Truetown

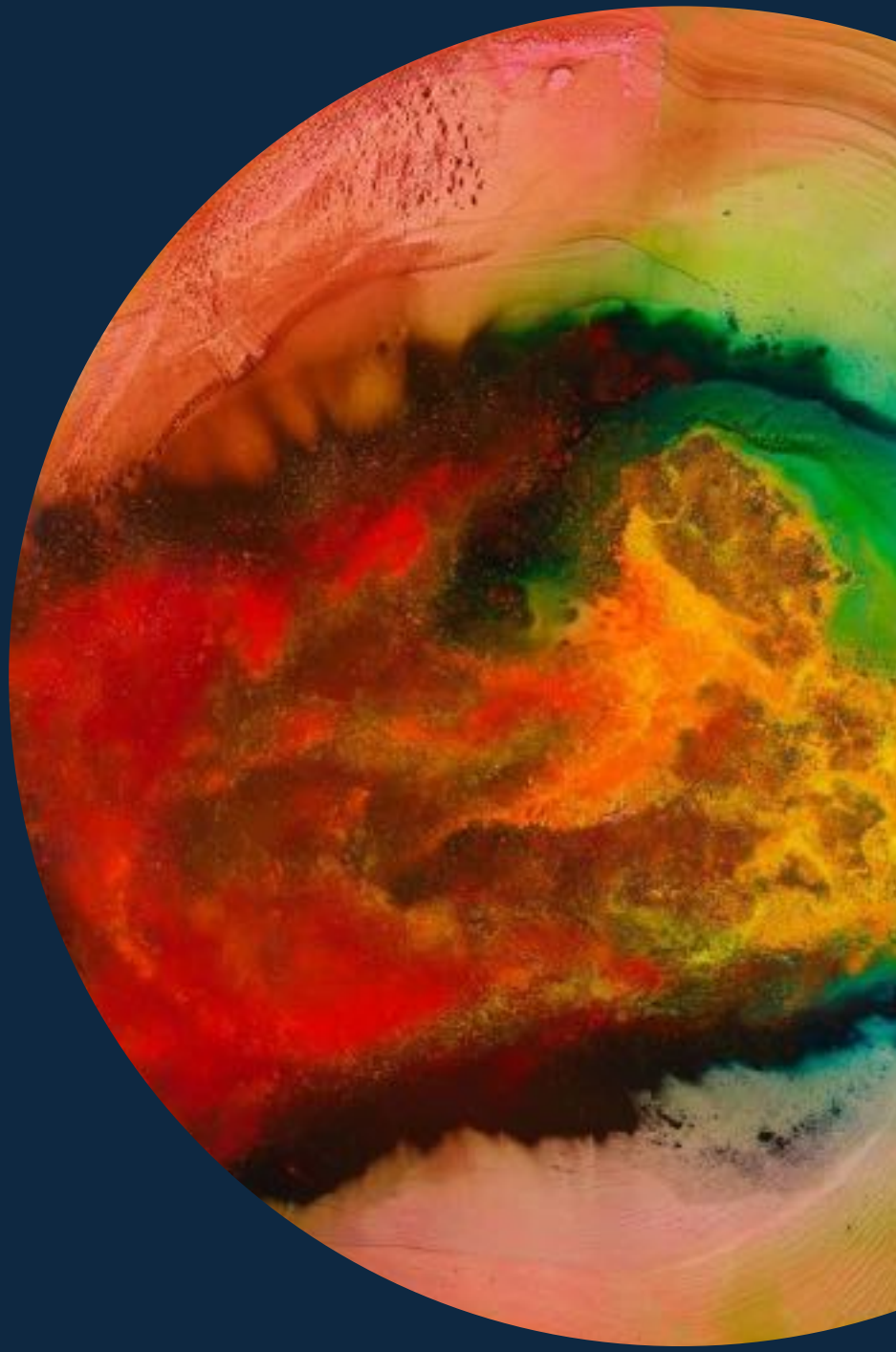
Acid Mine Treatment Plant and Pigment Production

May 05 - 06, 2026

Art: John Sabraw

Agenda

- Project Overview
- Design Basis
- Project Status
- Social & Environmental Impact
- Q&A



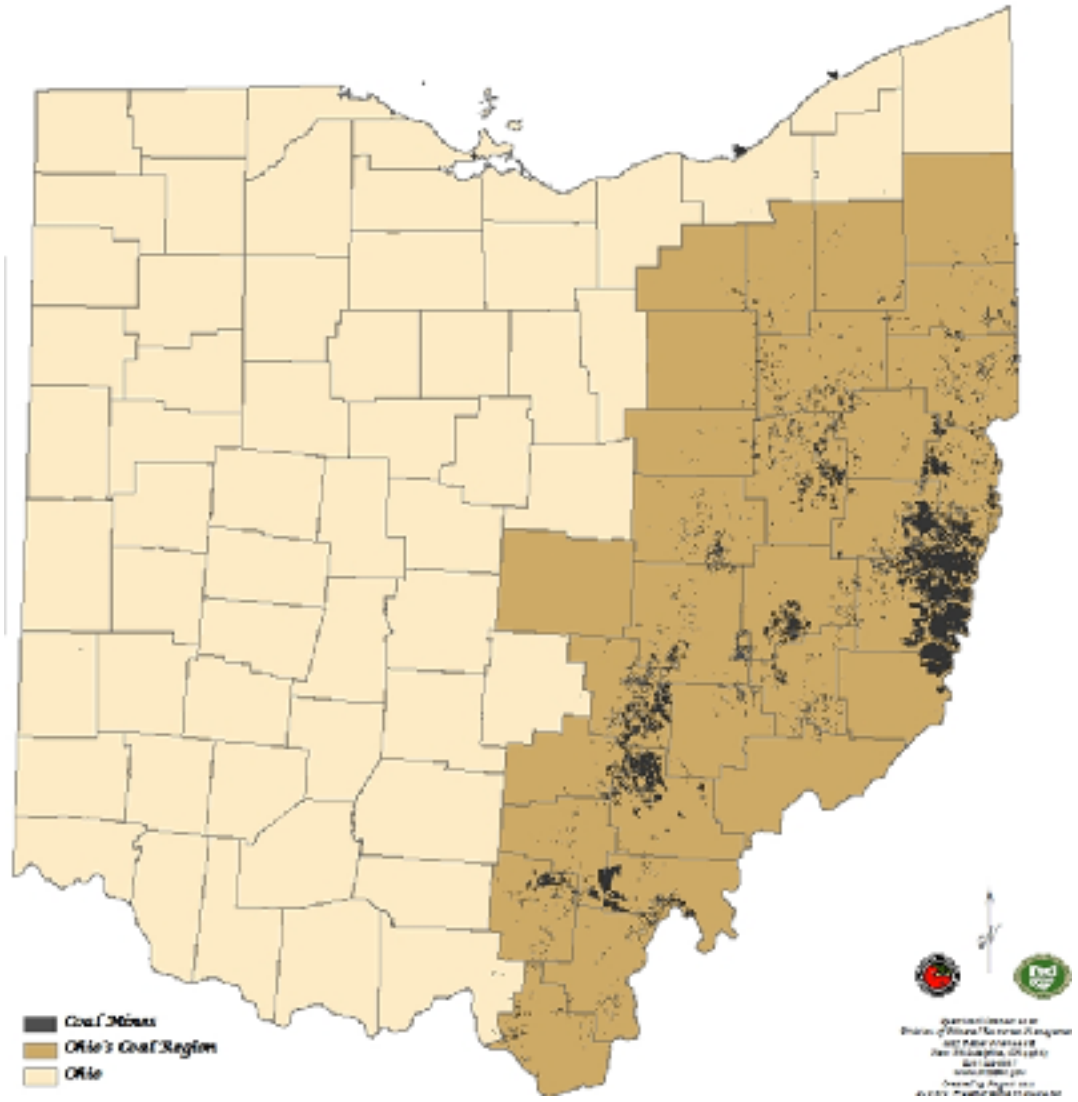
Partnering for Success

- Ohio Department of Natural Resources
- U.S. Department of the Interior – Office of Surface Mining
- Rural Action/True Pigments
- Ohio University
- AECOM

Overview

- Partnerships
- Past projects and research
- Background on the Truetown discharge and UGM Complex
- Truetown's impact on Sunday Creek

Abandoned Coal Mines of Ohio



Partnership Spotlight – ODNR and Sunday Creek Watershed Group

- Beginning in 1999 with the formation of the Sunday Creek Watershed Group
- 2002 First Watershed Coordinator
- 2004 First AMD Project – Congo Run Stream Capture
- 2013 Pine Run Doser
- Education and outreach
- Operation and maintenance
- Water and biological sampling
- Truetown and True Pigments

One of Rodger's Hollow primary stream captures during wet conditions, Photo by Sunday Creek Watershed Group

Completed natural channel stream Photo by Kaabe Shaw

Education and Outreach

- Over 100 people have toured the Truetown site each year since Rural Action purchased property
- Ohio University and Hocking College classes are frequent visitors
- Coal India delegation visited in October 2024
- Groundbreaking brought 90+ folks to the site for celebration

Past Projects and Research

- Electrolysis
- Dr. Reifler's initial treatment approach
- Pilot plant
- OU research – Dr. Reifler (OU Engineering) and John Sabraw (OU Prof. Fine Arts)
- Rural action
- Visit PA treatment sites
- Aveka – spray drying
- WesTech – settling and filter testing
- AECOM – design
- Filter press purchase
- Solar drying (OU)
- Site development


WesTech

Visiting AMD Treatment Sites in PA

Site Development

Site Development

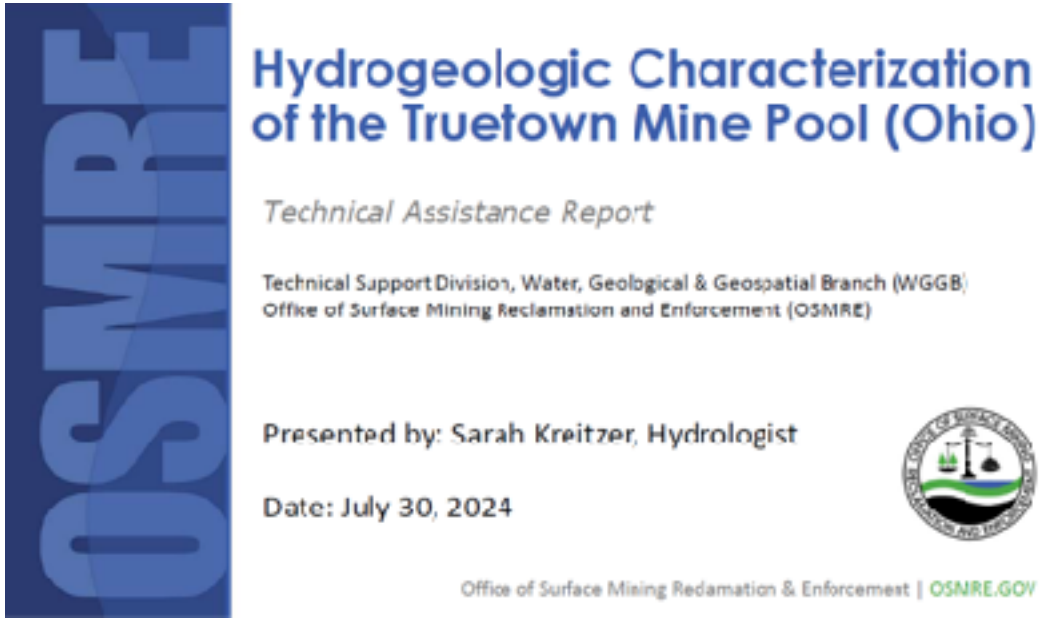
Site Development

Truetown Discharge

- 1983, a seal at a pumping station failed draining water from the Truetown mine severely impacts lower 7 miles of Sunday Creek which runs through the Village of Chauncey
- Flow = 2.2 cfs = 996 gpm = 1.43 MGD
- Fe = 252 mg/L, Al = 2.1 mg/L, Mn = 5 mg/L
- pH = 5.3, Acidity = 430 mg $CaCO_3$/L, Alkalinity = 22 mg $CaCO_3$/L
- CO_2 (aq) = 235 mg/L
- TDS = 2,300 mg/L, conductivity = 2,200 µSi/cm
- $SO4_2$- = 1,511 mg/L, Cl- = 20.6 mg/L, Na+ = 190 mg/L, Ca2+ = 178 mg/L, Mg2+ = 56 mg/L

