Steele Shaft
AMD Treatment Facility

Presenter: Elizabeth Roberts

October 9, 2009

AMD Reclamation, Inc.
PA non-profit company

Agenda

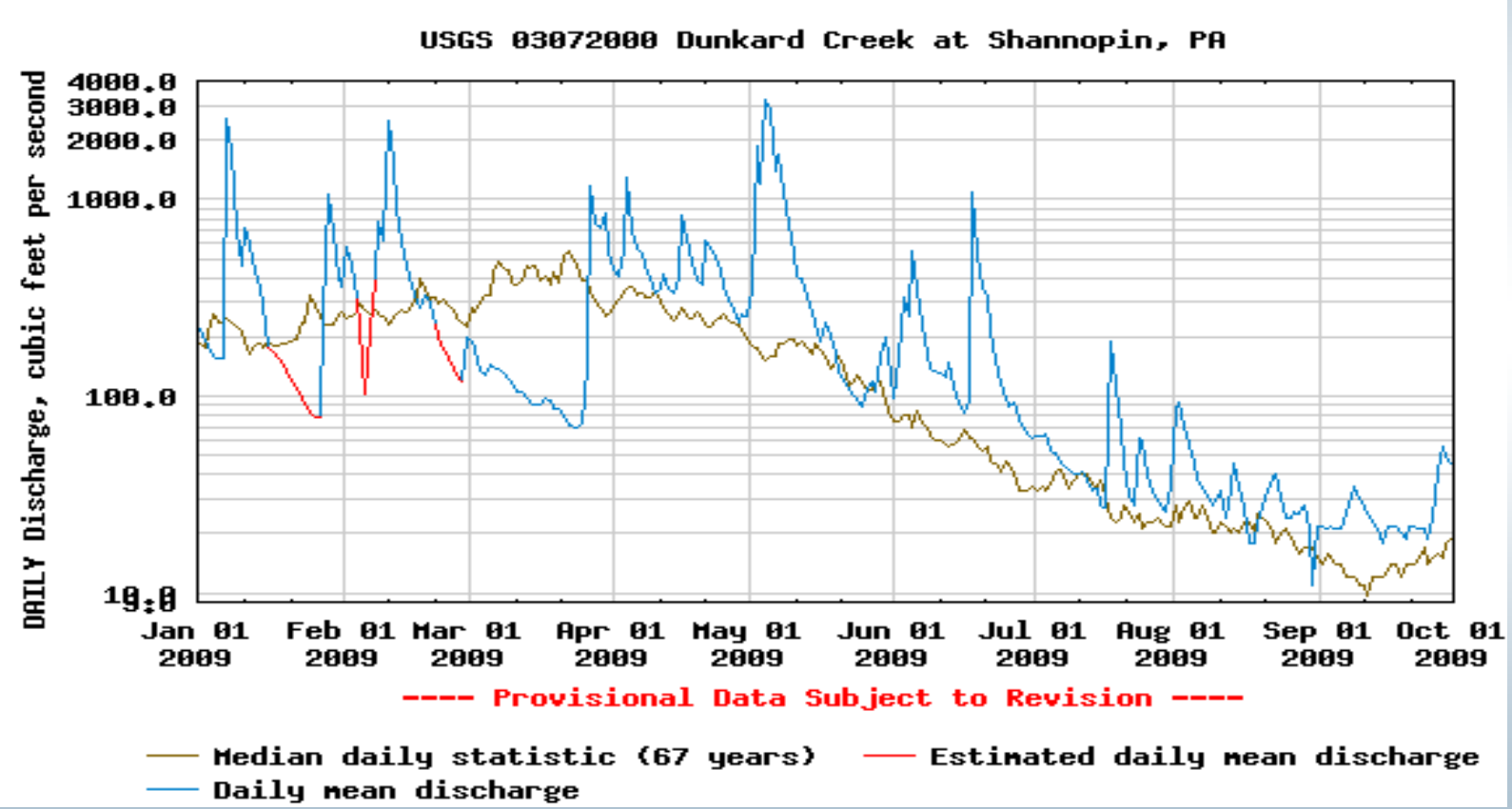
- Steele Shaft Treatment Facility
- USGS – Dunkard Creek
- Benthic Studies – lower Dunkard Creek

