

**Project No. 102148PR
November 2010**

D'APPOLONIA

**EXPRESSION OF INTEREST
RICHARDSON BRANCH COMPLEX DESIGN
RALEIGH COUNTY, WV**

REQUISITION NO. DEP15210

PREPARED FOR

**WEST VIRGINIA DEP
OFFICE OF ABANDONED MINE
LANDS & RECLAMATION
CHARLESTON, WEST VIRGINIA**

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**PROCUREMENTS DIVISION
STATE OF WV**

D'APPOLONIA

275 CENTER ROAD
MONROEVILLE, PENNSYLVANIA 15146-1451
(412) 856-9440 FAX (412) 856-9535

November 29, 2010

Project No. 102048PR/01

Department of Administration
Purchasing Division
2019 Washington Street, East
Charleston, WV 25305-0130

**Expression of Interest
Richardson Branch Complex Design
Requisition # DEP 15210**

Gentlemen:

We appreciate the opportunity to submit this Expression of Interest (EOI) for the subject project. Enclosed please find the AML Consultant Confidential Qualification Questionnaire, and the AML and Related Project Experience Matrix (RPEM). The RPEM makes references to additional information on selected Project Profiles, which are provided in Appendix A.

D'Appolonia's design office is located in Monroeville, Pennsylvania, a suburb of Pittsburgh and within a short drive to West Virginia. From this office, we serve clients throughout the Appalachian coal fields with both field and design engineering services. We have 20 engineers (10 who are registered professional engineers) who serve the mining industry with design of mine and reclamation projects. Our engineering staff averages over 15 years of experience, and is supported by geologists, scientists, CAD operators, surveyor and technicians. We could assemble four AML Design Teams, if necessary.

D'Appolonia has provided services to the mining industry since the late 1950s, and performed AML design projects in West Virginia, Pennsylvania, Ohio, Virginia, Illinois and Indiana. These projects have included regrading of and reclamation of surface mine and refuse disposal sites, stabilization by grouting of underground mines, control and treatment of acid mine drainage, backfilling and sealing of mine portals and shafts, and demolition and clearing of former mine structures. Additionally, several of our projects have involved stabilization of landslides, control of refuse fines, and stream bank restoration.

We trust the enclosed information supports our qualification for design of AML projects, and we look forward to the opportunity to interview with the Office of Abandoned Mine Lands and Reclamation.

Very truly yours,

A handwritten signature in black ink, appearing to read 'RES', with a long horizontal line extending to the right.

Robert E. Snow, P.E.
Principal

RES:msw
Enclosures

**WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
AML CONSULTANT QUALIFICATION QUESTIONNAIRE**

PROJECT NAME DEP 15210
RICHARDSON BRANCH COMPLEX DESIGN

DATE (DAY, MONTH, YEAR)
28 November 2010

FEIN
25-1564895

1. FIRM NAME
D'Appolonia Engineering Division of Ground Technology, Inc.

2. HOME OFFICE BUSINESS ADDRESS
275 Center Road
Monroeville, PA 15146

3. FORMER FIRM NAME
E. D'Appolonia Consulting Engineers
STS-D'Appolonia

4. HOME OFFICE TELEPHONE
(412) 856-9440

5. ESTABLISHED (YEAR)
1956

6. TYPE OWNERSHIP
Corporation

6a. WV REGISTERED DBE
(Disadvantaged Business Enterprise)
NO

7. PRIMARY AML DESIGN OFFICE: ADDRESS/TELEPHONE/PERSON IN CHARGE/NO. AML DESIGN PERSONNEL EACH OFFICE
275 Center Road, Monroeville, PA 15146 / (412) 856-9440 / Robert E. Snow / 16

8. NAMES OF PRINCIPAL OFFICERS OR MEMBERS OF FIRM
Robert E. Snow, P.E.
James L. Withiam
Edward P. Voytko, P.E.
William J. Johnson, P.G.

8a. NAME, TITLE, & TELEPHONE NUMBER - OTHER PRINCIPALS

9. PERSONNEL BY DISCIPLINE (Bold Lettering Indicates Minimum Design Team Members)

3	ADMINISTRATIVE	ECOLOGISTS	LANDSCAPE ARCHITECTS	1	STRUCTURAL ENGINEERS
	ARCHITECTS	ECONOMISTS	MECHANICAL ENGINEERS	1	SURVEYORS
	BIOLOGIST	ELECTRICAL ENGINEERS	MINING ENGINEERS		TRAFFIC ENGINEERS
3	CADD OPERATORS	ENVIRONMENTALISTS	PHOTOGRAMMETRISTS	1	HYDRAULIC ENGINEERS
	CHEMICAL ENGINEERS	ESTIMATORS	PLANNERS: URBAN/REGIONAL	2	WORD PROCESSORS
8	CIVIL ENGINEERS	GEOLOGISTS	SANITARY ENGINEERS	1	TECHNICIANS
3	CONSTRUCTION INSPECTORS	HISTORIANS	SOILS ENGINEERS		
1	DESIGNERS	2	SPECIFICATION WRITERS	37	TOTAL PERSONNEL
	DRAFTSMEN				

TOTAL NUMBER OF WV REGISTERED PROFESSIONAL ENGINEERS IN PRIMARY OFFICE: 3
*RPEs other than Civil and Mining must provide supporting documentation that qualifies them to supervise and perform this type of work.

10. HAS THIS JOINT-VENTURE WORKED TOGETHER BEFORE? NOT A JOINT-VENTURE

12. A. Is your firm experienced in Abandoned Mine Lands Remediation/Mine Reclamation Engineering?

YES

D'Appolonia has completed more than 75 projects related to AML remediation and mine reclamation engineering. A summary list of projects indicating various types of experience is provided in Attachment C. Of these projects, 28 were sites located in West Virginia and these successfully completed projects cover the full spectrum of experience that would be required for the work described in the RFQ.

B. Is your firm experienced in Soil Analysis?

YES

D'Appolonia, which was founded in 1956, has always been known as one of the top geotechnical firms in the country. Geotechnical engineering continues to be a mainstay of our business. During our existence, we have completed thousands of geotechnical engineering projects, including many located in West Virginia. Our project history includes all types of projects including settlement analysis, slope stability analysis and remedial design, bearing capacity analysis and foundation design, deep foundations, and subsidence. We are experienced in performing geotechnical analyses and designs associated with mine lands remediation and mine reclamation. Our geotechnical engineers are experienced in the classification of soils and the development of laboratory testing programs. In addition to our geotechnical capabilities, D'Appolonia's engineers have evaluated site soils and topsoil substitutes and amendments in preparation of mine reclamation designs and specifications.

C. Is your firm experienced in hydrology and hydraulics?

YES

Hydrology and hydraulic engineering are a mainstay of our business. Much of our work related to mining, dams and reservoirs and industrial site development has components related to hydrology and hydraulic engineering. We have completed hundreds of projects with such components. We are experienced in the development of design basis storms for watersheds including the 100-year frequency event and the Probable Maximum Flood (PMF). We have analyzed flows resulting from these storms and we have designed channels and other hydraulic structures to accommodate these flows. Our experience includes the development of erosion and sedimentation control plans associated with new and remedial construction. Our engineers are familiar with TR-55, HEC-1, HEC-2, HEC-RAS and other commonly used software.

D. Does your firm produce its own Aerial Photography and Develop Contour Mapping?

NO/YES

We typically subcontract aerial mapping or purchase available data. We prepare contour mapping based on our own surveys or from available project information, and work with site surveyors as necessary.

E. Is your firm experienced in domestic waterline design? (Include any experience your firm has in evaluation of aquifer degradation as a result of mining.)

YES

D'Appolonia has prepared water distribution line designs for a variety of commercial and industrial uses, ranging from 3-inch to 12-inch lines. We frequently address aquifer degradation due to mining, both in terms of water quality and quantity.