Hydrogeologic Characterization

- Sarah Kreitzer – Hydrologist
- Omar Beckford – Hydrologist
- Steve Ball – Hydrologist
- Tom Mastrorocco – Geographer



Truetown Mine Complex Overview

Location: Southeastern Ohio, Athens County

Mining History: The Truetown mine complex consists of approximately 14 room-and-pillar mines in the Middle Kittanning (No. 6) coal seam in Athens County, Ohio; mining ceased in 1993

Current State: 75% flooded, acid generation in unflooded areas

Mine Footprint: 14,240 acres

Truetown Discharge: Largest AMD discharge in Ohio (avg. 1,004 gpm) located in Sunday Creek watershed

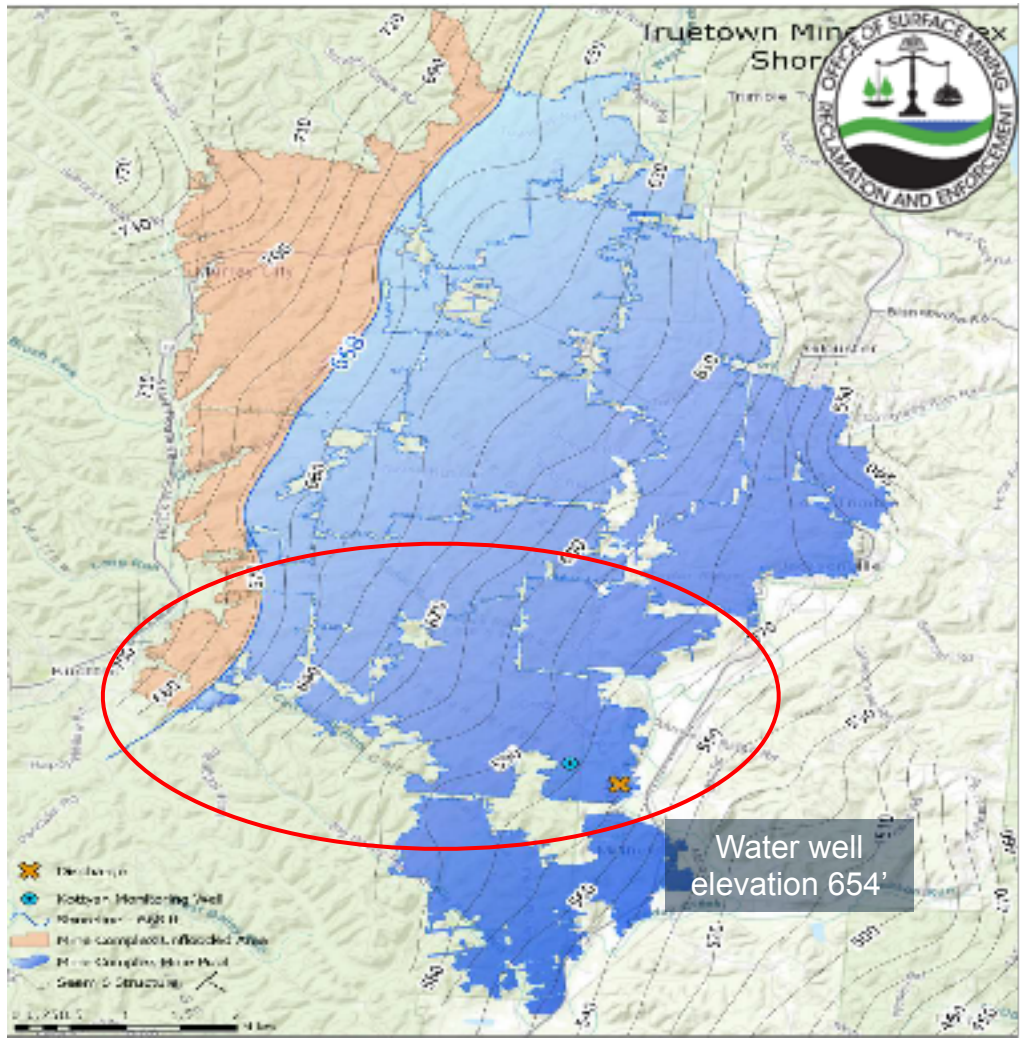
Main Pool Characteristics

Flooded Extent: ~75% of the mine complex

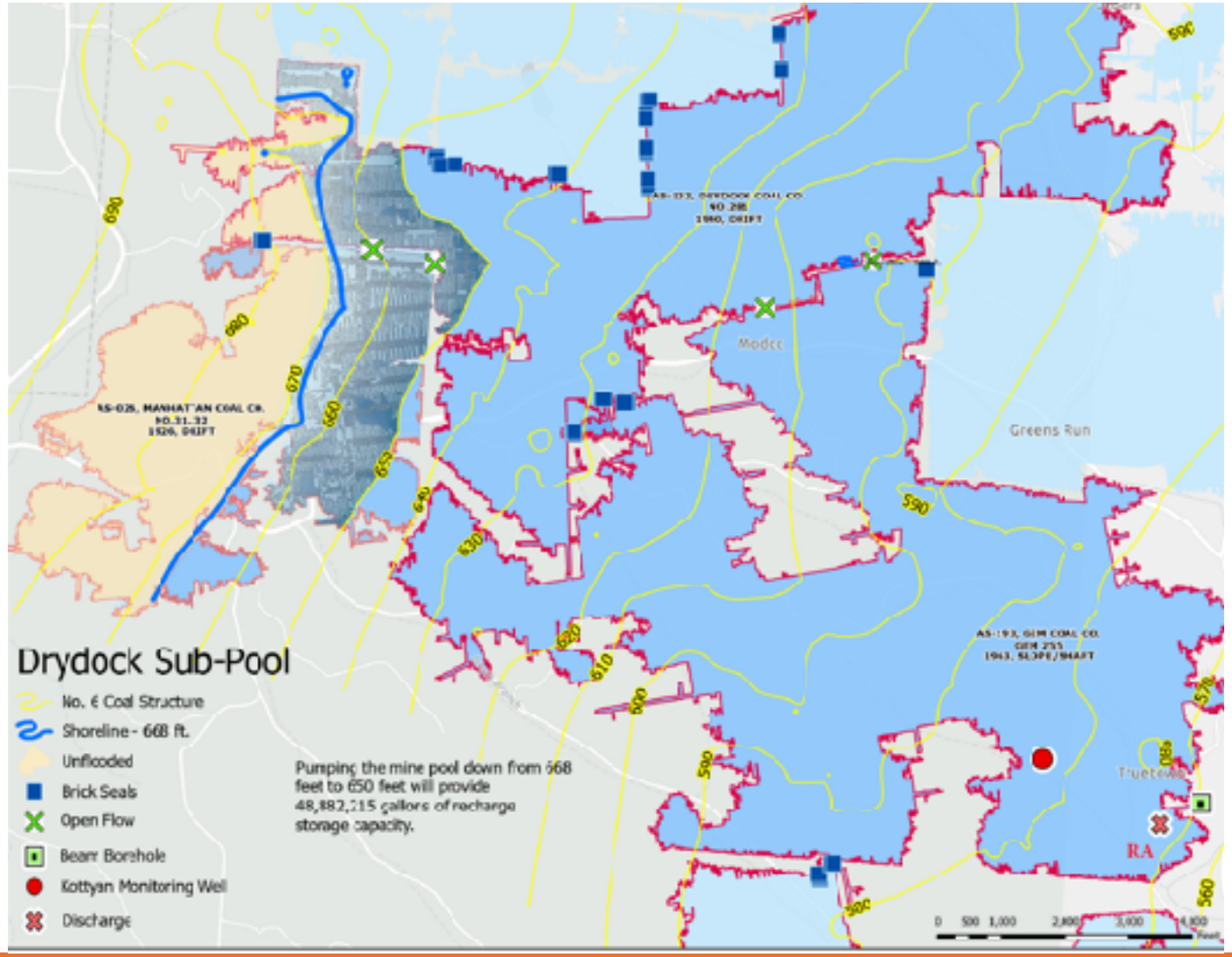
Shoreline Elevation: ~668 feet AMSL (same as Truetown discharge)

Recharge: Primarily vertical infiltration, some from adjacent mines and groundwater

Estimated Recharge Rate: 0.07 gpm/acre



Mapping by Tom Mastrorocco

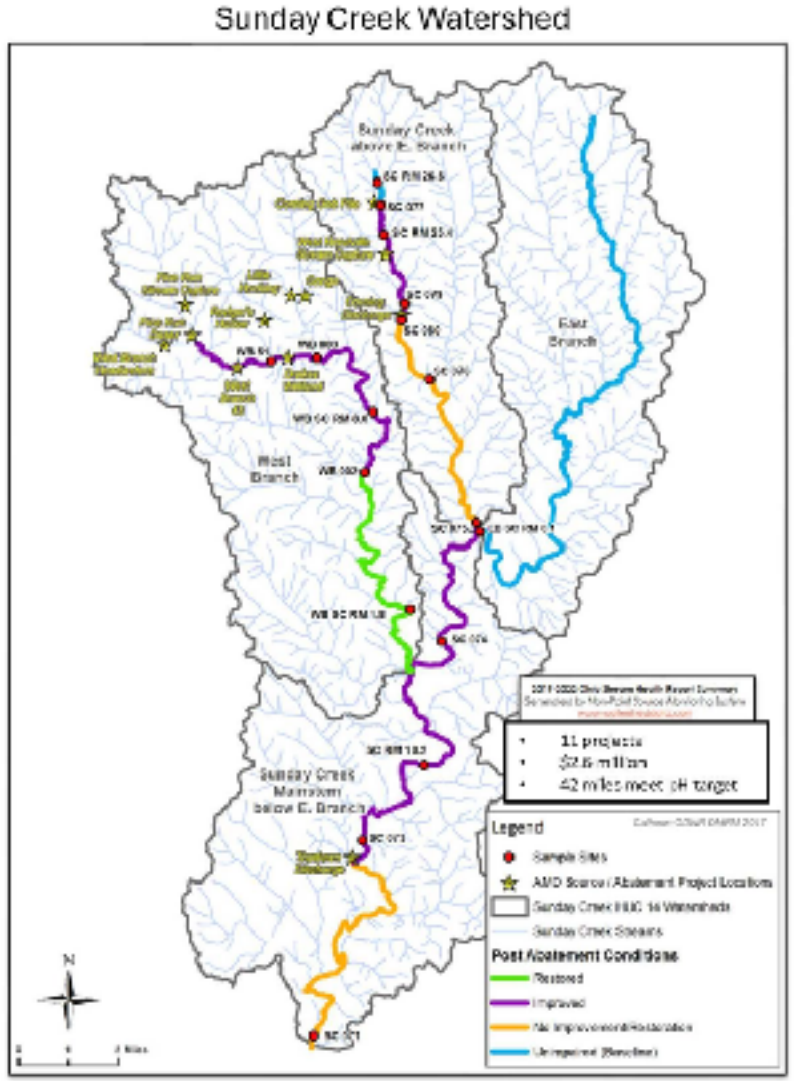

Drydock Sub-Pool
No. 6 Coal Structure
Shoreline - 668 ft.
Unflooded
Brick Seals
Open Flow
Beam Borehole
Kottyan Monitoring Well
Discharge
Pumping the mine pool down from 668 feet to 650 feet will provide 48,882,215 gallons of recharge storage capacity.
Greens Run
690
680
670
660
650
640
630
620
610
600
590
580
570
560