Steele Shaft Treatment Facility

- AMDRI commenced pumping and treating water from the Shannopin Mine in 2004 to prevent an imminent uncontrolled discharge or “breakout” of degraded water from a portal at the Shannopin Mine adjacent to Dunkard Creek near Bobtown, Greene County, PA.
- The Shannopin Mine is an abandoned bituminous underground coal mine located in Dunkard Township. Subsequent to Shannopin Mining Company’s bankruptcy filing in 1991, there has been no known viable party responsible for treating discharges from the Shannopin Mine.
- Discharge of water from the Steele Shaft Treatment Facility is authorized pursuant to the terms of the 2003 Consent Order and Agreement and Post Mining Activity Permit No. 30031691. The maximum permitted discharge volume is 7500gpm into the Dunkard Creek.

USGS – Dunkard Creek

- USGS Dunkard Creek: 03072000



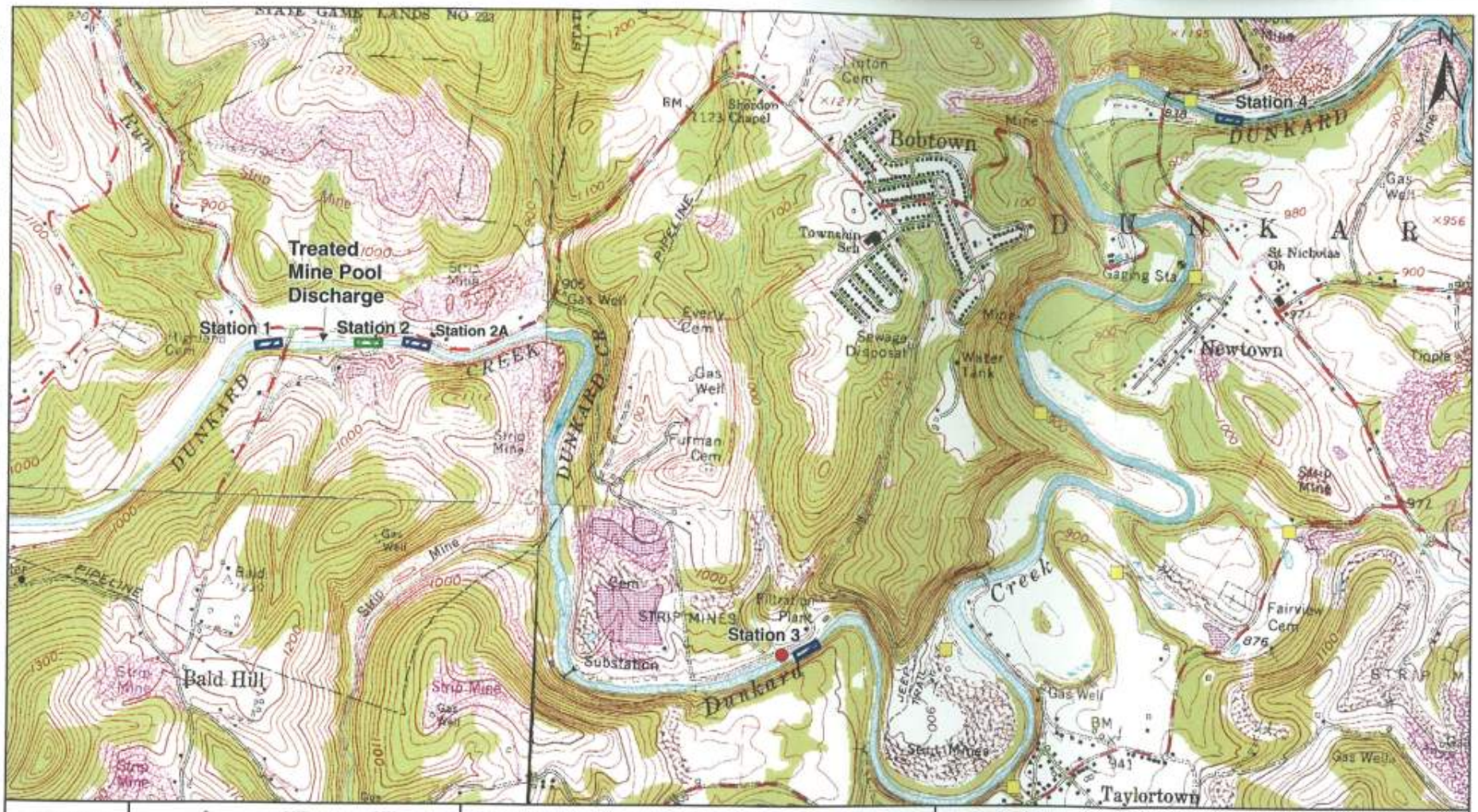
- Average estimated daily discharge for Steele Shaft: 9.7 cfs