F. Is your firm experienced in Acid Mine Drainage Evaluation and Abatement Design?

YES

D'Appolonia has completed more than 25 projects relating to acid mine drainage (AMD) evaluation and abatement design (several are identified in Attachment C and are illustrated in project profiles presented in Appendix A). Our projects have included the evaluation of the source of AMD impacts to receiving waters and methods to mitigate such impacts and treat the AMD source. Our design plans have included sealing of mines and mine entries to control drainage and AMD quantities, alkaline flooding of underground mines to address acid generation, chemical treatment plants for large AMD flows, passive treatment systems for small AMD flows, and isolation/neutralization of acid mine rock for source control.

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR AML PROJECT DESIGN (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
SNOW, ROBERT E. - PROJECT PRINCIPAL	9	20	1

Brief Explanation of Responsibilities
 Since joining D'Appolonia in 1977, Mr. Snow has served as lead engineer, project manager, or project principal for the design of facilities for the power, mining, steel, nuclear, and chemical industries, supervising engineers and environmental scientists in the completion of these projects. For this project, Mr. Snow would serve as project principal and in this capacity would make sure that appropriate staff and firm resources are made available to the project. Mr. Snow will also provide technical guidance and managerial input to the project work scope preparation and planning. He will attend client meetings, as appropriate, and will provide senior technical review for technical reports. Mr. Snow will review project schedules and budgets to verify that the firm provides the required technical products within budget and on schedule. Mr. Snow will coordinate internal QA/QC reviews with the project manager.

EDUCATION (Degree, Year, Specialization)
 M.S., 1977, Civil Engineering
 B.S., 1975, Civil Engineering
 M.B.A., 1993, Business Administration

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
 American Society of Civil Engineers, Society of Mining Engineers

REGISTRATION (Type, Year, State)
 Civil Engineering, 1981, PA, OH, KY, NM, VA, WV, IL

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR AML PROJECT DESIGN (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
MESSMER, DANIEL P. - SR. PROJECT ENGINEER	5	14	1

Brief Explanation of Responsibilities
 Mr. Messmer's experience has included reclamation of abandoned surface and pit mine areas for recreational and commercial use, construction of landfills in abandoned strip mine areas and reclamation of an abandoned strip mine for construction of a penitentiary. These projects have involved storage and treatment of surface and ground water, slope stability, grouting of mine voids, and construction of deep caisson foundations extending below mined areas. His responsibilities have included geotechnical engineering analyses, environmental issues, permitting, engineering design, preparation of plans and specifications, and construction monitoring. For this project it is anticipated that Mr. Messmer would serve as project manager and serve as lead engineer for specific tasks. Mr. Messmer will be responsible for establishing task scopes of work and budgets, scheduling, and coordination with subcontractors. He will provide day-to-day project management and will be responsible for providing project work products in accordance with project schedules and budgets. He will frequently communicate with WVDEP relative to work progress and relevant issues. Mr. Messmer will report to the project principal on a regular basis the project status with respect to completion of project deliverables and schedule and budget issues.

EDUCATION (Degree, Year, Specialization)
 B.S., 1985, Civil Engineering

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
 American Society of Civil Engineers, National Society of Professional Engineers, American Concrete Institute

REGISTRATION (Type, Year, State)
 Civil Engineering, 1990, PA, AL, AZ, CA, CO, CT, FL, HI, ID, ME, MD, MT, NV, NH, NM, OH, OR, UT, VA, WA, WI, WV

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR AML PROJECT DESIGN (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	
MCKELVEY, JOHN A. - PROJECT ENGINEER	4	25	1

Brief Explanation of Responsibilities
 Mr. McKelvey has extensive experience with respect to mining and subsidence and the design and construction of mine waste disposal facilities. This experience includes subsurface exploration, installation of monitoring instruments, hydrologic and hydraulic analyses, slope stability analyses, and design of internal drainage systems. Field exploration has included surficial reconnaissance, geotechnical drilling and sampling, installation of monitoring wells and piezometers, aquifer performance tests, and installation and monitoring of instrumentation. He has designed surface mine facilities, including surface drainage, sedimentation control, and spoil disposal embankments. He has been responsible for preparation of plans and specifications for mine waste disposal and AML reclamation projects, including mine grouting and sealing. He has also been responsible for construction monitoring on many of these projects. For this project, Mr. McKelvey will be responsible for performing geotechnical engineering tasks, as assigned by the project manager.

EDUCATION (Degree, Year, Specialization)
 B.S., 1980, Civil Engineering

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
 REGISTRATION (Type, Year, State)

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR AML PROJECT DESIGN (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	
CAMPBELL, COLLEEN M. - Sr. PROJECT ENGINEER	8	17	5

Brief Explanation of Responsibilities
 Ms. Campbell's experience related to AML includes site studies, subsurface exploration programs, development of alternatives based on economic analyses, design of surface drainage and sediment control systems, embankment layout, hydrologic analyses, hydraulic analyses of surface drainage facilities and discharge structures associated with impounding facilities, development of site regrading plans, slope stability analyses, and design report and specification preparation. Her experience includes development of AMD treatment systems for mine discharges and coal refuse. She is thoroughly familiar with hydrology and hydraulic software, as well as software for slope stability and other geotechnical analyses. Ms. Campbell will be lead engineer for project tasks related to hydrology and hydraulic engineering, as assigned by the project manager.

EDUCATION (Degree, Year, Specialization)
 B.S., 1980, Civil Engineering

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
 REGISTRATION (Type, Year, State)
 Civil Engineering, 2010 - PA

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR AML PROJECT DESIGN (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
<p>VOYTKO, EDWARD P. - PRINCIPAL ENGINEER</p> <p>Brief Explanation of Responsibilities Mr. Voytko has managed and been responsible for numerous engineering (civil and geotechnical) and environmental studies related to dams, reservoirs, transportation facilities, structure foundations, retaining walls, soil and rock slopes, and AML reclamation. He has managed long-term contracts with the City of Pittsburgh and Allegheny County related to civil and geotechnical issues. His responsibilities on these projects have included evaluation and design of repair measures for settlement, soil and rock slope stability, sinkholes and subsidence, site exploration and development of design and construction recommendations. His experience includes reclamation plans for abandoned mine lands in West Virginia. This work included slope stability analyses, remedial designs, development of site drainage plans and preparation of associated plans and specifications. For this project it is anticipated that Mr. Voytko would serve as a technical consultant. He would also be available as a task leader, as needed.</p>	7	20	1
<p>EDUCATION (Degree, Year, Specialization)</p> <p>B.S., 1977, Civil Engineering M.S., 2004, Civil Engineering</p>			
<p>MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS</p> <p>American Society of Civil Engineers, United States Society on Dams, Association of State Dam Safety Officials, Deep Foundations Institute</p>			
<p>13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR AML PROJECT DESIGN (Furnish complete data but keep to essentials)</p>			
NAME & TITLE (Last, First, Middle Int.)	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
<p>SHUSKO, ROBERT M. - PRINCIPAL ENGINEER</p> <p>Brief Explanation of Responsibilities Mr. Shusko has been involved in and responsible for a wide variety of mining and environmental projects involving design and permitting of mine facilities, including mine reclamation plans, along with remedial investigations and feasibility studies of other industrial properties. He has prepared reclamation plans for mine sites ranging from refuse disposal areas to mine portals and shafts, and developed subsidence mitigation plans for active and abandoned mines. Additionally, he has prepared slope stabilization designs for landslides and heavily eroded sites. Mr. Shusko will be responsible for subsidence assessments, entry sealing, and reclamation plans, as assigned by the project manager.</p>	4	8	1
<p>EDUCATION (Degree, Year, Specialization)</p> <p>B.S., 1995, Environmental Science B.S., 1994, Civil Engineering</p> <p>MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS</p> <p>American Society of Civil Engineers</p>			

EQUIPMENT

D'Appolonia maintains a wide array of field equipment suited for geotechnical and environmental application. Additional equipment may be rented on an as-needed basis. The following list identifies available D'Appolonia's equipment:

- Field Vane Shear Equipment
- Field Chemical Screening Devices
- M-Scopes
- PH/Specific Conductance Meter
- Photoionization (H-Nu) Meters
- CO₂/O₂/LEL Meters
- Dye Kits
- Nuclear Density Test Equipment
- Concrete Sampling & Testing Equipment
- Pneumatic Pressure Readout Device (Sinco)
- Peak Vibration Monitor (Sinco)
- Digitilt Indicator (Sinco)
- Tape Extensometer (Sinco)
- Digitilt Datamate System (Sinco)
- Surveying and GPS Equipment
- Downhole Nuclear Gauge
- Customary Geotechnical Field Devices
- Syscal Kid Multi-Electrode DC Resistivity
- RAMAC Ground Penetrating Radar
- Scintrex Cesium Magnetic Gradiometer
- Geonics EM61 Time-Domain Deep Metal Detector
- Vibratech Three-Component Vibration Monitoring and General Purpose Seismic Equipment

RESIST Program for analysis of geophysical resistivity survey data to permit evaluation of apparent resistivity as a function of electrode spacing for Schlumberger, Wenner and bipole arrays.

