

Introduction

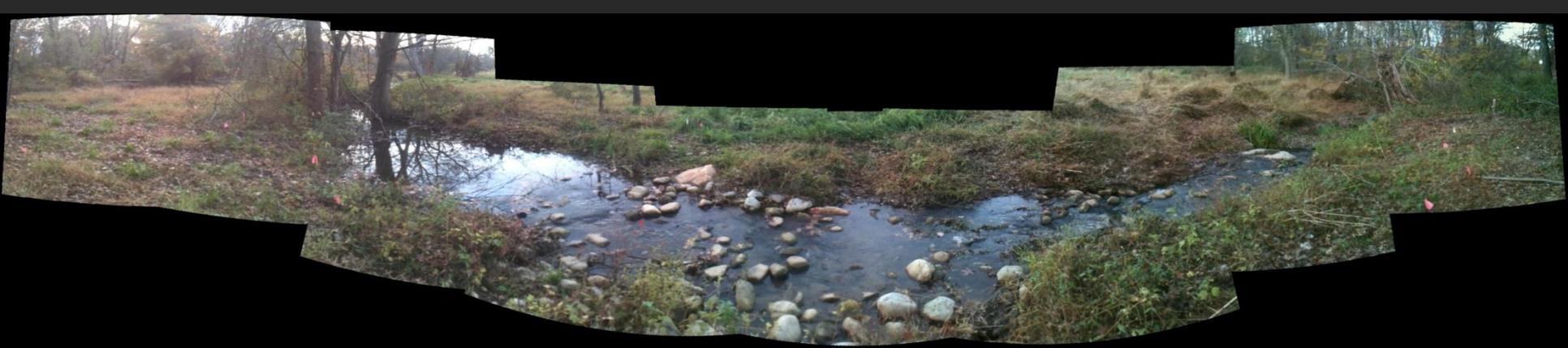
***Creative Design:
The Handmaiden of Restoring Hydrologic
Connectivity and Ecological Function***

Ellen McClure & Chris Streb, Biohabitats, Inc.

Bill Buettner, Maryland State Highway Administration

MASRC 2011 Annual Conference, Rocky Gap, WV

Wednesday November 16, 2011



Sponsors, Consultants & Collaborators

Project Sponsor & Collaborator:

Maryland State Highway Administration



Design:

Biohabitats, Inc.



Contractor:

Ecotone



Monitoring:

RK&K



Additional Collaborators:

- Private landowner: Nixon's Farm
- Public Howard County



Creativity



The Wolman Pebble Count

People
Embracing science and art

an installation



Please join us to honor the memory of **M. Gordon "Reds" Wolman**
Thursday, February 24, 2011 on the Homewood campus

with a seminar: **Pebbles and People: Art and Play in the Science of a Social Earth**
from 3:30 – 5:00 in Taylor Auditorium, Maryland Hall 110

and a reception for the installation: **The Wolman Pebble Count** from 5:30 – 7:30
in the F. Ross Jones Building in the Mattin Center

RSVP eng.jhu.edu/wse/reds_wolman
contact us with questions: (410) 516-8723
or engineering@jhu.edu



The installation is on view February 14th – March 14th

The Johns Hopkins University
Whiting School of Engineering
3400 N. Charles Street
Baltimore, MD 21218

EARTH SURFACE PROCESSES AND LANDFORMS, VOL. 20, 585–591 (1995)

PLAY: THE HANDMAIDEN OF WORK

M. GORDON WOLMAN

Johns Hopkins University, Baltimore, Maryland, U.S.A.

Received 27 July 1994

Accepted 22 February 1995

ABSTRACT

The natural habitat of geomorphologists is at play in the fields of the Lord. Picnics, not the work ethic, often motivate the most productive. As in the field, so too in the mind, creative insights derive from the play of ideas. As in much of science today, Earth scientists are called upon to 'solve' immediate problems, but problems whose solutions lie at the cutting edge of the research frontier. The impact of anthropogenic activities in the context of natural processes, the playground where many geomorphologists work, requires continuous reciprocal exchange between research and application. Apologies are not needed for choices of orientation, but only for destructive separation.