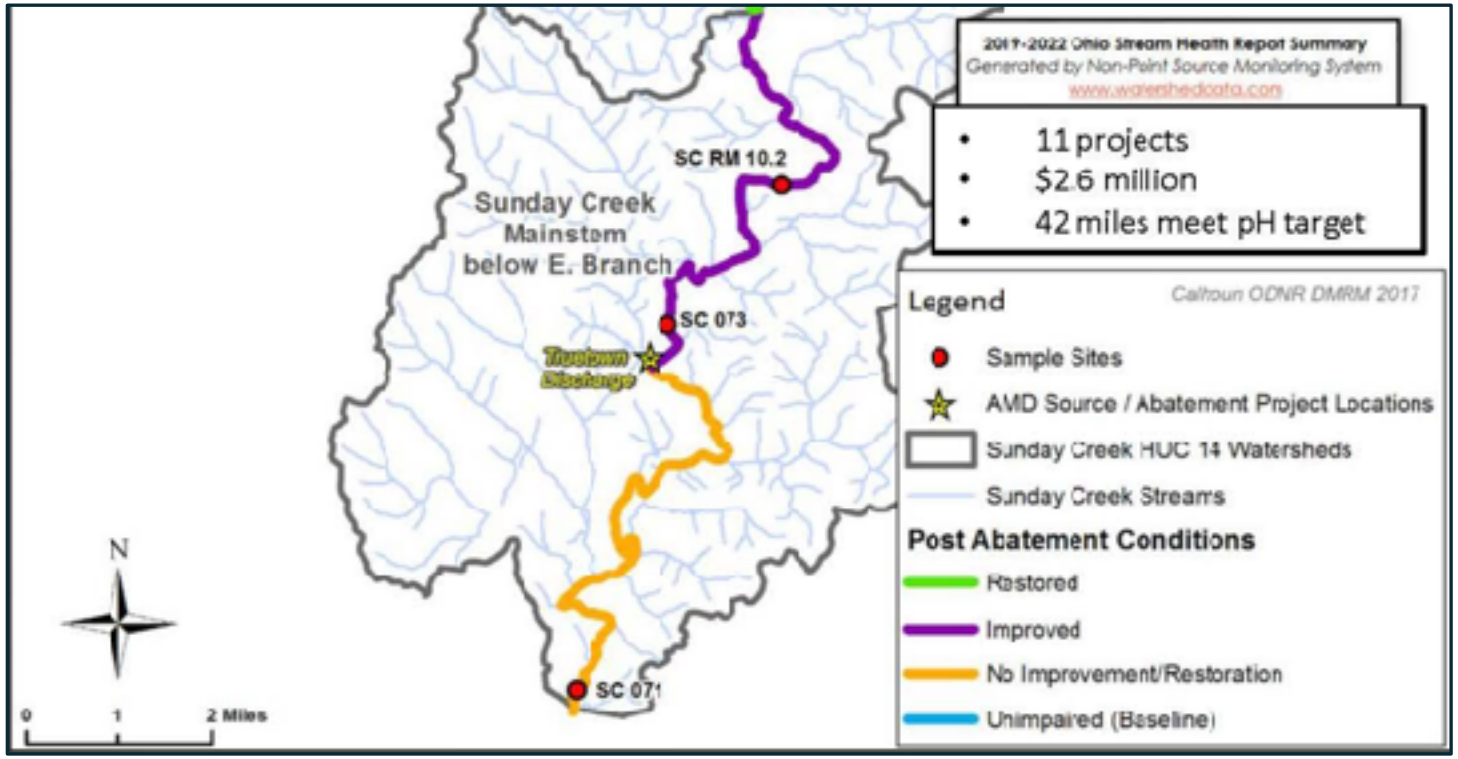
Monitoring Wells and Discharges

Kottyan WQ
pH – 7.4
Net alk. – 186 mg/L
Total Fe – 2.02 mg/L

Beam Bore Hole Routed to the Wetland

Truetown's Impact





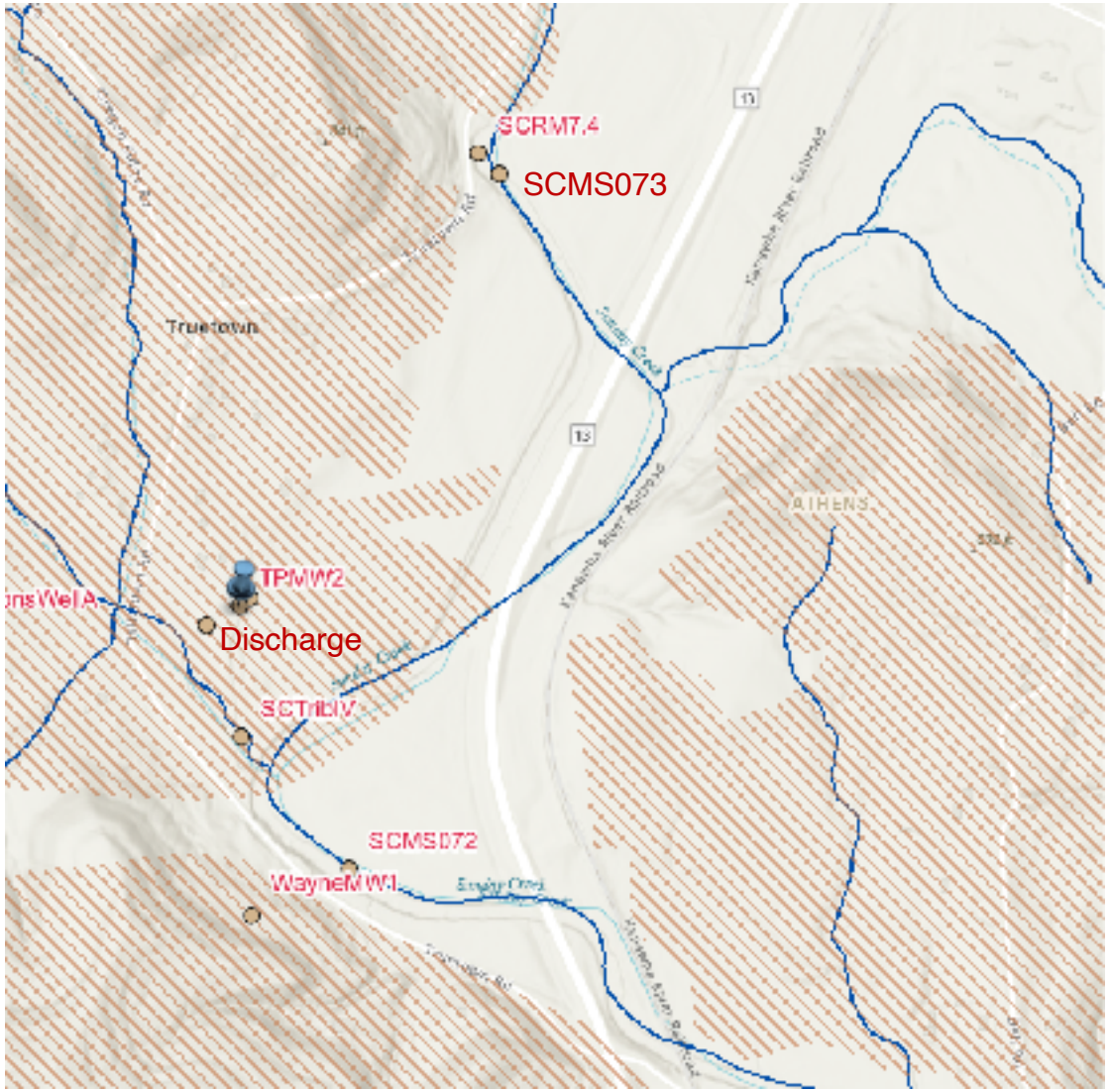
Ohio AMD Program (ODNR DMRM) Watershed Restoration Goals for Impacted Watersheds

Category	Parameter	Watershed and/or Stream Reach Goal
Chemical	pH[1]	6.5 - 9.0 (s.u.)
	Total Iron[1]	< 1.0 (mg/l)
	Total Aluminum[2]	Watershed and/or site specific (0.75 mg/L)
	Alkalinity	Net alkaline conditions
Physical Habitat	QHEI[3]	≥ 60
Biological	IBI[3]	Meets WWH ALUD (44)
	MAIS[4]	≥ 12

[1]Ohio EPA Water Quality Standards Program, Numeric Chemical Criteria
[2]U.S. EPA Aquatic Life Criteria for Aluminum in Freshwater
[3]Ohio EPA Biological Criteria for the Protection of Aquatic Life
[4]Studies (Kinney, 2006 and Johnson 2009) using MAIS for Assessing AMD Impacts on Streams

Source: Table from Rush Creek AMDAT Part 2. 2025

Truetown Discharge Meets Sunday Creek



SCMS073 – Upstream Discharge

Biology and Chemistry Snapshot

- MAIS 15
- IBI – 40
- Net Alkaline – 78.0 mg/L
- Total Fe – 0.81 mg/l
- Total Al – 0.05 mg/L
- QHEI – 70

SCMS0732 – Downstream Discharge

Biology and Chemistry Snapshot

- MAIS 10
- IBI – 14
- Net Acid – 91 mg/L
- Total Fe – 90 mg/L
- Total Al – 1 mg/L

02 Design Basis

Initial Design Basis

Water Side Design Basis

- 600-1500 gpm per train (2x)
- Mechanical redundancies due to lack of mine storage
  - Parallel treatment trains – pigment train can be operated as standard water treatment train
  - Ability to run in parallel as AMD Treatment
  - Emergency treatment train with settling pond

Pigment Production & Processing

- 600-1000 gpm running in series w/ Water Treatment Train
- Pigment train will be backup water treatment train (no pigment production)
- Filter, dewater, grind, dry and package solids
  - 8,965 lbs/day of pH adjusted solids