SLUG Program for analysis of slug tests in single wells to evaluate in-situ permeability.

GENERAL APPLICATIONS

CONCRETE Windows based analysis of bending, shear and torsion in concrete UTILITIES beam and column elements based on ACI code recommendations.

SURFER Multipurpose graphing and surface modeling software.

EXCEL Windows based spreadsheet software.

COPLOT Multipurpose graphing and surface modeling software.

POWERPOINT Presentation development software.

PRIMAVERA Project scheduling and management software.

DRAFTING

AUTOCAD PC-based, interactive computer-aided drafting (Release 14) software for preparation of engineering drawings with a variety of text fonts, symbols, and shading controls. Includes IGES translator for transfer of text and graphic files to other CAD systems.

MICROSTATION PC-based, interactive computer-aided drafting software for preparation of engineering drawings with a variety of text fonts, symbols, and shading controls.

WORD PROCESSING

MS WORD, The two most comprehensive and widely-used word processors available.
WORDPERFECT

SWMM Storm Water Management Modeling (SWMM) computer program developed by the EPA to simulate urban runoff quantity and quality in both storm and combined sewer systems. The program incorporates surface and subsurface runoff, transport through drainage system networks, storage and treatment estimate runoff quantity and quality.

TR55 Project for evaluation of the hydrologic impacts of urbanization of small watersheds. This program was developed by the Soil Conservation Service and is used to estimate quantities of stormwater runoff from watershed areas. It is widely accepted method of comparing pre- and post-development runoff conditions. It will also provide an estimate of the storage capacity required to maintain pre-development discharge rates.

FLOWMASTER1 Open channel flow analysis software.

GROUND WATER ENGINEERING

SEEP/W Windows-based finite element program for the analysis of seepage modeling. Compatible with SEEP/W, CTRAN/W and SLOPE/W.

CTRAN/W Windows -based finite element program for the analysis of subsurface contaminant transport. Compatible with SEEP/W, CTRAN/W and SLOPE/W.

HELP The Hydrologic Evaluation of Landfill Performance (HELP) computer program is a quasi 2-D hydrologic model of water movement across, into, through and out of landfills. The model accepts climatologic, soil and design data and utilizes a solution technique that accounts for the effects of surface storage, runoff, infiltration, percolation, evapotranspiration, soil moisture storage and lateral drainage. Landfill systems including various combinations of vegetation, cover soils, waste cells, special drainage layers and relatively impermeable barrier soils, as well as synthetic membrane covers and liners, may be modeled. The program was developed to facilitate rapid estimation of the amounts of runoff, drainage and leachate that may be expected to results from the operation of a wide variety of landfill designs. The model is applicable to open, partially closed and fully closed site.

IN-SITU TESTING/INSTRUMENTATION

PC SLIN Data analysis program for evaluation and graphical presentation of inclinometer field measurements.

KECKES Program for evaluation of resistivity survey data using Wenner array to determine location of ground water contamination.

PRESSURE-METER Data analysis program for evaluation and graphical presentation of pressuremeter test results.

MINING AND SUBSIDENCE ENGINEERING

ARMPS 16 Software for analysis of retreat mining pillar stability.

CISPM Subsidence prediction software.

SDPS Subsidence surface deformation prediction software.

HYDROLOGY AND HYDRAULIC ENGINEERING

AdICPR The Advanced Interconnected Channel and Pond Routing Model (AdICPR), is an interactive hydrology/hydraulics model for analyzing the storm-water management systems. A node/reach model, AdICPR automatically computes the hydrographs the various subbasins (nodes) of a drainage basin, then flood-routes them through storage in lakes or detention basins in the subbasins out through pipes or channels (reaches) by the modified Plus method. The model takes into consideration storage in the pipes or channels, tailwater conditions at pipe or channel outlets, reverse flow conditions if water surfaces at reach outlets are higher than reach inlets, and time-varying elevations (i.e., tidal action).

DMBRK Program for computer simulation of the influence of a dam related to upstream and downstream flow. The model is used to predict flow profiles in the event of dam failure.

HEC-1 Program for simulation of surface water runoff response in a river basin to precipitation to permit computation of streamflow hydrographs at desired locations within the river basin.

HEC-2 Model for calculation of water surface profiles in channels for subcritical and supercritical flow conditions. The effects of bridges, weirs, culverts and other channel restrictions can be considered in the program.

HEC-RAS Multi-purpose software for modeling hydraulic performance of channels, culverts and bridges.

STORM Program for analysis of the quantity and quality of runoff from urban and nonurban environments. The model is used as an aid in sizing storage and treatment of runoff control facilities and considers rainfall and snowmelt, runoff, dry weather flow, pollutant accumulation and washoff erosion.

STREMR Numerical model that generates discrete solutions of the incompressible Navier-Stokes equations for depth- or width-averaged, 2-D flow. The program computes the mutual interactions between sidewalls, obstacles and bathymetry to predict depth-averaged flow in channels of arbitrary shape. A k-e turbulence model is used to generate an eddy viscosity from the computed primary flow and 3-D secondary flow correction accounts for the interaction between lateral curvature and vertical nonuniformity, which causes high velocities to migrate toward the outside of channel bends.

14. PROVIDE A LIST OF SOFTWARE AND EQUIPMENT AVAILABLE IN THE PRIMARY OFFICE WHICH WILL BE USED TO COMPLETE ABOVE DESIGN SERVICES

STABL6	Revision to original STABL software including optional reinforcing layer within soil.
STIFF1	Structural analysis of various pile types providing pile stiffness as a function of axial load and moment.
REWARD	Advanced retaining wall design and analysis.
RESLOPE	Slope stability software incorporating mechanically stabilized earth option.
MGRSW	MIRAFI mechanically stabilized soil wall analysis software.
MRSS	MIRAFI slope stability software incorporating mechanically stabilized earth option.
UTEXAS2	DOS-based limit equilibrium slope stability software.
TENSWAL	TENSAR program for analysis of reinforced walls.
TENSLO1	TENSAR program for analysis of reinforced slope.
GRLWEAP86	Wave equation analysis of pile driving and capacity.
CBEAR	FHWA software for bearing capacity analysis of shallow foundations.
EMBANK	FHWA software for determination of one-dimensional compression settlement due to embankment loads.
SPILE	FHWA software for prediction of pile vertical, static capacity.
CPGA	US Army Corps of Engineers pile group analysis program.
PILENEG	DOS based, menu-driven analysis of downdrag effects on pile settlement and capacity.
SNAIL	DOS based analysis of soil nailed slopes.

