, and all the others who help to make projects like these possible!

# REFERENCES

- “2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report”  
<http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/2012%20Integrated%20List/2012%20Pennsylvania%20Integrated%20Water%20Quality%20Monitoring%20and%20Assessment%20Report.pdf>
- <http://www2.datashed.org/>
- Google Earth <http://www.google.com/earth/>

# QUESTIONS?