Initial Target Project Cost: $10M

Truetown AMD Treatment

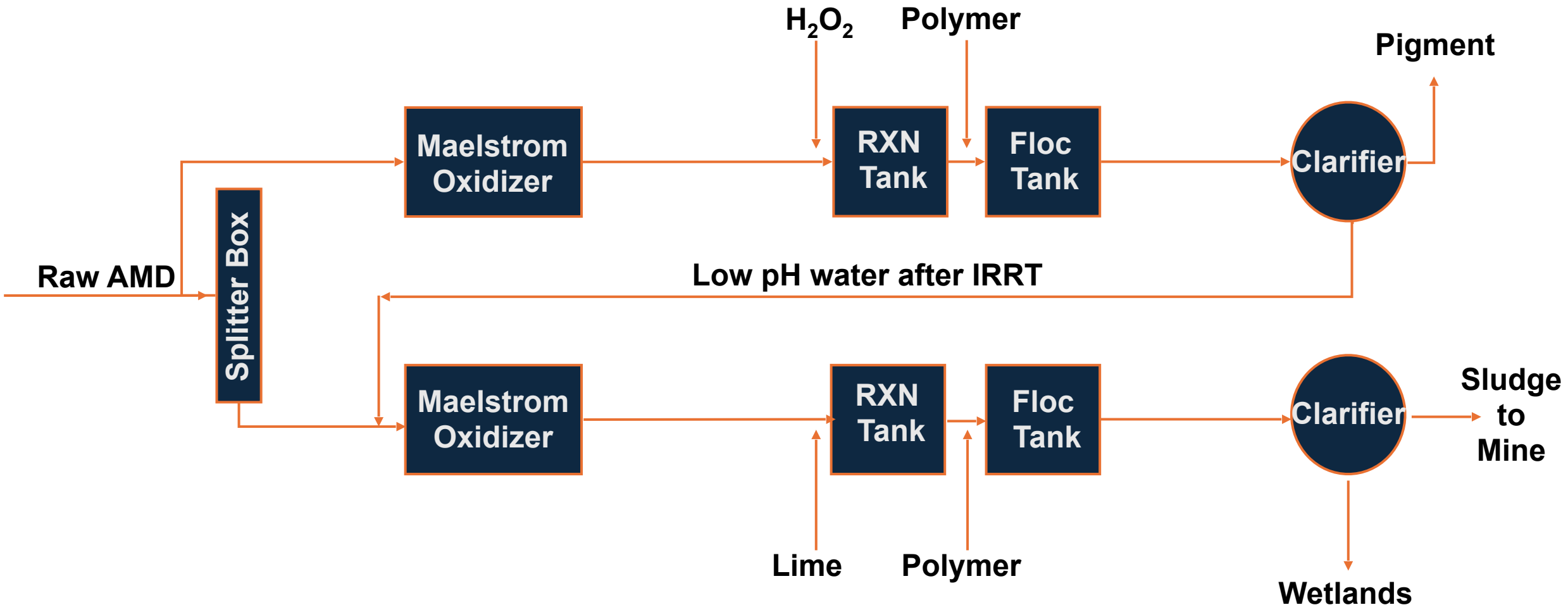
Known Treatment Chemistry

- AMD treatment is known
  - Remove excess CO_2
  - Treat with hydrated lime ($Ca(OH)_2$)
    - Raise pH to 8.0
    - Precipitate solids (Fe, Al, Mg)
    - Settle solids and pump back to mine
  - Use wetlands to provide polishing and buffer before re-entering Sunday Creek

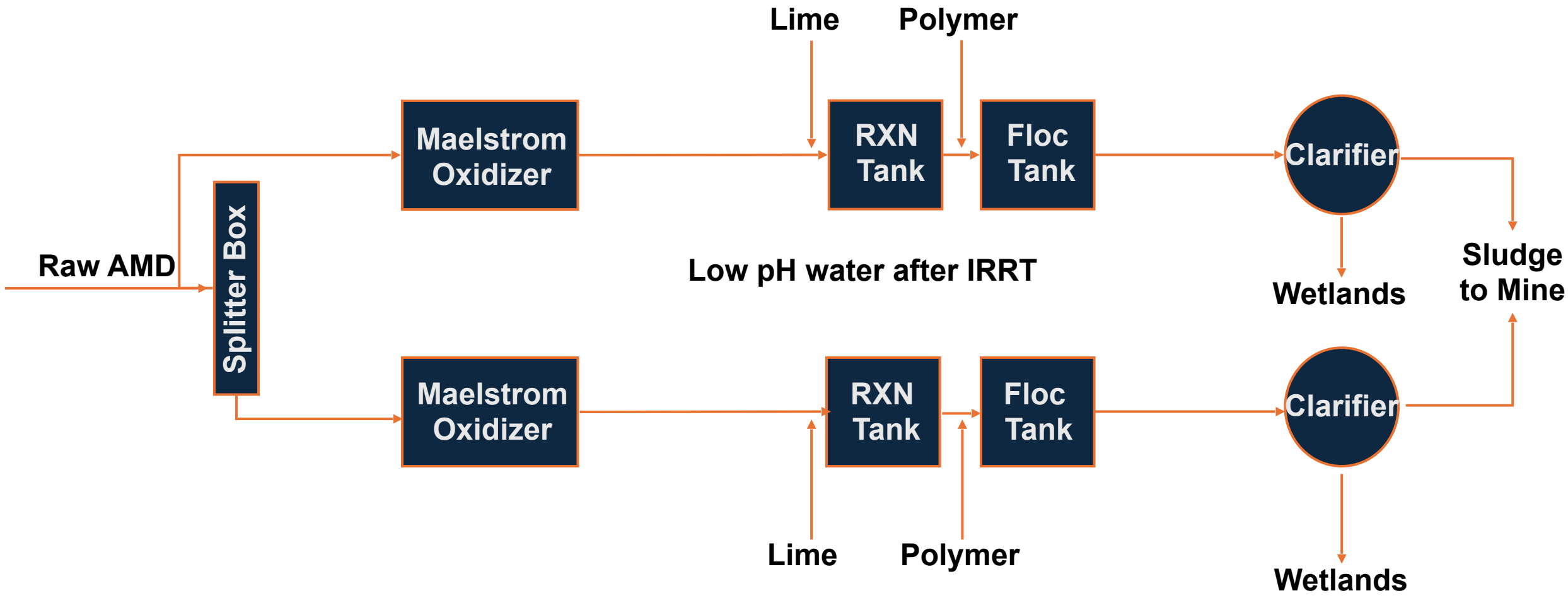
AMD Treatment Challenges

- Minimal treatment buffer since mine is not being pumped down
  - Concern about altering the mine water chemistry
- Change location of seep closer to facility to minimize scaling issues
  - Testing to make sure water chemistry is the same
  - Upcoming tests to make sure flow is connected and original seep will stop flowing

Simplified Process Flow – Pigment Production



Simplified Process Flow – AMD (2x 100%)



Project Approach – IRRT

Pigment Production

- IRRT flow: 600-1000 gpm
  - Excess flow will be diverted to regular treatment side
- Selectively precipitate Fe
- Concentrate, dewater, dry and package iron sludge
- Pigment criteria:
  - Purity > 90% Fe by weight
  - >95% dry by weight
  - Size = less than 30 micron

Additional Testing Needed for IRRT

- Previous testing done by OU in batch
  - Addition of H_2O_2 while maintaining pH at ~4 with caustic
- Mixed results on dewatering tests
- Lack of kinetic data needed for scale up

Project Approach – Parallel Design Paths

Main Treatment Design Parallel to IRRT Testing

- IRRT sludge processing to be in separate building/warehouse
  - Small part of overall site development and water treatment plan
  - IRRT design independent of MDTP
  - Merge designs into single overall design at 60-70%

Challenges in IRRT Design

- Oxidation methods explored
  - H_2O_2, O_3, and Ferrate (Fe+6)
- New approach to making pigment quality solids discovered
  - Oxidizing without adjusting pH
  - Higher quality solids that are easier to filter
  - Better pigment quality
- Downside – only removes 50% of the iron in the pigment step; with pH adjustment, yield was ~99%

Pigment Recovery and Processing – Tale of Two Solids

Original (pH adjusted solids)

- Polymer selection known
- 99% yield
- Solids settle faster
- Difficult to dewater:
  - Increased filter areas needed
  - High water content in solids make drying expensive
- Less marketable color

Low-pH Solids

- Need to evaluate polymers for settling
- 50% yield
- Finer solids – slower settling rate
  - Increased clarifier size
- Improved filtration – faster filtering with thicker cake
- Color more consistent with commercial colors

Solids selection impacts equipment specifications

Pigment Recovery and Processing – Tale of Two Solids

Additional Testing and Evaluations

- Additional settling tests needed
- Challenges in filtration, drying and packaging
  - Filter options: plate & frame; rotary drum; tube press
  - Drying options: spray drier; rotary vacuum dryer; all electric – no gas available
  - Packaging challenges: dust control; moisture control (95% dry spec)

Path Forward – April 2025

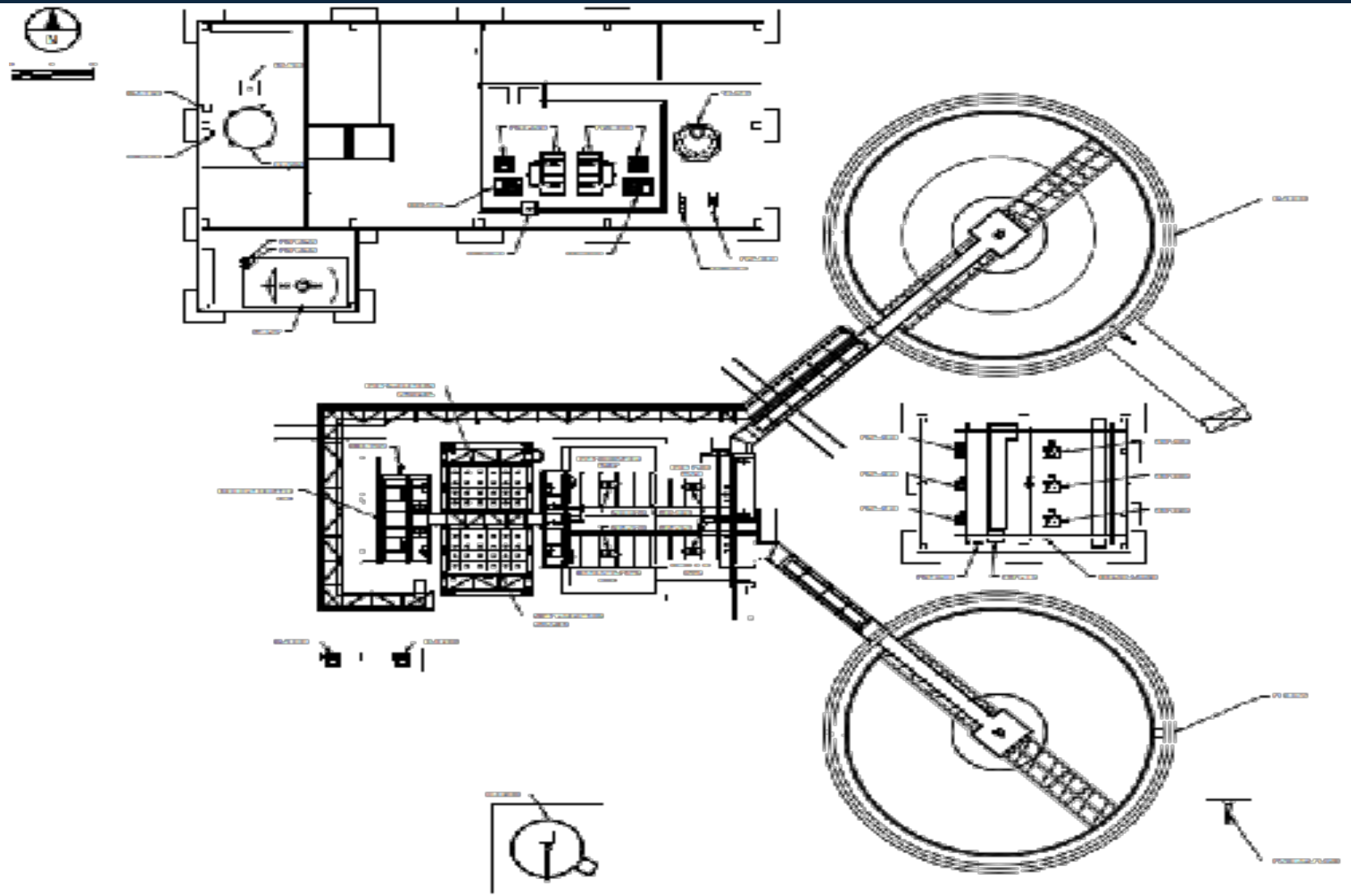
- Added uncertainty in IRRT solids handling approach causing project delays
- IRRT pigment processing removed from scope
  - IRRT process train still in scope
  - Need larger pilot or full-scale information to design drying/ packaging equipment
  - Decided that future IRRT would be a standalone project
- Maintain pilot/research area in main control building to gather information on IRRT sludge