SOFTWARE

GEOTECHNICAL ENGINEERING

SLIDE	Windows based limit equilibrium slope stability software.
SIGMA/W	Windows based finite element (FE) program for the static analysis of plane strain and axisymmetric soil-structure stress-deformation problems. Compatible with SEEP/W, CTRAN/W and SLOPE/W.
SLOPE/W	Windows based limit equilibrium slope stability software. Compatible with SEEP/W, CTRAN/W and SLOPE/W.
CANDE89	Plane strain FE code for the analysis of flexible and rigid culvert systems. Program considers nonlinear soil behavior, relative slip between the culvert and soil backfill, construction and external loading conditions.
COM624P	One-dimensional (1-D) finite difference (FD) program for the evaluation of laterally-loaded piles and drilled shafts which considers variable degrees of head fixity, loading, and subsurface conditions. Program computes deflections, moments and stresses as a function of depth.
CONSOL	FD program for the evaluation of 2-D consolidation settlement of soft-compressible soils below circular-, strip- and large-area loading conditions.
QUAD-4M	2-D FE program for the evaluation of soil-structure interaction problems in response to dynamic loading conditions.
FLUSH	3-D FE program for the evaluation of soil-structure interaction problems in response to dynamic loading conditions.
GROUP	The programs include a general 2-D and 3-D, FD solution to determine the load-deflection and load-moment relationships for 3DPILE vertical and battered piles in a group subjected to axial, lateral and moment loading. The effects of soil-pile interaction are considered using p-y curves for single piles, as are the effects of ground water conditions, and axial and cyclic loading. The program computes the deflection, bending moment, shear, and soil resistance as a function of depth. Pinned, fixed-head or elastic restraint boundary conditions can be considered to account for the fixity provided by the pile cap.
MAGSET	Settlement analysis program for evaluation of displacement of multi-layer soil systems due to elastic and consolidation components; relies on SPT or cone penetrometer data and laboratory test results for soil properties.
SHAKE91	1-D program for the development of seismic response of horizontally-layered soils to vertically propagating shear waves.
STABL/G	2-D limit equilibrium slope stability program using the modified Bishop method of slices or simplified Janbu for generation of circular, wedge and irregular failure surfaces, respectively. The program considers the effects of groundwater, elevated pore

15. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS THE DESIGNATED ENGINEER OF RECORD

PROJECT NAME, TYPE AND LOCATION	NAME AND ADDRESS OF OWNER	NATURE OF YOUR FIRM'S RESPONSIBILITY	ESTIMATED CONSTRUCTION COST	PERCENT COMPLETE
Cumberland Mine Refuse Area No. 2; Coal Refuse Disposal Facilities Greene County, PA	Cumberland Coal Resources Waynesburg, PA	Construction Engineering and Monitoring – Coal Refuse Embankment Grading, Stability, Drainage Control, and Reclamation	\$8,000,000	60
Pangburn Site Reclamation Waste Remediation at Former Surface Mine Allegheny County, PA	CONSOL Energy Pittsburgh, PA	Design, Permitting, Construction Monitoring, Post Remediation Monitoring – Hazardous Waste Removal, Drainage, Highwall Elimination, and Reclamation	\$800,000	95
Emerald Mine Refuse Area Nos. 1 & 2 Monitoring; Coal Refuse Disposal Facilities Greene County, PA	Emerald Coal Resources Waynesburg, PA	Design, Permitting, Construction Monitoring – Coal Refuse Embankment Grading, Stabilization, Drainage Control and Reclamation	\$5,000,000	Ongoing
Mason Dixon Mine Coal Refuse Disposal Facility Monongalia County, WV	CONSOL Energy Monongah, WV	Exploration, Design and Permitting – Coal Refuse Embankment Grading, Stability, Drainage Control, Reclamation	\$15,000,000	10
Iselin Coal Refuse Disposal Facility Indiana County, PA	Homer City Processing Homer City, PA	Design, Permitting, and Construction Monitoring – Coal Refuse/Combustion Ash Stabilization, Grading, Drainage Control, Reclamation	\$5,000,000	Ongoing
Mine Spoil Embankment Stabilization, Clarksburg, WV	Lowes Clarksburg, WV	Construction Engineering and Monitoring – Drainage Control, Slope Stabilization, Grouting, Instrumentation	\$800,000	10
Viper Mine Coal Refuse Disposal Facility Logan County, IL	ICG Illinois Williamsville, IL	Design, Permitting, Construction Monitoring – Coal Refuse Embankment Grading, Combustion Ash Stabilization, Drainage Control, Reclamation	\$3,000,000	70
TOTAL NUMBER OF PROJECTS:	25	TOTAL ESTIMATED CONSTRUCTION COSTS:	\$80,000,000	

16. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS SERVING AS A CONSULTANT TO OTHERS

PROJECT NAME, TYPE AND LOCATIONS	NATURE OF FIRMS RESPONSIBILITY	NAME AND ADDRESS OF OWNER	ESTIMATED COMPLETION DATE	ESTIMATED CONSTRUCTION COST	
				ENTIRE PROJECT	YOUR FIRMS RESPONSIBILITY
Mine Stabilization Grouting Program Edwardsport, IN	Exploration, Engineering, Subsidence Assessment, Grout Design, and Construction Monitoring	Duke Energy Plainfield, IN	2011	\$23,000,000	\$1,500,000
Bear Run Surface Mine Spoil Stabilization, Kendall Mine, Dugger, IN	Foundation Engineering	Peabody Energy St. Louis, MO	2011	\$50,000,000	\$4,000,000
Island Creek Bridge Replacement, Logan County, WV	Geotechnical Engineering and Foundation Design for Concrete Bridge Replacement	Corps of Engineers Huntington District Huntington, WV	2011	\$500,000	\$50,000
Bluwell Dam Spillway Rehabilitation, Mercer County, WV	Hydrology and Hydraulic Engineering for Storm Runoff and Routing	Mercer County, WV	2011	TBD	TBD
Ohio River Navigational Locks & Dams Improvements Ermsworth, PA	Foundation Engineering	Corps of Engineers Pittsburgh District Pittsburgh, PA	2012	\$80,000,000	\$2,000,000
Gas Well Pad Site Development, Westmoreland County, PA	Site Engineering including Mine Void Detection and Grouting, Mine Spoil Stabilization, Impoundment Siting	Williams E&P Canonsburg, PA	2012	\$1,500,000	\$100,000
Kingston Ash Impoundment Remediation, Kingston, TN	Independent Review of Ash Pond Failure Study, Geotechnical Engineering, Remediation Plan Recommendations	TVA Kingston, TN	2011	TBD	NA

17. COMPLETED WORK WITHIN LAST 5 YEARS ON WHICH YOUR FIRM HAS BEEN THE DESIGNATED ENGINEER OF RECORD

PROJECT NAME, TYPE AND LOCATION	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST	YEAR	CONSTRUCTED (YES OR NO)
Blackdog Hollow Reclamation Mine Structures and Refuse Facility (refuse grading, drainage control, impoundment stabilization, bin/conveyor demolition, waste removal, reclamation) Washington County, PA	Utica Insurance Co. c/o Stites & Harbison Lexington, KY	\$900,000	2005	Yes
Coal Refuse Facility Expansion and Shaft Seal Design (concrete bulkhead and cap design for mine entry) Elkhart, IL	Turriss Coal Co./ICG Illinois Elkhart, IL	\$1,000,000+	2005	Yes
Coal Refuse Facility No. 1 Impoundment Design Greene County, PA	RAG Emerald Resources Waynesburg, PA	\$2,000,000	2006	Yes
Coal Refuse Slurry Injection System Abandoned Underground Mine Clymer, PA	Alpha Natural Resources Latrobe, PA	\$500,000	2009	Yes
New Kiln and Plant Foundation Design and Void Stabilization Program Martinsburg, WV	Capitol Cement/Essroc Martinsburg, WV	\$50,000,000	2009	Yes
Lamira Site Reclamation Surface Mine Refuse Area and Coal Preparation Plant Reclamation Belmont County, OH	R&F Coal Co./Capstone Holding Co. Cadiz, OH	\$1,500,000	2005	Partially complete
Mine Void Detection Demonstration at Impoundment, Pine Ridge Prenter Mine Prenter, WV	Pine Ridge Coal Company Prenter, WV	NA	2005	Yes
Mine Subsidence Evaluation and Grouting Program Washington County, PA	Burgettstown Area School District Burgettstown, PA	\$600,000	2008	Yes

18. COMPLETED WORK WITHIN LAST 5 YEARS ON WHICH YOUR FIRM HAS BEEN A SUB-CONSULTANT TO OTHER FIRMS (INDICATE PHASE OF WORK FOR WHICH YOUR FIRM WAS RESPONSIBLE)