Benthic Studies – lower Dunkard Creek

- AMDRI conducts macro invertebrate studies in accordance with its permits.
- The Pennsylvania Department of Environmental Protection (P ADEP) Southwest Regional Mining Office (California District Office) requested that the field sampling of benthic macro invertebrates be performed in accordance with P ADEP Technical Guidance Document (TGD) 563-2000-655, *Surface Water Protection - Underground Bituminous Coal MiningOperations (PADEP 2005). According to procedures outlined in, "Appendix B -*
- PADEP Low Gradient Stream Assessment Protocol" presented on pages 30-41 of the TGD and perform these surveys within the October 1 through May 31 sampling period window specified in the TGD.

Benthic Studies – continued

- Concurrent with the benthic macroinvertebrate sampling at each station, basic water quality measurements (temperature, pH, dissolved oxygen and conductivity), a modified Wolman pebble count, and a habitat assessment according to methods presented in EPA 841-B-99-002, *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition (USEPA 1999)* are conducted.
- Field observations on water quality and substrate characteristics are also recorded on field data sheets.



USGS MASONTOWN SANANDS FORT, PA. AND OSAGE, MORGANTOWN NORTH, WV QUADRANGLES

APPROVED BY: JEM

DWN. BY: CBL | CHK. BY: MJD

1 inch = 1,150 feet

DATE: 8/20/2009

0 1,150 2,300 Feet

Legend

- Benthic Macroinvertebrate Sampling Station (May 2009)
- Benthic Station (Not Sampled in May 2009)
- AMD Breakout
- Dunkard-Bobtown Mun. Auth. Outfall

ISSUED FOR: AMD RECLAMATION, INC.

ISSUED BY:

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BENTHIC MACROINVERTEBRATE SAMPLING STATIONS AND SOURCES OF ACID MINE DRAINAGE TO DUNKARD CREEK GREENE COUNTY, PENNSYLVANIA MAY 21-22, 2009

PROJECT NO.: 090-974

FIGURE: 1

P:\2009\090-974\-GIS\maps\071013_ben_mac_inv_samp_stat_rev2_8_20_2009.mxd

Benthic Studies – continued

- The instantaneous or grab dissolved oxygen (DO) measurements at the four Dunkard Creek sampling stations ranged from 8.5 mg/L to 11.4 mg/L for riffle habitat and 8.1 mg/L to 9.8 mg/L for pool habitat .
- These measurements are all above the minimum daily average of 5.0 mg/L and instantaneous minimum of 4.0 mg/L for the warm water fishes DO requirement listed in the PA Code, Title 25, Chapter 93, Water Quality Standards (PADEP 2009a).
- The DO measurement for the treated mine pool discharge was 6.7 mg/L.

Benthic Studies – continued

- Stream discharge data for the USGS gauging station on Dunkard Creek at Shannopin, Pennsylvania has not received the USGS Director's approval and should be considered provisional, and subject to revision.
- The mean discharge reported by the USGS for May 21, 2009 was 138 cfs, and the discharge ranged from 131 cfs to 146 cfs at the gauging station. The hourly discharge data shows that the Dunkard Creek discharge deviated by as much as 17 cfs from one hour to the next, suggesting that periodic withdrawal or introduction of water into Dunkard Creek may have been occurring.