Refocusing an Industry

Natural Capital

Productive soils
Clean air
Fresh water
Biodiversity
Climate regulation

Social Capital

Interactions
Educational
Relationships

Economic Capital

Prosperity
Equality
Security



Regulatory Drivers

Mitigation requirements
No-net loss regulations
Phase I and Phase II NPDES MS4 permits
404 Permitting – streams and wetlands
TMDLs (nutrients, sediment, bacteria, trash)
Threatened and endangered species
Sustainability mandates

Project Site & Schedule

- This project: to mitigate for “unavoidable impacts to wetland and “waters of the U.S. resulting from the dualization and intersection improvements of MD Rte 32 and MD 108 west to I-70 in Howard County, MD.”
- West of MD 32 crossing over Middle Patuxent River, Howard County
- 36.5-acre site
 - 14.8 ac upland forest
 - 12.6 ac open field
 - 1.5 ac farm pond
 - 5.1 ac PSS/PEM
- Assessment/Design: 2007-09
- Construction: Fall 2010



Objectives

Wetlands

- Preserve, enhance, create wetland area (~7.5 ac)
- Support wetland functions

Stream

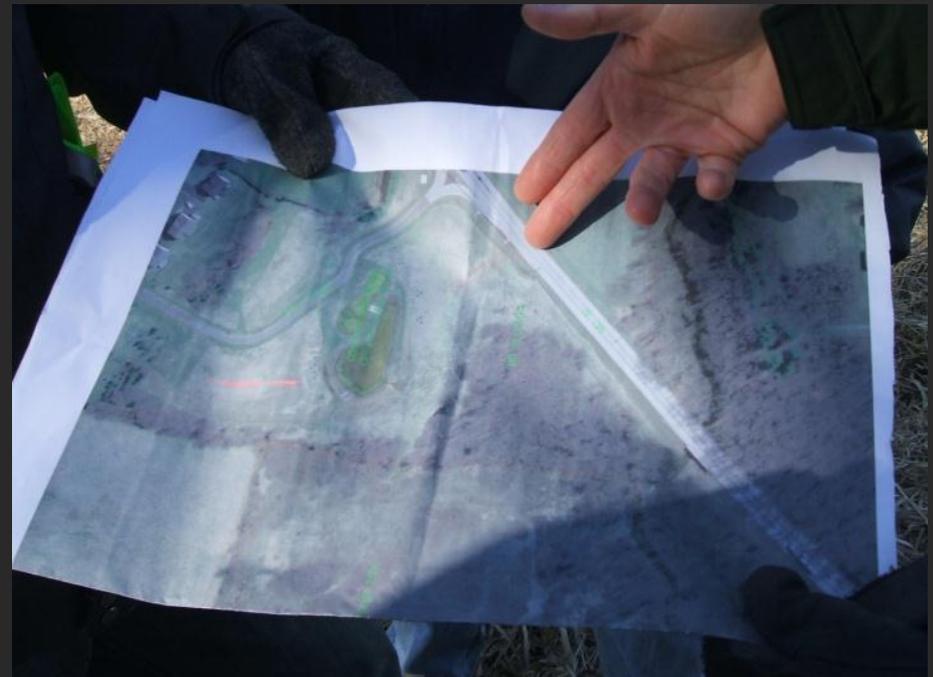
- Reduce streambank erosion
- Restore floodplain connectivity
- Improve bedform diversity

Riparian/Landscape

- Establish riparian buffer

Additional Considerations

- Minimize cost
- Minimize disturbance



Existing Surface Water Features

Sources

- Incised “Old West Tributary”
(700 LF first-order trib)
- Spring along pond
- Future runoff from development
- Middle Branch Patuxent
(1/2 site in 100-yr floodplain)

Storage

- Farm pond (1.5 ac)
- Existing wetlands (5.1 ac: PSS/PEM)

Losses

- Ditches, including “South Channel”
- Incised tributary



Preservation

identifying beneficial functions



Approach

“boosting” site hydrology

Extend near surface saturation by:

- Utilizing/integrating existing surface water sources
- Integrating wetland and stream processes across site
- Retarding surface runoff to enhance infiltration and raise groundwater table
- Preserving/mimicking functional features



Existing Surface Water Features

the ultimate creative juice?