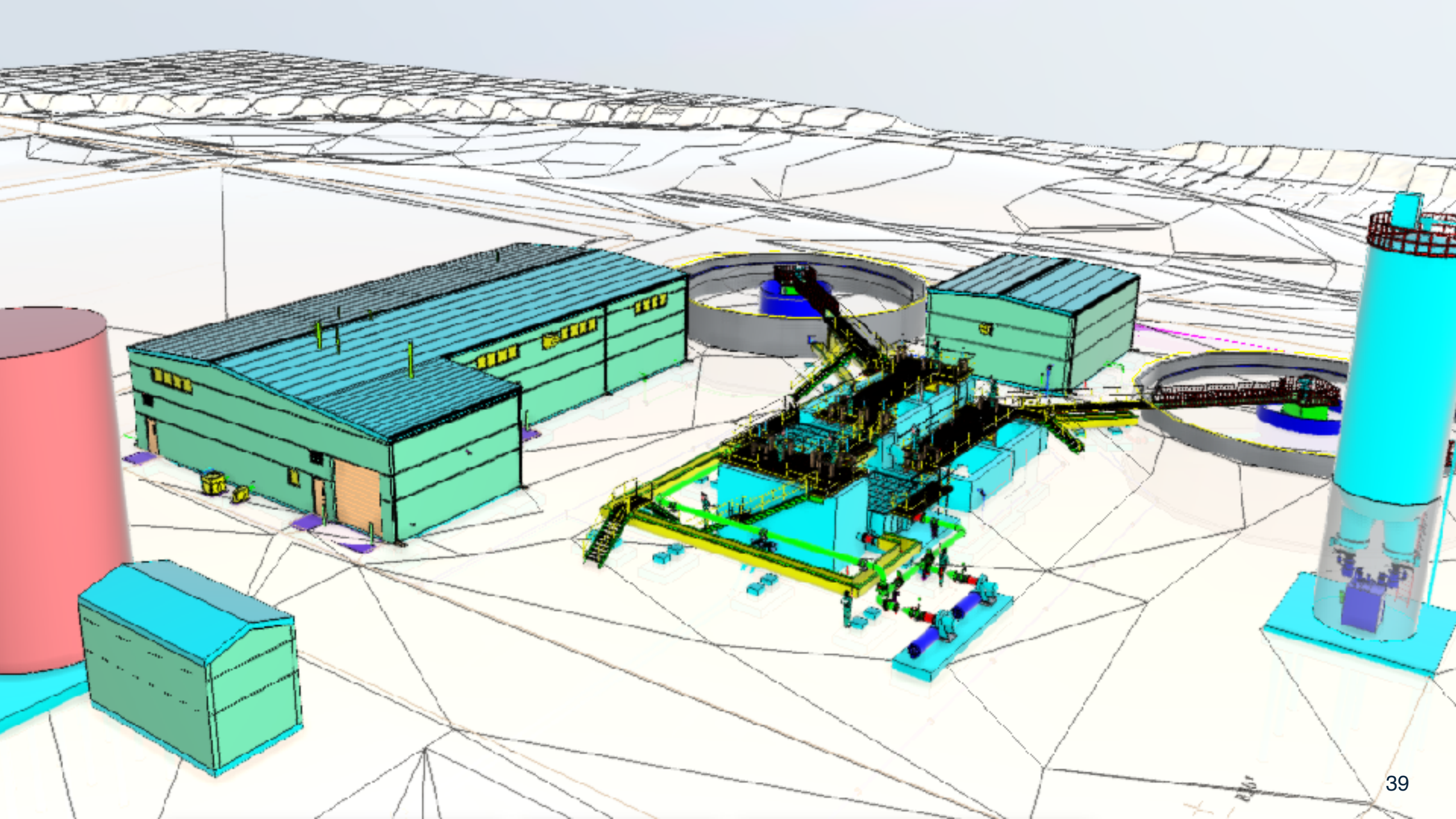
03 Project Status

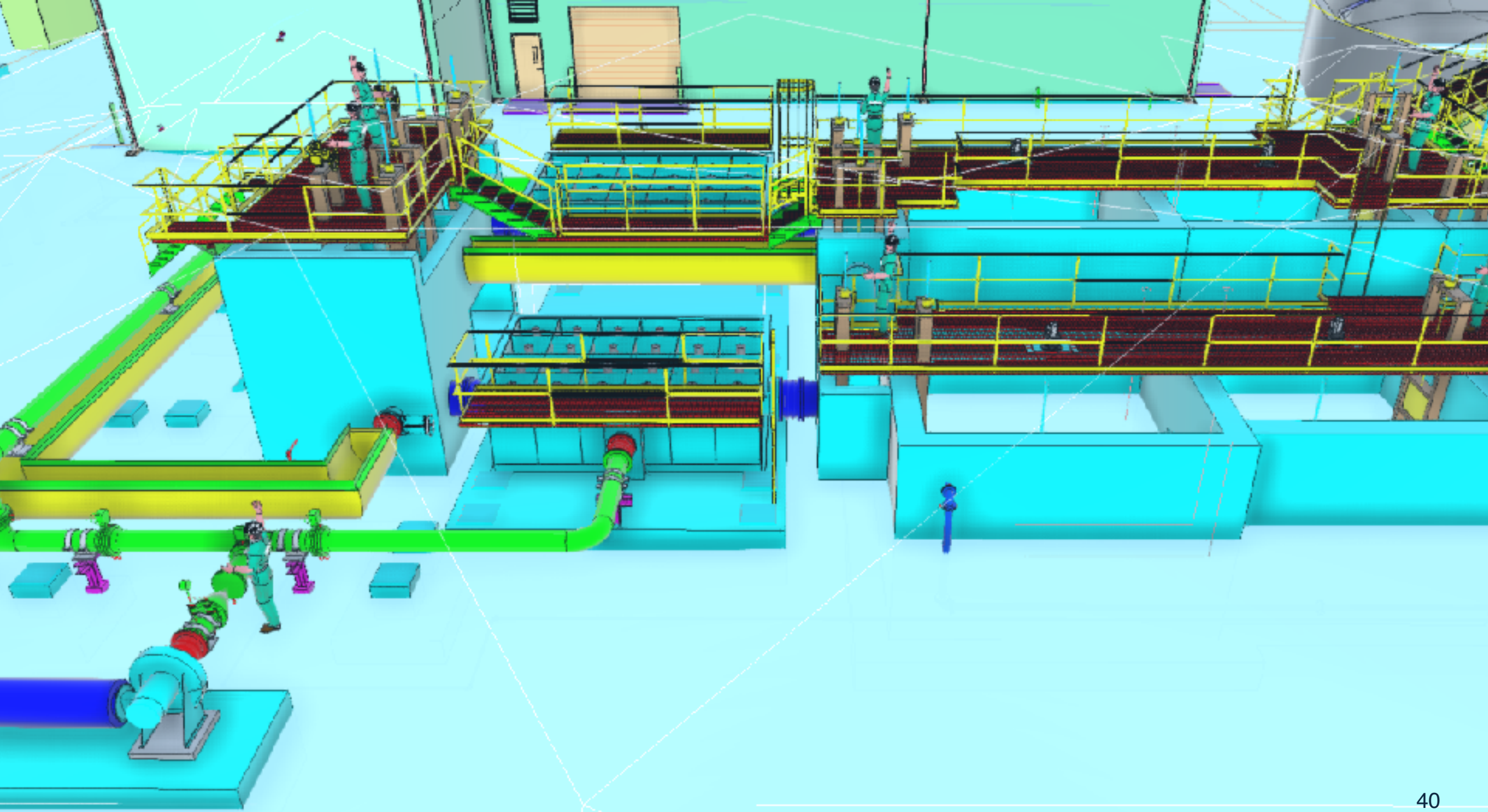
Project Status – No IRRT Processing

- IRRT treatment train still exists
  - Settling test were very dependent on polymer dosage but polymer impacts pigment quality
  - Due to the IRRT being in series, solids carryover is less critical
  - Low-pH solids are the preferred product for pigment
  - Caustic system was removed – only lime for pH adjustment
- Pigment testing to continue once facility is in service
  - Batch tank testing area in operations building
  - Ability to treat raw water or process sludge from clarifier
  - Plan to purchase small filter to develop design information on large scale pigment production
  - Once design information is better defined, expected to be a separate future project