PROJECT NAME, TYPE AND LOCATION	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST OF YOUR FIRM'S PORTION	YEAR	CONSTRUCTED (YES OR NO)	FIRM ASSOCIATED WITH
Millcreek Site Remediation Waste Dump Cleanup Millcreek, PA Design, Permitting and Construction Management	Millcreek PRP Group Erie, PA	\$3,000,000	2005	Yes	demaximis, inc. Knoxville, TN
Krayn Wind Project Foundation Exploration and Design on Surface Mine Spoil and Abandoned Underground Mines Cambria County, PA	EverPower Renewables LLC New York, NY	\$2,000,000	2007	Yes	GZA Geoenvironmental Buffalo, NY
Bluestone Dam Rehabilitation Anchor Design for Penstocks Load Transfer, Hinton, WV	Corps of Engineers Huntington District, Huntington, WV	\$6,000,000	2008	Yes	Brayman Construction Saxonburg, PA
Jonathan Lark Reservoir Dam Blasting Impact Evaluation and Monitoring Putnam County, WV	South Putnam Public Service District Scott Depot, WV	\$1,200,000	2006	Yes	H.K. Bell Engineering Lexington, KY
Drainage and Water Treatment System, Coal Refuse Area Charleroi, PA Environmental Assessment, Design, Permitting	Corps of Engineers Pittsburgh District Pittsburgh, PA	\$1,500,000	2008	Yes	Bergmann Associates Rochester, NY
Mine Grouting Program Abandoned Underground Mine Edwardsport, IN	Duke Energy Plainfield, IN	\$23,000,000	2009	Yes	Bechtel Engineering Baltimore, MD

19. Use this space to provide any additional information or description of resources supporting your firm's qualifications to perform work for the West Virginia Abandoned Mine Lands Program. D'Appolonia maintains a complete array of geophysical and field sampling equipment to explore and evaluate AML sites. Additionally, our in-house computer system is networked with six CAD stations for preparation of design drawings and permit submittals. We can assemble 4 AML Project Teams consisting of Project Engineers and CAD Specialists, and have a support staff of engineers, geologists, and scientists with significant mining experience to address reclamation, stability, drainage control, water supply and mine sealing.

20. The foregoing is a statement of facts.

Signature:  Title: Principal

Printed Name: Robert E. Snow

Date: November 29, 2010

AML and RELATED PROJECT EXPERIENCE MA		PRIMARY STAFF PARTICIPATION/CAPACITY					
PROJECT		*** M = Management P = Professional					
		R. E. SNOW (M)	D.P. MESSMER (M)	R.M. SHUSKO (P)	C.M. CAMPBELL (P)	E.P. VOYTKO (P)	J.K. McKELVEY (P)
CLIENT	DESCRIPTION						
Consol - Mason Dixon Mine	Refuse Disposal Facility	●		●	●		
PADEP - Blackwood Mine	Abandoned Shaft Sealin	●		●			
Alpha - Freeport Mine	Refuse Disposal Facility			●			●
Peabody - Bear Run Mine	Mine Spoil Stabilization		●			●	●
Utica Insurance - Clyde Mine	Refuse Area Reclamatio	●			●		
Homer City Processing	Refuse/Ash Beneficial U	●					
Consol - Pangburn Site	Surface Mine/Waste Ref	●			●		●
Duke Energy - Kendill Mine	Mine Grouting					●	●
Wyomac Mining Co.	Mine Water Control/Trea	●					
Alpha - Cumberland Mine	Refuse Disposal Facility			●			
Alpha - Emerald Mine	Refuse Disposal Facility			●			
Laurel Run Mining	Abandoned mine				●		
ICG - Viper Mine	Refuse Disposal Facility	●	●		●		
Allegheny Energy - Harrison	Combustion Ash Dispos	●					
Pinnacle Mining - Maitland	Mine Water Control/Trea	●			●		
Hercules - Elrama	Highwall reclamation/wa	●					
Waste Mgt - Greenridge Landfil	Highwall stability/subside	●					●
Lowes - Clarksburg	Mine Spoil Embankmen					●	
PADEP - Washington/Greene C	Subsidence - Remote S	●					
Millcreek PRP Group	Haz. Waste Site remedi	●	●		●		●
Bethlehem - Mine 101	Refuse Disposal Facility	●					
Burgettstown Area School Distr	Mine Grouting					●	●
Empire Coal - No. 6	Mine Spoil/Refuse	●					
Harrison Mining - Hopedale Min	Refuse Disposal Facility	●			●		
MSHA - Pine Ridge Mine	Mine Void Detection Der	●					
Sun Coke - Ebensburg	Subsidence Assessment			●			
Sigmon Enterprises	Abandoned refuse	●					
United Pocahontas	Preparation plant	●					
Capstone Holdings - Lamira Pla	Refuse Reclamation Site	●			●		
Maple Creek Mining, Inc.	Refuse Reclamation Site				●		
Evergreen Mining - Cowen Mine	Refuse Disposal Facility	●			●		
Doverspike Brothers - Weisner	Refuse Disposal Facility	●			●		
Utica Insurance - Dora Mine	Mine Portal Reclamation	●			●		
Stateline - Rosebud Preparation	Refuse Disposal Facility	●					
OSM - Warwood	Abandoned mine					●	
OSM - Ohio Avenue	Spoil landslide					●	
OSM - Helen	Abandoned refuse					●	
OSM - Cawood	Hillside slide					●	
OSM - Minden	Abandoned refuse					●	
OSM - Sarah Ann	Abandoned mine					●	

PROJECT PROFILE

ENVIRONMENTAL ASSESSMENT OF THE BLACKWOOD MINE SITE

The Pennsylvania Department of the Military Affairs (PADMA) was considering acquisition of all or part of a 7,000-acre site in Schuylkill County, Pennsylvania. D'Appolonia was retained to perform an environmental site assessment according to specifications and directions of PADMA, which generally follow the American Society for Testing and Materials (ASTM), Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E 1527-93).

The scope of services provided to PADMA by D'Appolonia encompassed five phases performed sequentially in the following order:

- Records Review,
- Interviews,
- Site Reconnaissance,
- Report Preparation, and
- Phase II Recommendations.

Site reconnaissance activities were conducted both on the ground and from a helicopter because of the size of the site and the difficult access conditions associated with large portions of the site.

A substantial portion of the environmental assessment focused on problems associated with past and current mining activities at the site. The topography

had been significantly altered as a result of site activities, with numerous strip mine highwalls, open and water-filled pits, culm piles, discarded or abandoned equipment and buildings, and deep mine openings.

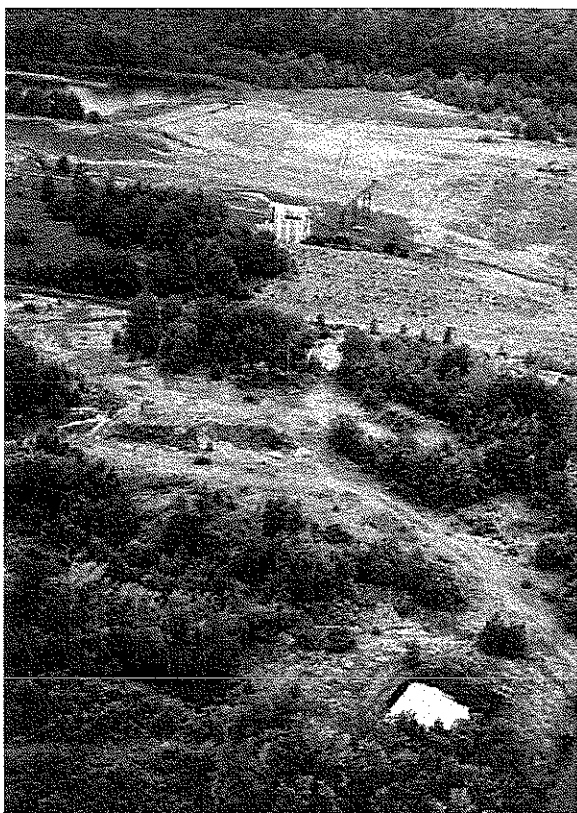
Mine maps associated with permit applications indicated the locations of openings associated with previous mining. Fifteen open shafts were identified on the National Abandoned Lands Inventory System (NALIS) maps, but this list was not believed to be complete.