Old West Tributary

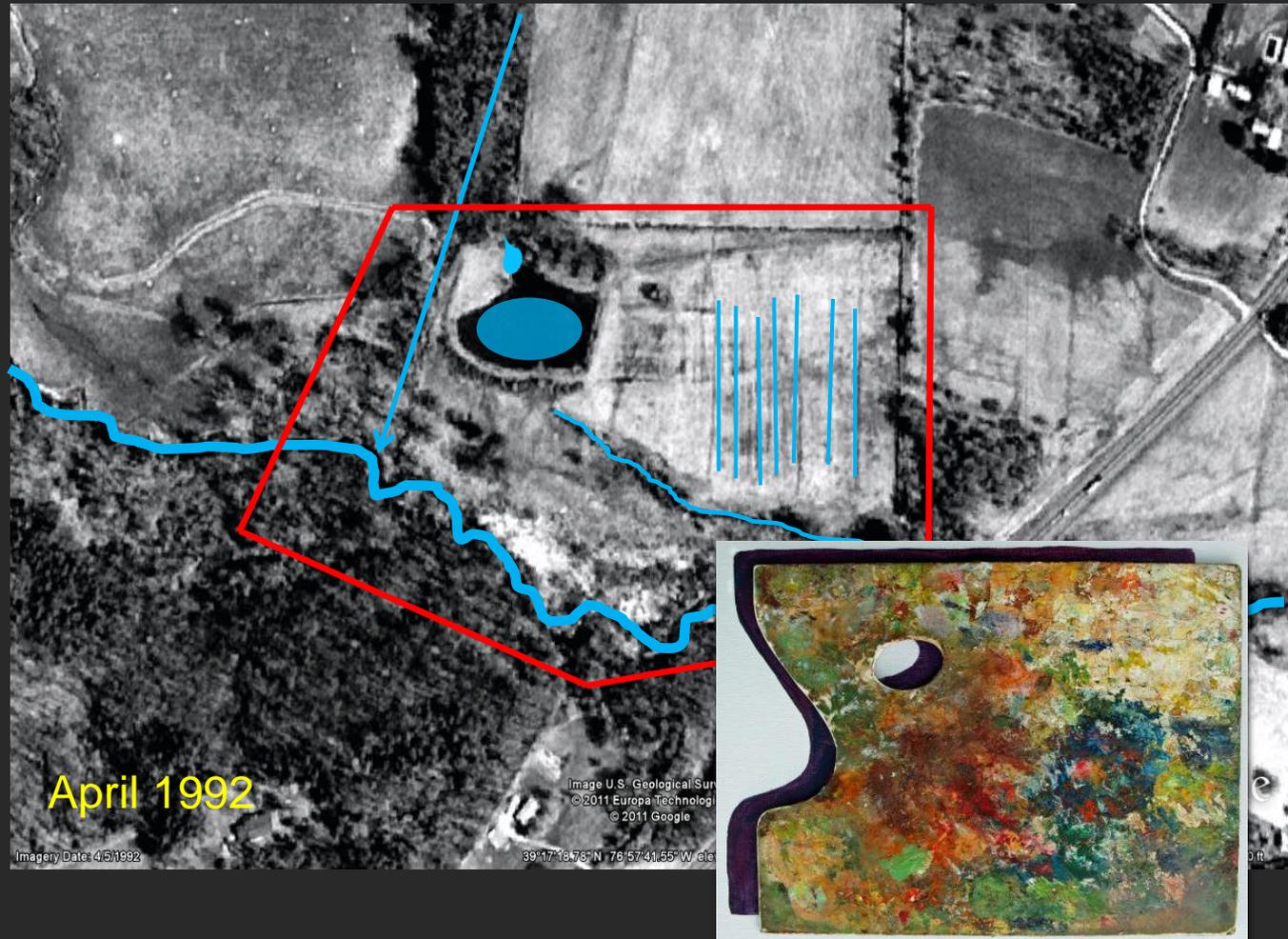