Current Design Concept



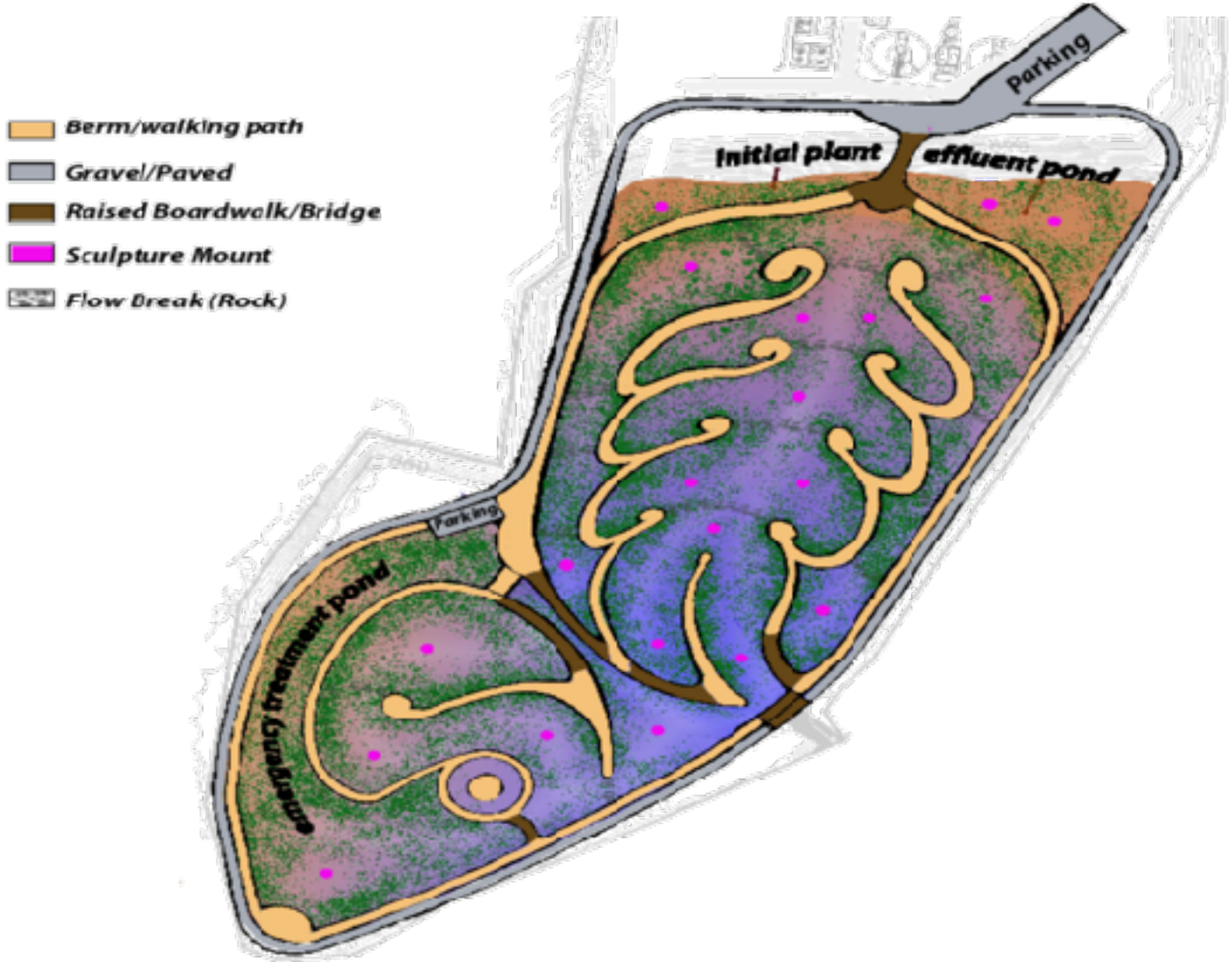


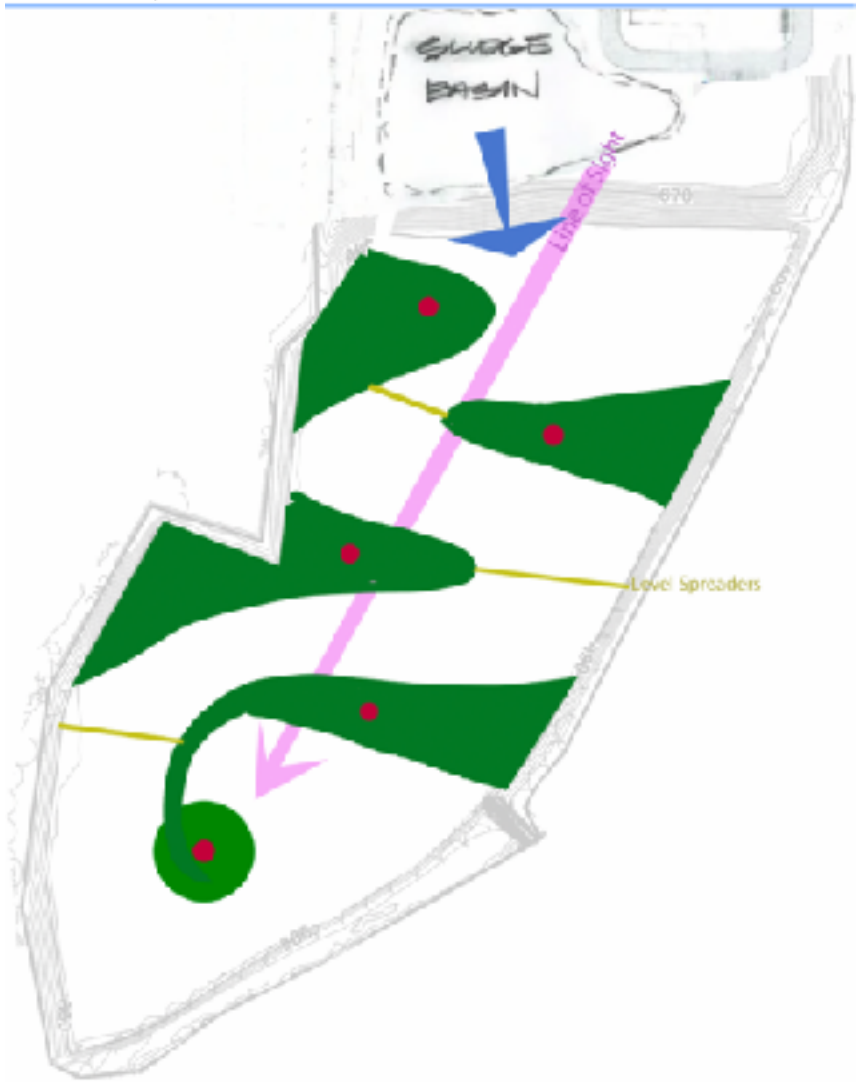


Challenge #2 – Too Expensive

	Price
Original ODNR target	$10M
Initial ROM at start of design	$25-30M
Estimated TIC based on ‘wanted’ design @ 65%	$54M
Key Drivers of Cost	
Destination wetlands with walkways, sculptures and scenic overlook	$6.5M
Fire protection	$2.8M
Buildings and facilities	$14.8M
Value Engineering Effort	
Reduce building footprint Simplify wetlands Reduce inlet pump (from 4 to 2) Remove fire water tank and sprinkler requirements by adjusting H_2O_2 location and using a dry-hydrant design that pulls from new firewater pond	
Estimated Cost After Value Engineering	**$39M**

Preliminary Wetlands Design





Path Forward – Phase 1

Finish design on water treatment trains, facility civils, sludge management and chemical delivery systems

Complete the simplified wetland design

Complete the operations building design

Looking for supplemental funding opportunities to offset construction costs

Phase 1

- Two – raw water influent pumps
- Alkaline addition
- Emergency basin
- Sludge pump back
- Wetland

04 Social & Environmental Impact

Recovery is Possible

Turning Pollution into an Asset

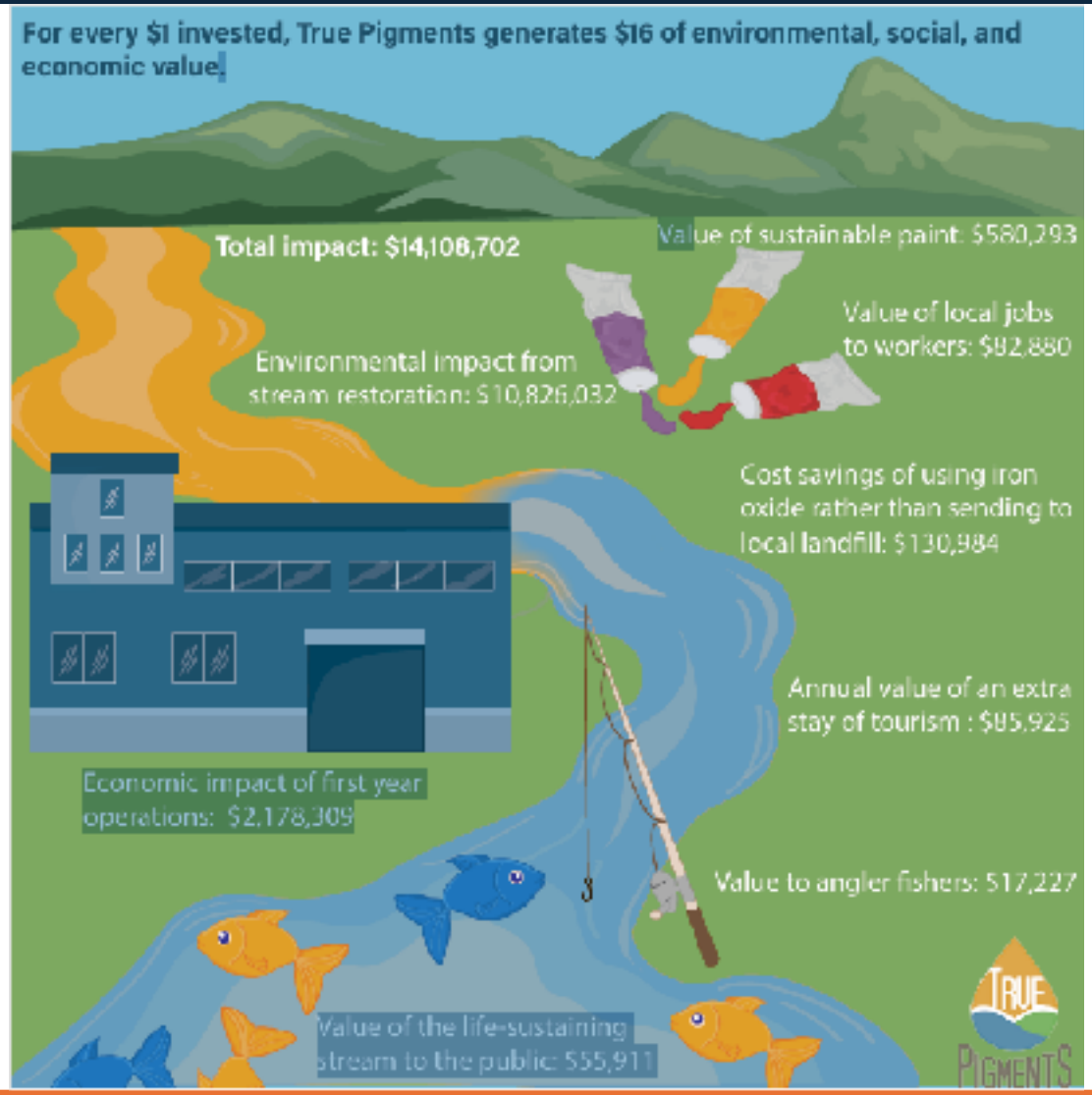
True Pigments – a Social Enterprise of Rural Action

Social enterprises operate based on four Ps:

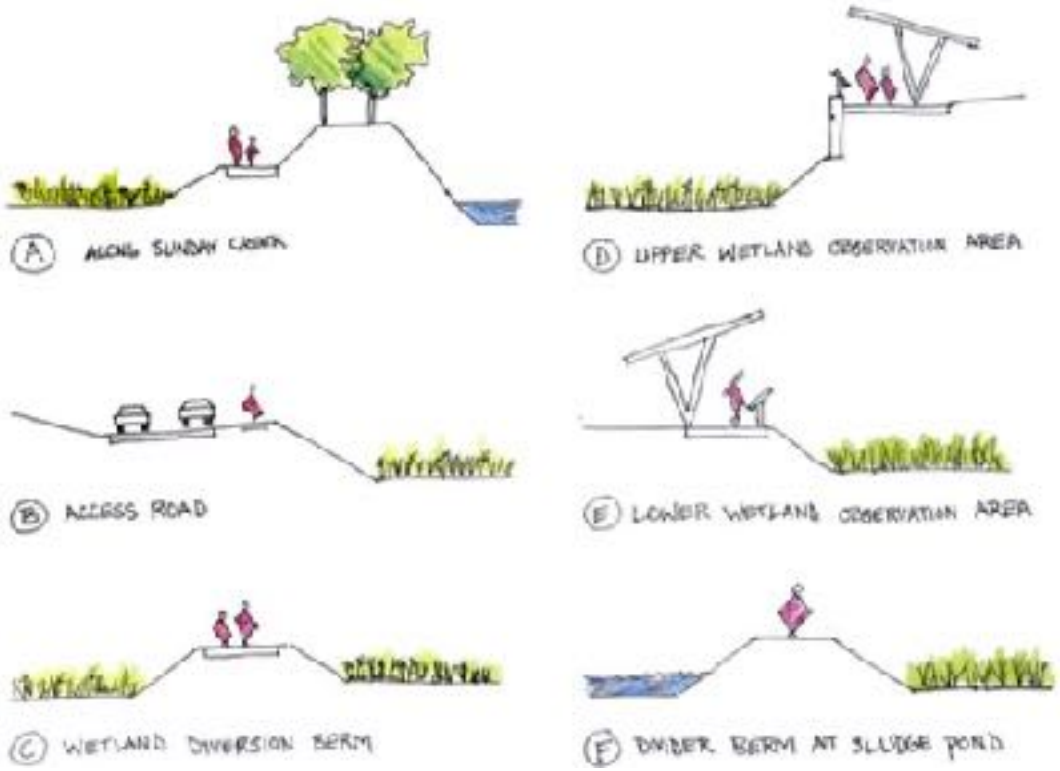
1. Planet
2. People
3. Prosperity
4. Purpose