Acid mine drainage (AMD) was another important environmental issue associated with the Blackwood site. The NALIS database showed 37 AMD locations at the site, but more may have been present. Surface water quality was highly variable.

Although past mining activities were found to be the most significant environmental issue, small areas of soil contaminated with petroleum products

were observed, and other areas were identified for subsequent sampling to evaluate whether there were hazardous substances at the site. Visual evidence of hazardous substance disposal on a scale that would cause this site to be included on the NPL was not observed.

Subsequently, in 2003, D'Appolonia was retained by the Bureau of Abandoned Mine Reclamation (BAMR) of the Pennsylvania Department of Environmental Protection (PADEP) to prepare a reclamation design for the Blackwood property. The scope of work for this project included permanent sealing of the deep ventilation shaft. The reclamation plan has been under regulatory review, and we anticipate that construction work associated with reclamation of the Blackwood property will commence in 2006.



Aerial view of the Blackwood Mine Site at the time of the study. The building is an abandoned coal breaker. The square concrete pad in the foreground covers a deep ventilation shaft to the mine, but the sides of the pad partially collapsed, requiring further remediation.



Organic sludge spilled on the ground surface near the breaker building at the abandoned Blackwood Mine site.

PROJECT PROFILE

RECLAMATION OF COAL REFUSE SITE USING BIO-SOLIDS APPLICATION

After more than 30 years of operation, the Clyde Mine in Greene County in Southwestern Pennsylvania terminated operations and left an estimated 72 acres of unreclaimed waste embankments and ponds in the adjacent Black Dog Hollow. D'Appolonia was retained to prepare a reclamation plan for the site, covering grading, drainage control, top soil restoration, and revegetation. A lack of sufficient soils stockpiled or readily available made traditional reclamation methods impractical without incurring excessive costs and causing substantial disturbance to the previously unaffected valley slopes.



Black Dog Hollow site slope following regrading and removal of erosion features.

Prior to reclamation, the site exhibited ungraded slopes steeper than 2:1 (horizontal to vertical) with heights of up to 20 feet; extensive refuse piles at an approximately 2:1 slope; substantial presence of erosion scars, many exceeding 10 feet in depth; a 17-acre fine coal refuse slurry pond with impounded water; an unpermitted 8-acre pond in excess of 20 feet deep without a functional outlet structure; a small sediment pond with no low-level outlet structure; and numerous piles of domestic trash.

D'Appolonia's reclamation plan incorporated innovative measures utilizing bio-solids applied to regraded coal re-

fuse to achieve revegetation. Overall, the reclamation plan included off-site disposal of trash, regrading of erosion features and steep slopes, installation of drainage control structures at the base of slopes and collection points, converting existing site sediment ponds to permanent ponds, eliminating the existing slurry impoundment, and vegetating the final surfaces.

Most existing slopes at the site were regraded to 3:1 to facilitate bio-solids application and to sustain the growth media and vegetation through seasonal conditions. The unpermitted 8-acre pond was drained to a depth of about 5



Application of biosolids to regraded site.

feet and less than 2 acres in surface area, and the existing culvert was rehabilitated and fitted with an intake riser to provide an outlet structure. The reclaimed pond was incorporated into the reclamation plan to provide sediment control for most of the site. The slurry pond was dewatered and the fine coal refuse was stabilized by sequential covering with embankment materials. Slurry impoundment embankment soils were used for reclamation.

The reclamation plan was successfully implemented within the coverage provided by surety bonds. D'Appolonia received a Diamond Award Certificate for Engineering Excellence from the Consulting Engineers Council of Pennsylvania for its work on the project.



Refuse area and central silt basin following reclamation.

PROJECT PROFILE

ASSESSMENT AND CLOSURE OF UNCONTROLLED DUMP SITE

D'Appolonia provided environmental services for a waste disposal site encompassing about two acres of land in Allegheny County, Pennsylvania. This site had been used for the disposal of a mixture of industrial and municipal solid waste by the owners of a nearby landfill in the 1960s.

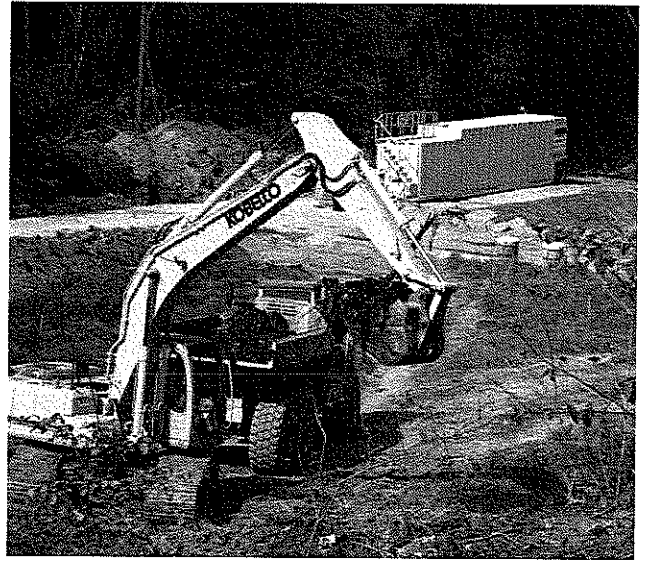


Typical wastes found at the site.

In 1983, the waste disposal site was identified by the USEPA as an abandoned uncontrolled dump containing municipal solid waste and possibly industrial waste. Chemical testing of the

main seep had historically detected the presence of several organic compounds. In 1984, diversion ditches were constructed for the purpose of diverting surface water away from the site and to reduce seepage. At the time the diversion ditches were constructed in 1984, the site area was also graded and vegetated in order to minimize ponding of surface water. In 1996, the Pennsylvania Department of Environmental Protection (PADEP) requested that additional studies for assessing the nature and extent of contamination of the site be performed.

D'Appolonia was retained to conduct these assessment studies consisting of drilling and sampling, geophysical exploration, test pits, and a historical review of past activities. The presence of subsurface contamination in excess of allowable Pennsylvania standards was confirmed by this study.

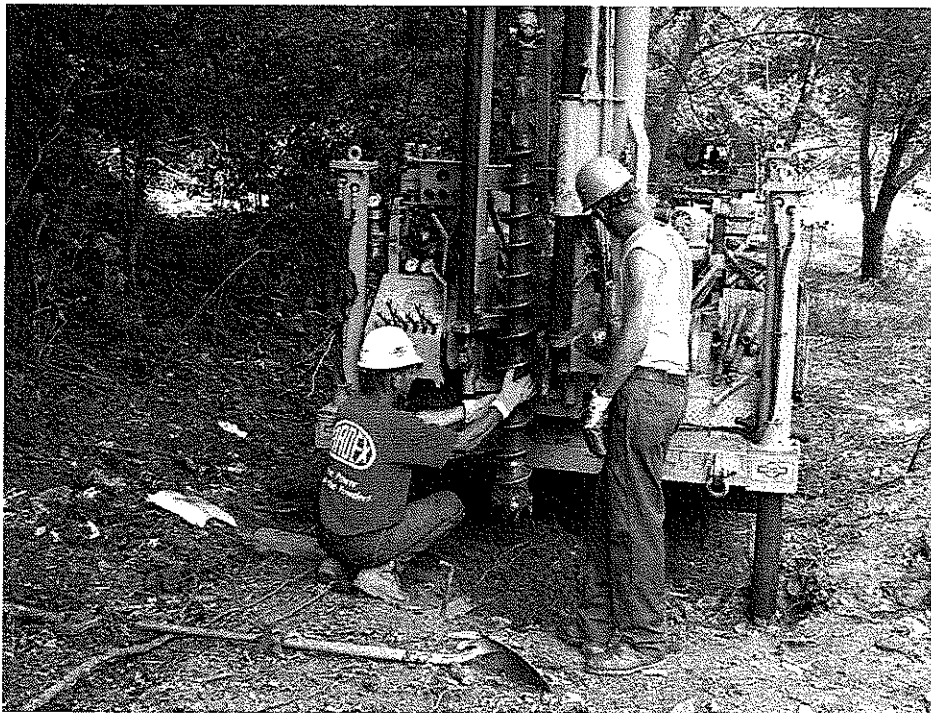


Removal of site waste for disposal at a nearby landfill.