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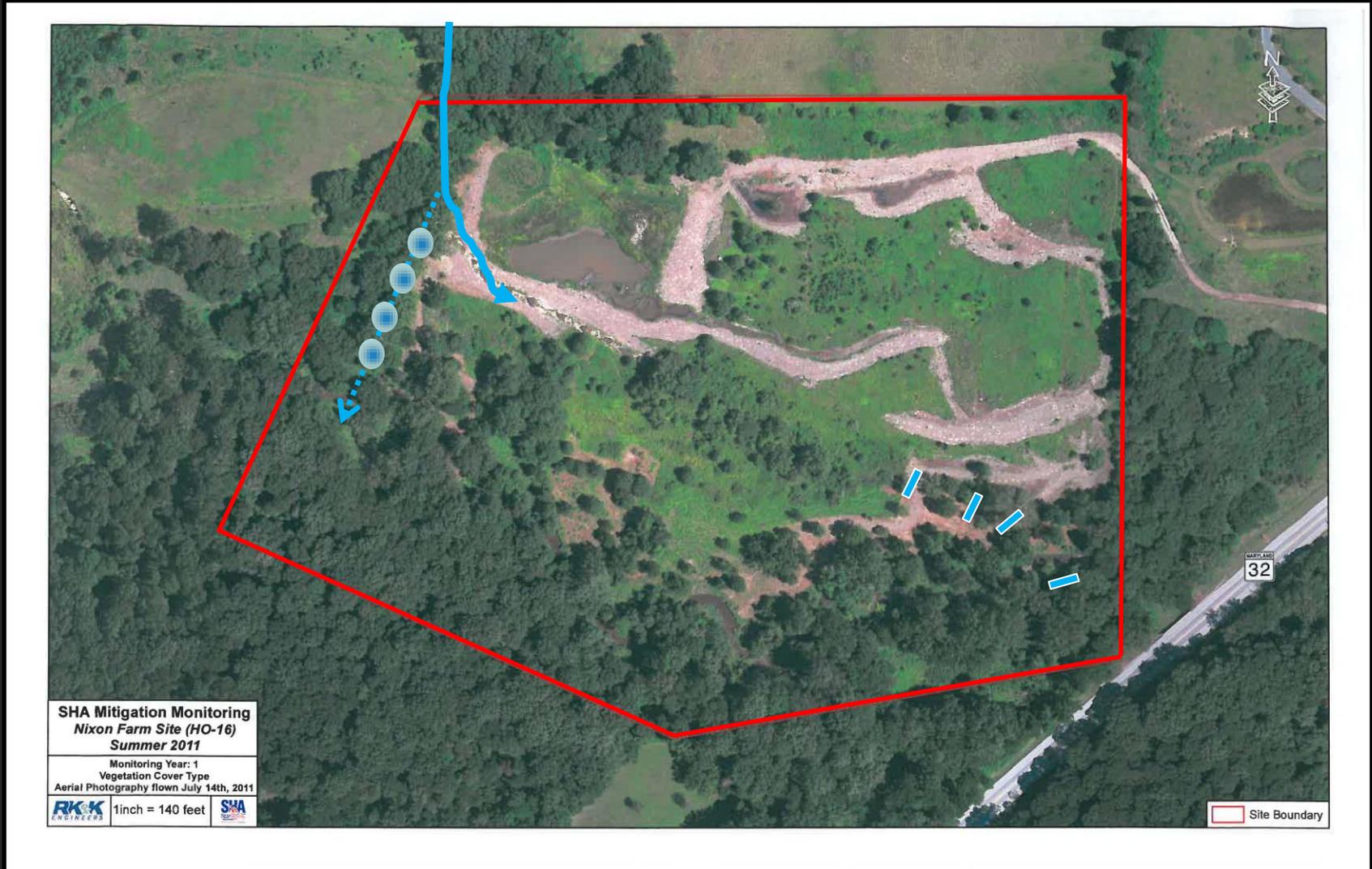
Losses