Social Return on Investment (SROI)

- SROI is a way of measuring the social, environmental, and economic impacts of a project that speaks the language of investors
- Each year of operations generates an SROI of $15.97 for every $1 invested
- Total economic impact of first year operations, including direct, indirect, induced effects, and taxes is $2,178,309



Community Open Space



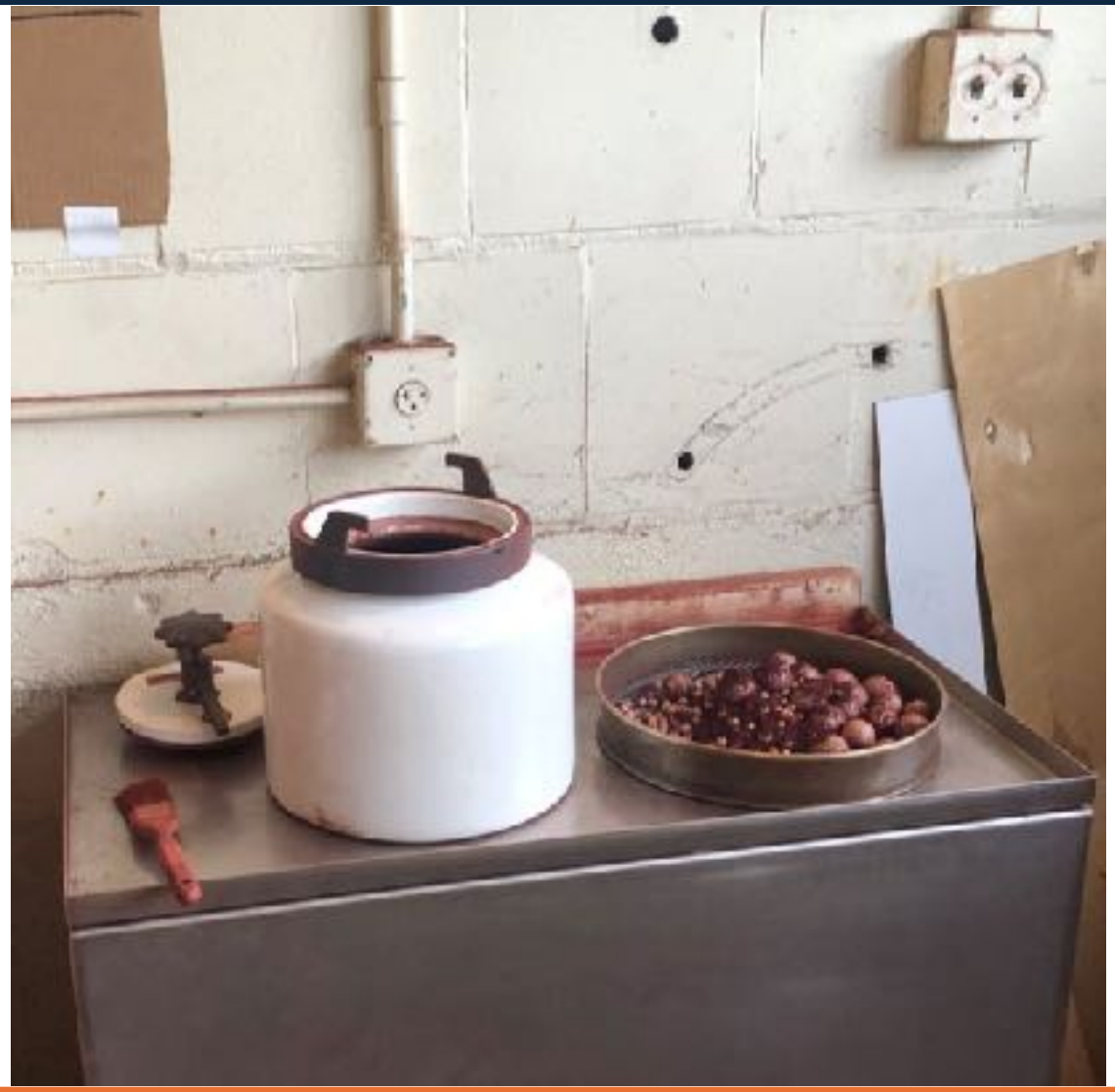
Pigment Production

- Sludge Production
- Dewatering
- Drying
- Grinding
- Kilning
- Quality Control
- Challenges

Dewatering with the Plate Press at Truetown

Dewatering and Drying

Grinding with the Ball Mill

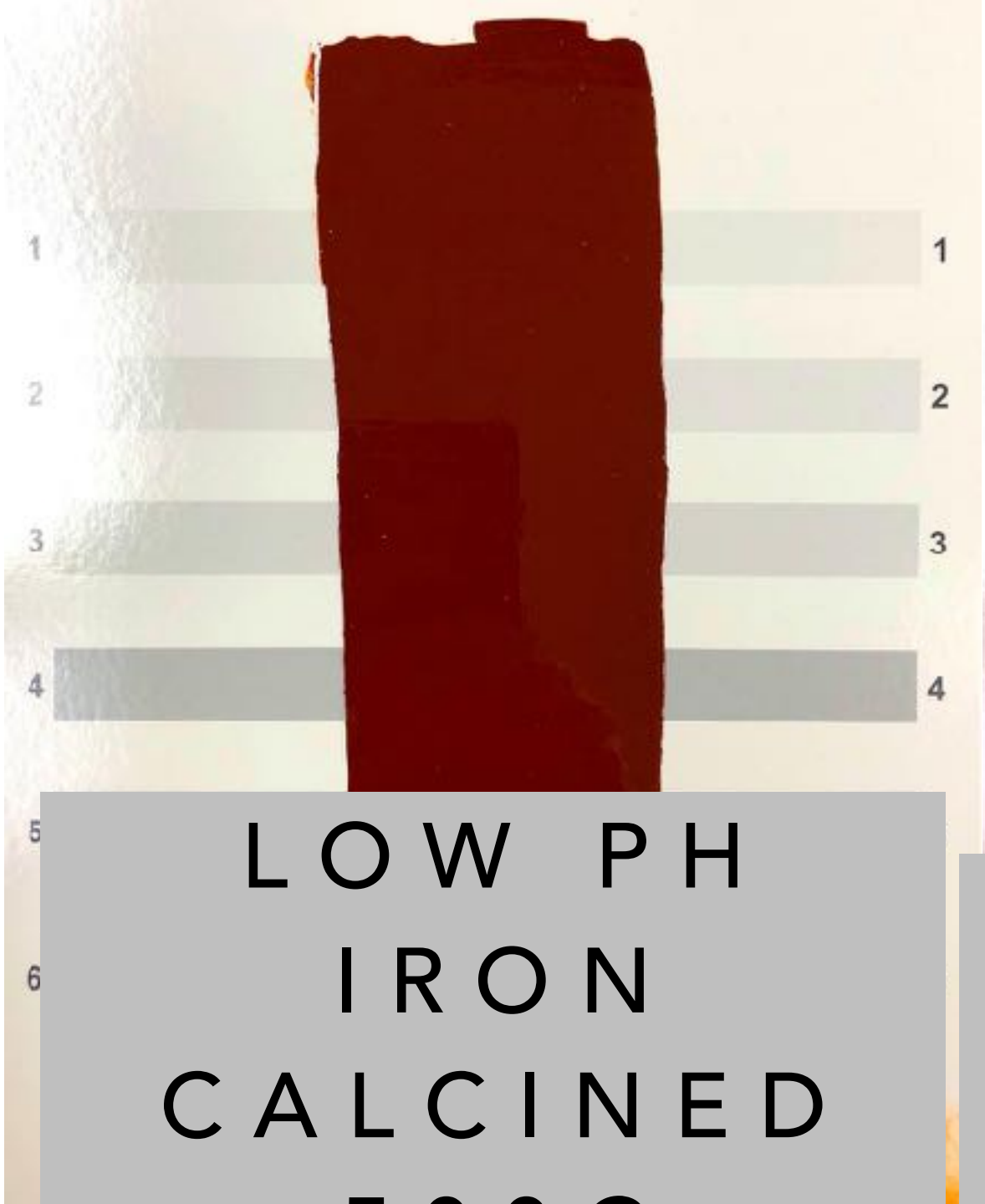


Grinding with the Ball Mill

Firing Dried Pigment to Red and Violet

2025 Low pH AMD iron

Gamblin Raw iron



LOW PH IRON CALCINED 700C

LOW PH IRON CALCINED 1,000C

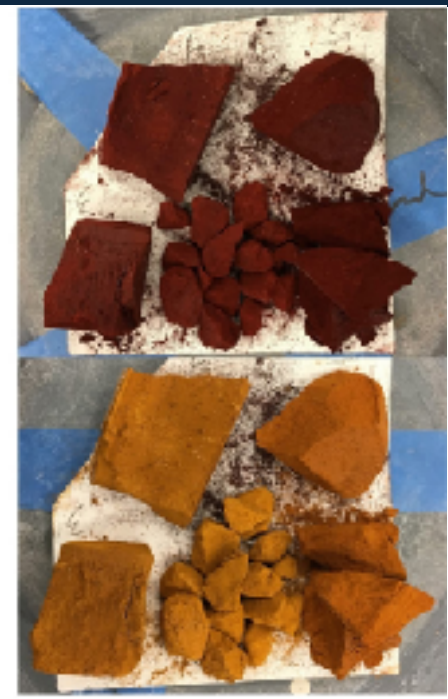
Challenges in Scaling Pigment Production

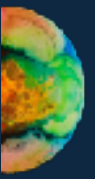
- Changes in the water treatment process directly affect pigment quality and characteristics
- Selection of equipment and process design must balance performance with long-term cost efficiency
- Solids handling, dewatering and drying, remains a key operational and design challenge
- Lack of onsite natural gas
- Market development is essential, as full-scale pigment production is still several years away

Reclaimed Earth Colors Oil Paints

Partnership with Gamblin Artists Colors

- Portland, Oregon
- Sold in art retailers worldwide
- Three colors all sourced from AMD pigments
- Interest in Iron Violet joining regular retail line





Iron Oxide Pigment Market

End uses for iron oxide pigments include:

- Artist paint
- Multi-use paint
- Industrial coatings
- Bricks
- Colored concrete products
- Tile
- Cosmetics including make-up and nail polish
- Fertilizer additive
- Arsenic removal for drinking water treatment
- pigment wholesalers and more

Education and Community Outreach

- Over 100 people have toured the Truetown site each year since Rural Action purchased property
- Ohio University and Hocking College classes are frequent visitors
- Coal India delegation visited in 2024

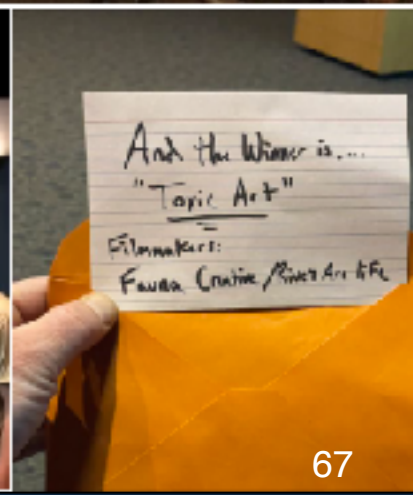
Phase I Construction Groundbreaking – June 2023