The extent and nature of the subsurface contamination was further evaluated in 1999 with a drilling and sampling program. As a result of these studies, it was determined that the waste and contaminated soils at the site were not hazardous and were suitable for disposal as residual waste. The total volume of waste and contaminated soil was estimated to be approximately 13,000 cubic yards.

After PADEP approval of a Sampling and Analysis Plan, D'Appolonia conducted a comprehensive program of 18 borings with associated chemical sampling and analyses. This effort provided additional validation of the 1999 results and effectively confirmed the suitability of a remedial solution involving the disposal of the contaminated soil and waste as residual waste at a nearby landfill.

D'Appolonia designed the removal operations, managed the bidding process, and monitored the removal of the waste to a nearby landfill under PADEP Act 2 protocols and managed subsequent land reinstatement activities in 2005. A total of 10,800 cubic yards of residual waste (municipal/industrial waste and contaminated soil and mine spoil) were disposed of at the landfill.



Drilling and sampling performed as part of the D'Appolonia field exploration program.

D'APPOLONIA

PROJECT PROFILE

MINE WATER CONTROL, CONVEYANCE AND TREATMENT

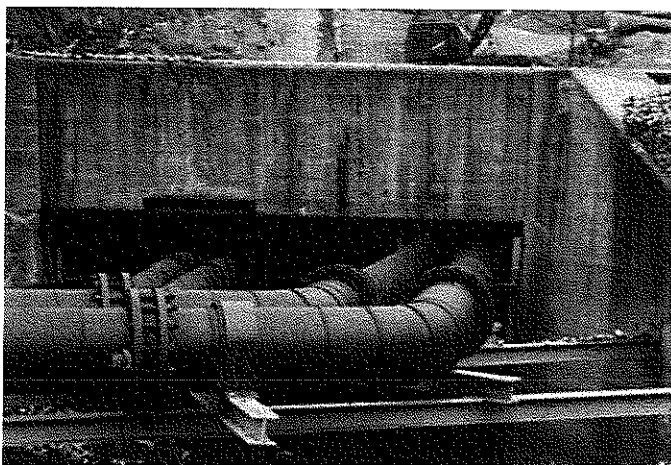
Six separately owned coal mines operating in the same seam were abandoned within a one-year period. The seam dipped uniformly in one direction, and due to hydrologic connections between mines, mine water drainage accumulated in down-dip workings. After the last mine was abandoned and dewatering operations ceased, water began to flow from the mine shaft lowest in elevation in the whole mine complex. The high water level in this shaft caused outflow into the surrounding area, resulting in more than 40 seepage points observed in a six-acre area. The large number of seeps present over a wide area made collection very difficult.

A difference of only 23 feet in elevation between the top of the discharging shaft and a river 250 feet away presented a serious design constraint. The area between the shaft and the river was occupied by several railroad tracks, further constraining the area available for construction of drainage collection, conveyance and treatment facilities. Because of these constraints, other parties had developed designs for remediation using permanent mine water pumps and sophisticated water treatment facilities

that would have cost over \$3 million to build and \$400,000 per year to operate.

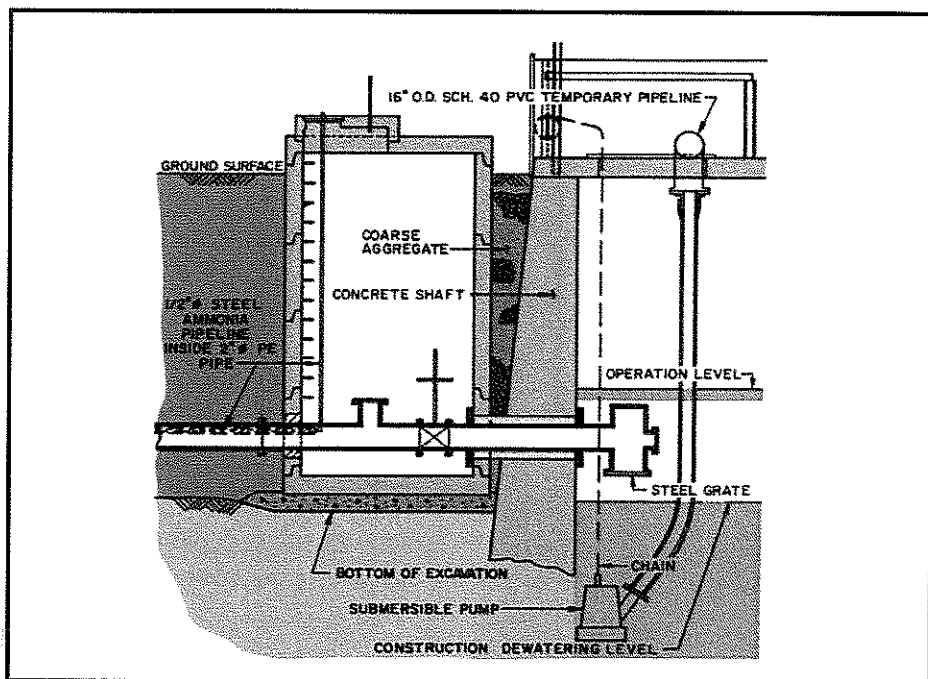
D'Appolonia conducted studies to determine the total drainage flow volume from the shaft area and developed several design concepts. The owner and D'Appolonia jointly evaluated the potential impacts of these various concepts on operations and a concept was then selected for implementation.

D'Appolonia developed a final detailed design for a recommended scheme that eliminated the need for a pumping system and new treatment facility. The design incorporated gravity flow pipes installed 16 feet below the ground surface and extending through the side of the mine shaft that was responsible for the seepage. The gravity flow pipes were designed to convey the mine shaft outflow to the existing treatment ponds.

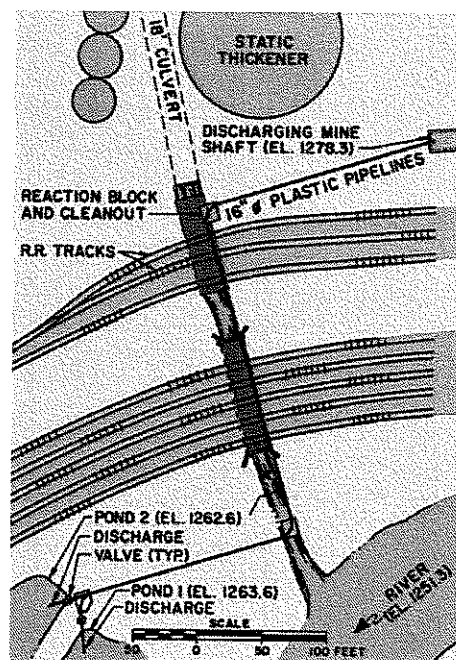


16-inch-diameter drainage pipes designed to convey water from mine shaft to existing treatment ponds.

The D'Appolonia design was implemented, and upon activation of the system, the water level dropped by 12 feet, causing the observed ground seepage to cease entirely and allowing treatment to be conducted at a single location in the nearby treatment ponds. Resulting treatment pond sludges were pumped to a permitted deep well injection facility that was also designed by D'Appolonia. Construction costs of \$2.4 million and more than \$200,000 in annual operating costs were saved through implementation of the D'Appolonia design.



Schematic cross section showing details of valve access and 16-inch-diameter pipe penetrating the mine shaft.



Plan of mine water conveyance system.