- Ditches
- Incised tributary



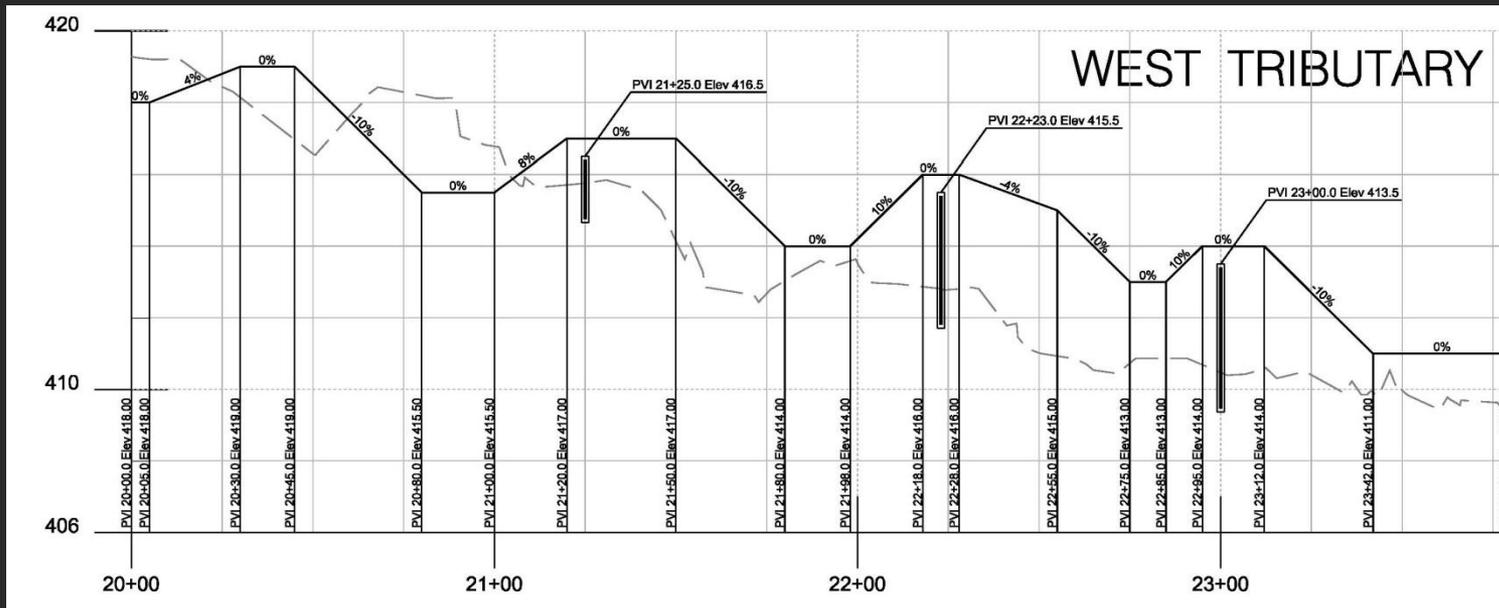
Approach

multiple strategies...