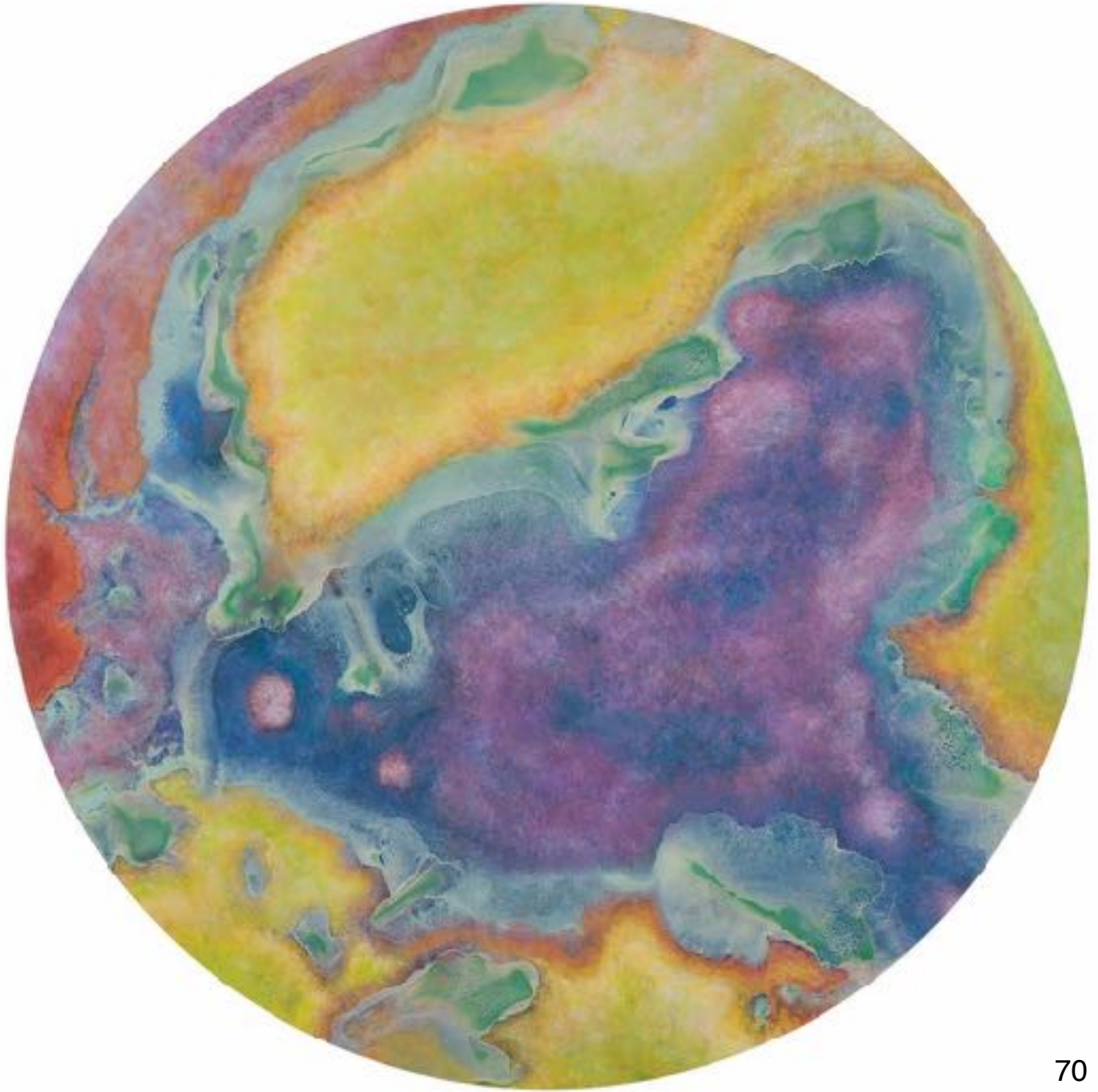
Groundbreaking brought 90+ folks to the site for the celebration

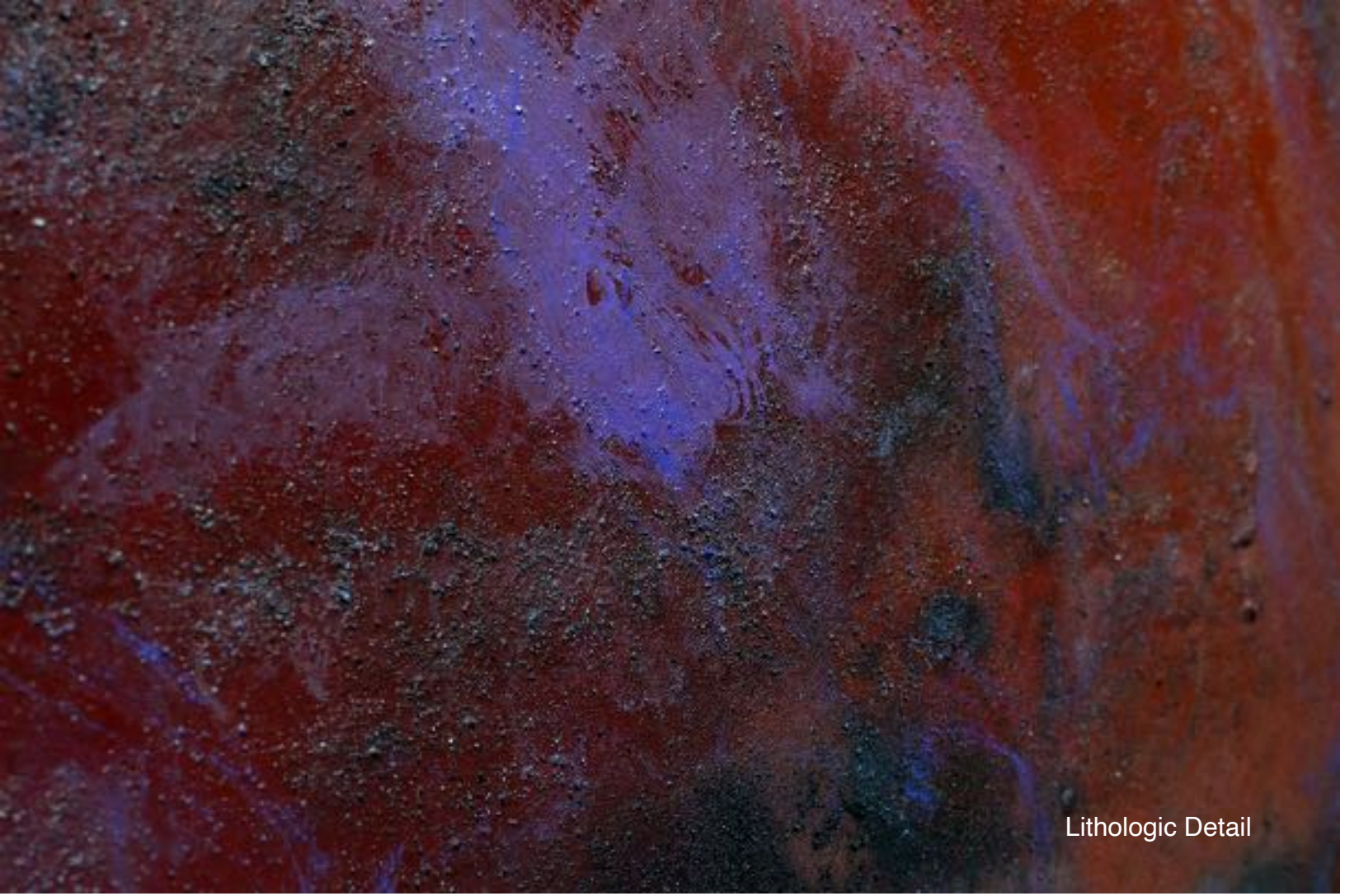
Films and National Media

Toxic Art

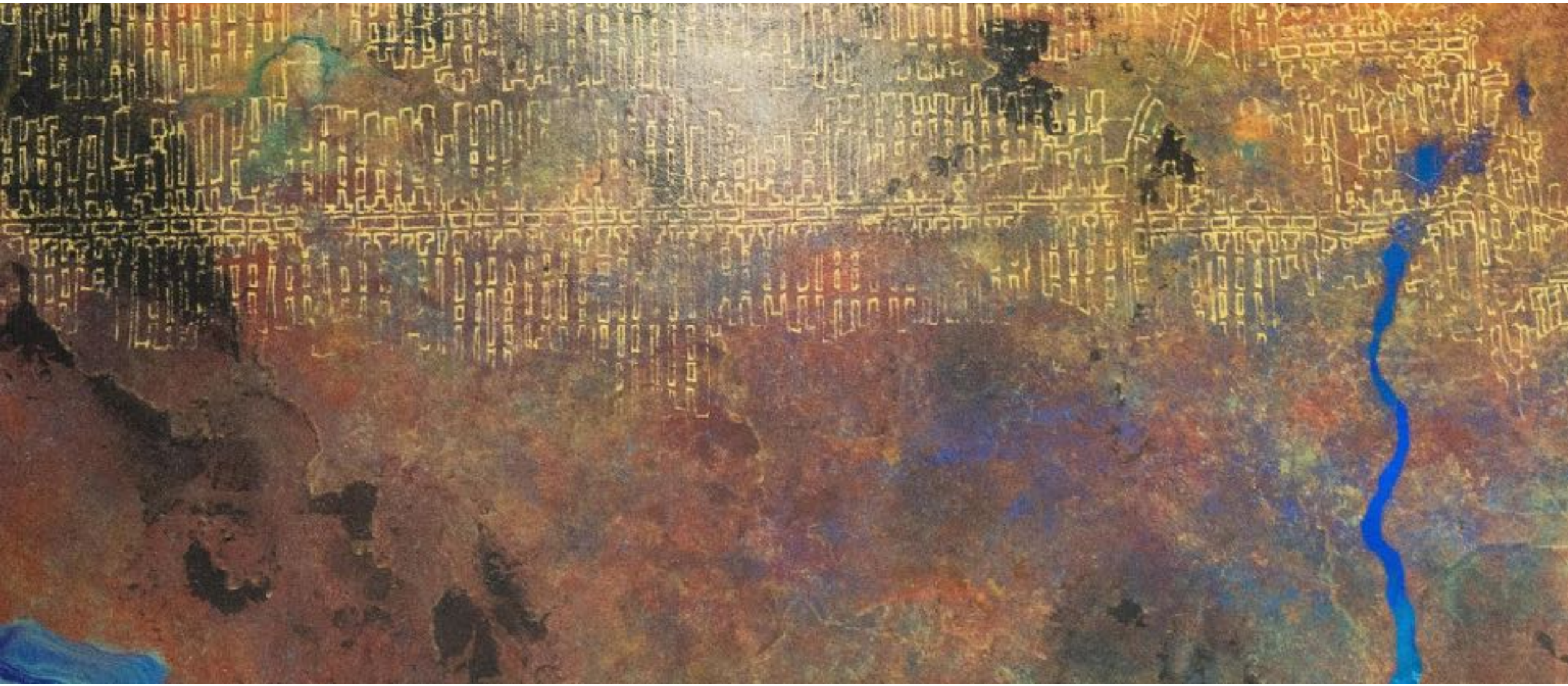
WILD & SCENIC FILM FESTIVAL OFFICIAL SELECTION 2024







Lithologic Detail




Q&A