Laboratory Analysis Results for Dunkard Creek Surface Water Samples
AMD Reclamation, Inc. Project, Dunkard Township, Greene County, Pennsylvania
CEC Project 090-974

PARAMETER	Dunkard Creek Sampling Stations					
	Station 1	AMDRI Outfall	Station 2A	Station 2A Duplicate	Station 3	Station 4
Sample Collection Date	5/21/2009	5/21/2009	5/21/2009	5/21/2009	5/21/2009	5/21/2009
Sample Collection Time	1620	1505	1345	1345	1145	0915
Acidity (as $CaCO_3$) (mg/L)	ND	NM	ND	ND	ND	ND
Total Alkalinity (as $CaCO_3$) (mg/L)	118	NM	126	126	124	102
Ammonia Nitrogen (mg/L)	0.24	4.7	0.52	0.64	0.46	0.33
Specific Conductance (µmhos/cm at 25 °C)	535	17,600	2,390	2,380	2,480	2,420
Osmotic Pressure (mOsm/kg)	7	175	26	26	27	25
Total Dissolved Solids (mg/L)	342	11,200	1,610	1,460	1,610	1,670
Total Suspended Solids (mg/L)	7.2	NM	7.6	7.6	4.8	14.5
Sulfate (mg/L)	95.7	NM	777	786	836	821
Total Iron (mg/L)	0.261	NM	0.256	0.256	0.179	3.10
Total Manganese (mg/L)	0.041	NM	0.077	0.078	0.064	0.313
Total Aluminum (mg/L)	0.148	NM	0.130	0.117	0.084	0.706

NM - Not Measured

ND - Not detected at Reporting Limit of 5.0 mg/L

TABLE 5

Summary of Total Biological Scores Calculated for 200 (±20%) Organism Subsamples Prepared from PADEP TGD Appendix B Samples Collected from Dunkard Creek in May and October 2007, November 2008, and May 2009 AMD Reclamation, Inc. Project, Dunkard Township, Greene County, Pennsylvania

CEC Project 090-974

DUNKARD CREEK SAMPLING STATIONS	Habitat Types Sampled					TOTAL BIOLOGICAL SCORES									
						Sampling Event Prior to Increase in AMDRI Facility Discharge in August 2007		Sampling Events Subsequent to Increase in AMDRI Facility Discharge in August 2007							
						May 2007		October 2007		November 2008		May 2009			
	Cobble/Gravel	Coarse Particulate Organic Matter (CPOM)	Sand / Fine Sediment	Submerged Aquatic Vegetation (SAV)	Snag	Primary Sample	Replicate Sample	Primary Sample	Replicate Sample	Primary Sample	Replicate Sample	Primary Sample	Replicate Sample	Mean[a]	Standar Deviati
Station 1	X	X	X	--	--	60.9	NS	70.3	NS	57.2	NS	47.8	NS	58.4	11.3
Station 2	X	X	X	--	--	46.0	NS	27.4	39.8	28.7	28.9	NS	NS	31.2	5.8
Station 2A[b]	X	X	X	--	--					38.6	NS	48.2	52.7	46.5	7.2
Station 3	X	X	X	--	--	41.9	44.1	NS	NS	38.9	NS	48.1	NS	43.5	6.5
Station 4	X	--	--	X[c]	--	49.4	NS	NS	NS	NC	NS	39.1	NS		

NS - either sampling station not sampled, or replicate sample not collected during this sampling event.

NC - Total Biological Score could not be calculated for Station 4 Appendix B sample due to <160 organisms in entire sample.

[a] Mean and standard deviation values shown are for the last three sampling events.

[b] Sampling at Station 2A initiated in November 2008 survey to replace Station 2.

[c] Submerged Aquatic Vegetation (SAV) habitat present and sampled at Station 4 only in May 2009.

Benthic Studies – continued

- A Total Biological Score (TBS), which is the average of the normalized scores for the five metrics, is presented for each subsample from Stations 1, 2A, 3, and 4.
- The mean TBS for Station 1, is 47.8, which is 9.4 points lower than the TBS (57.2) obtained in November 2008, and 22.5 points lower then the TBS (70.3) obtained in October 2007.
- **There appears to be a downward trend in TBS for Station 1 which is meant to remain constant**.
- Fish were incidentally collected during the collection of the PADEP TGD Appendix B samples at the Dunkard Creek sampling stations during the October 2007, November 2008, and May 2009 surveys (Table 6). No fish were collected during the May 2007 survey; however, ten common carp were observed just upstream from Station 4.

Summary

- Thanks