Abandonment of West Tributary

installation of bentonite plugs



Creation of Vernal Pools

Before

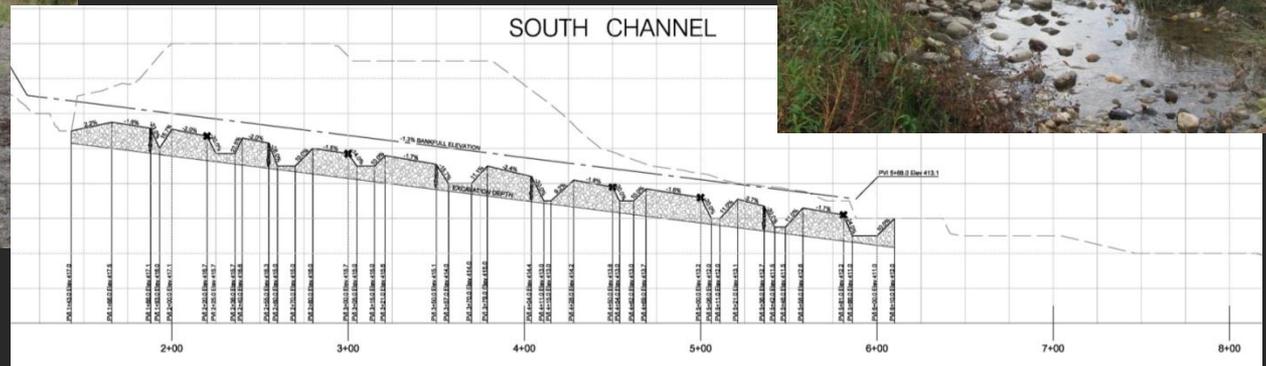


After



New South Channel

sub-bankfull channel



New South Channel



Approach

breaching of farm pond



Farm Pond

conversion from open water

Before

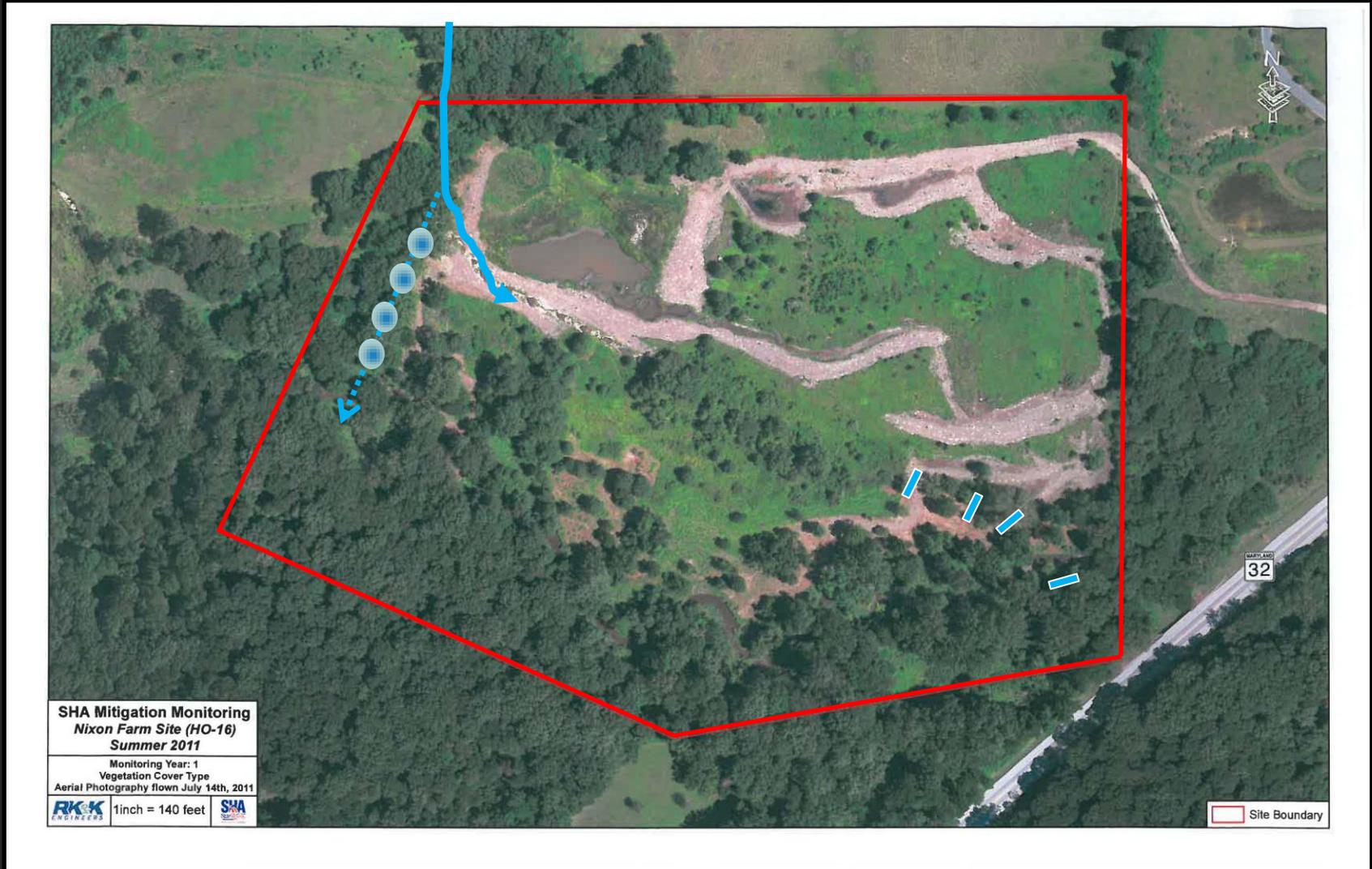


After



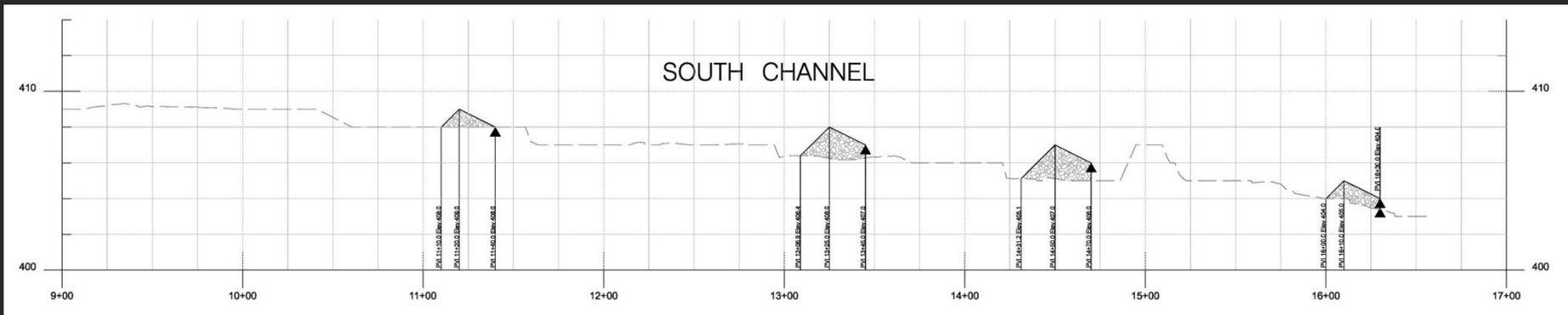
Approach

installation of weirs



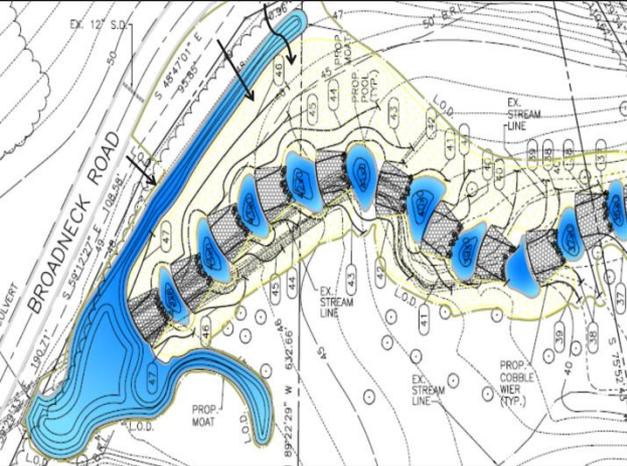
Weirs

localized disturbance in profile



Weirs

forcing lateral expansion



Approach

berm construction



Berms

enhancing infiltration



Ecological Trajectory

Surface Water Dynamics

Groundwater Recharge/Discharge

Nutrient Removal/Transformation

Organic Processing

Sediment Retention/Stabilization

Vegetation Diversity/Abundance/Succession

Aquatic & Terrestrial Habitats

Aquatic/Wildlife Species Diversity/Abundance

Trophic Structures & Life Cycles

Aesthetics



Preliminary Monitoring Results

promising...

Report excerpts:

- “The Nixon Farm site design was based on minimal grading and modifications to surface water drainage patterns to raise the groundwater table and extend near surface saturation.”
- “Overall the site appears to contain adequate hydrology to support hydrophytic vegetation communities within most of the locations specified on the design plans.”
- “Further monitoring of the hydrologic regime of the site is required to determine the areal extent of wetland hydrology and subsequent development of wetland plant communities.”



Project Value

	Mitigation Credit	Unit	Unit Design & Constr. Cost	Value
<i>Standard project cost (design & construction)</i>				
Wetland	7.5	ac	75K	562K
Stream	1,300	lf	400	520K
Forest	8.4	ac	25K	210K
			Subtotal =	1.3 M
<i>Increased water storage volume</i>		<i>* = based on MDE guidelines for value of bioretention</i>		
Stream	13,280	CF	\$10*	133K
Wetland	17,100	CF	\$10*	171K
			Subtotal =	304K
		TOTAL PROJECT VALUE =		1.6 M
Design Costs				250K
Construction Costs				600K
		ACTUAL PROJECT COST =		850K

Thank you...

questions?