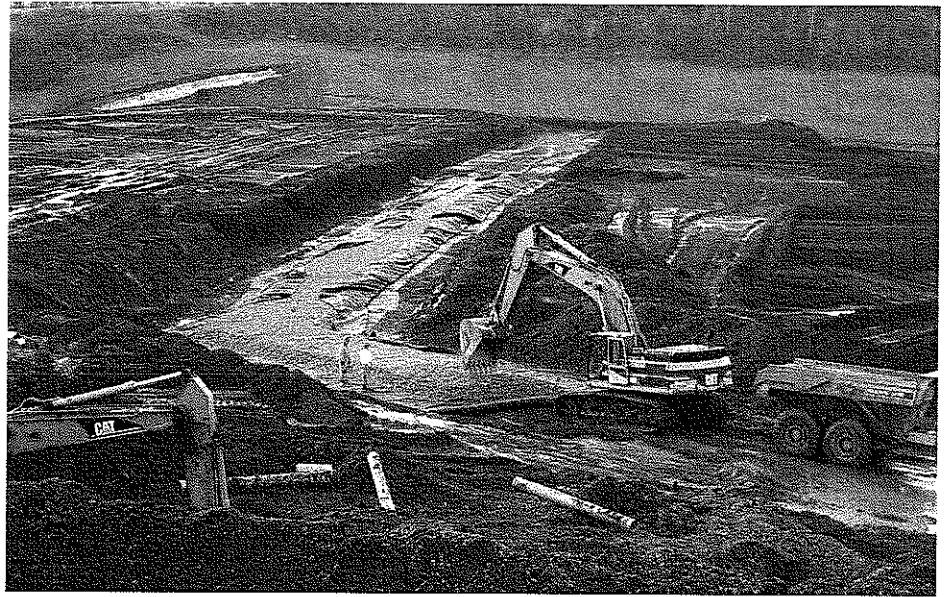
D'APPOLONIA

PROJECT PROFILE

UPSTREAM EXPANSION OF COAL REFUSE DISPOSAL FACILITY

D'Appolonia provided engineering and permitting services for the upstream expansion of the slurry impounding coal refuse disposal facility at Emerald Mine No. 1 in Greene County, PA. The scope of work included field exploration and in situ testing (SPT, SCPT, FVS, borehole permeability), laboratory testing (including conventional and cyclic shear strength testing), engineering analyses, facility design, preparation of plans and specifications, state and federal permitting, preparation of construction cost estimates and reports, and regulatory liaison. The final disposal facility configuration included two dams totaling more than 2000 feet in length, with the main dam exceeding 370 feet in height. Some of the important aspects of this project included seepage control, assessments of seismic hazard and tailings liquefaction susceptibility, seismic slope stability and deformation analyses, evaluations of time-dependent settlement effects on internal drains, potential mine subsidence impacts, and stability analyses for deeply buried HDPE decant piping.

Initially, an evaluation of existing seepage conditions was performed in order to determine a representative range of hydraulic conductivities (both horizontal and vertical) for the refuse, soil, and rock materials and to calibrate the seepage model to existing conditions, as



Construction of internal drain in upstream embankment at Emerald Mine.

determined from known piezometric levels, existing internal drain flows, borehole moisture profiles, and other available data.

Additional seepage analyses were conducted for the final facility configuration in order to obtain data for the design of additional internal drains and for static and seismic slope stability analyses. The hydraulic conductivity anisotropy ratio was a significant factor because of interlayering of sandy and clayey fine coal refuse, and the effects of equipment traffic and weathering on the embankment materials. Seepage

simulations were performed using the finite element software SEEP/W. Various combinations of horizontal conductivity and anisotropy ratio were assumed for the embankment materials, and a steady-state phreatic surface was computed. Each computed phreatic surface

was rated based on a comparison to observed conditions. Then the representative ranges in hydraulic conductivity and anisotropy ratio determined from the calibration analyses were applied to modeling of alternative internal drainage systems. Based upon all of these analyses, an integrated internal drainage system, consisting of a horizontal drain and intermittent sand column drains drilled into the horizontal drain, was designed and implemented.

Both probabilistic and deterministic seismic analyses were performed in order to select the Maximum Credible Earthquake (MCE) and Operating Basis Earthquake (OBE) horizontal accelerations for seismic stability and embankment deformation analyses. A horizontal ground acceleration of 0.10g was selected for use in the seismic slope stability analyses. The effect of amplification of the horizontal ground acceleration through the foundation and dam embankments was incorporated into the stability analyses. Slope stability factors of safety for the OBE were within acceptable limits. For the MCE, deformation analyses were performed. These analyses indicated that cumulative seismic deformations associated with the MCE would be tolerable.



Grading and geotextile placement for internal drain construction.

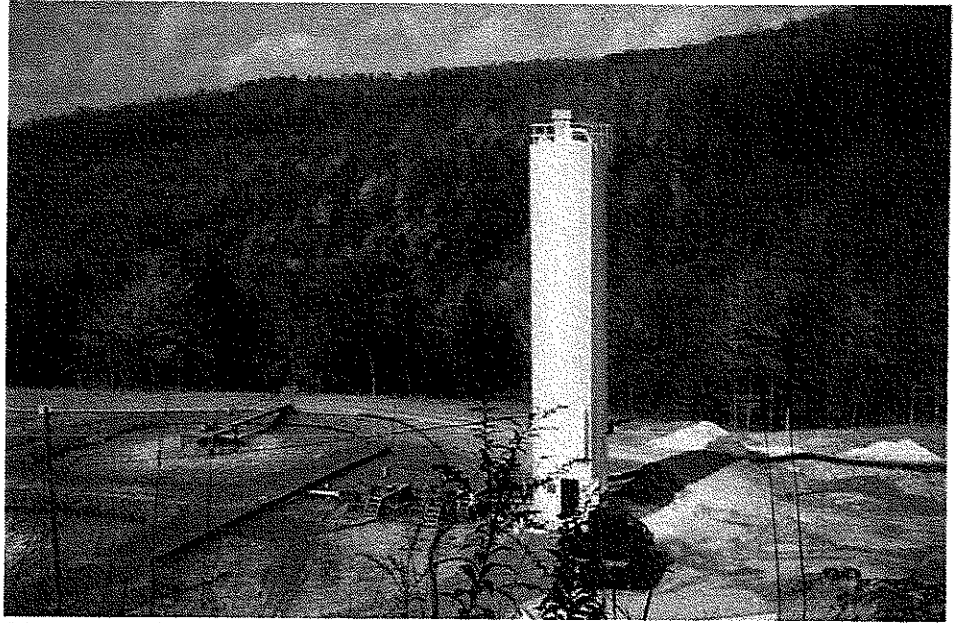
PROJECT PROFILE

ACID MINE DRAINAGE TREATMENT

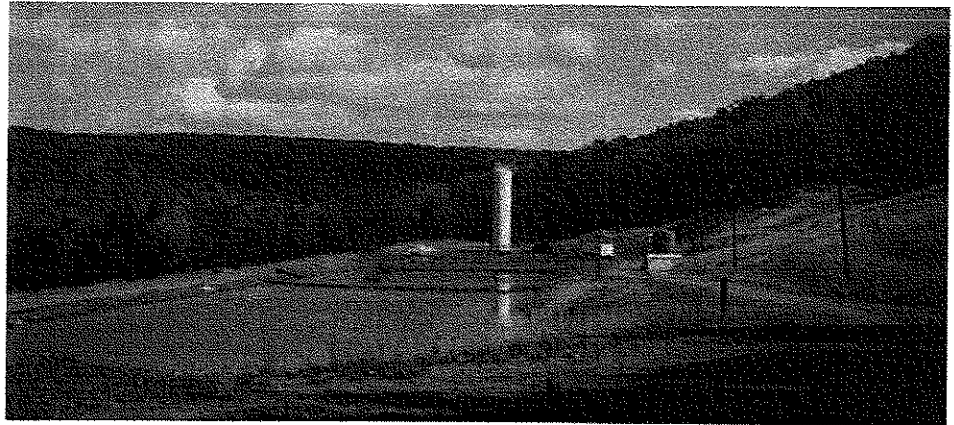
D'Appolonia designed a 4-million-gallon per day (MGD) treatment facility consisting of lime neutralization, aeration and sludge settling systems for acid mine drainage (AMD) from an underground mine and coal refuse disposal site in northern West Virginia. Prior to the time D'Appolonia was retained to design a treatment facility, the owners treated water at isolated discharge locations resulting in extremely high costs for chemicals and operations personnel. Implementation of D'Appolonia's design, which includes mine water collection and conveyance systems (see schematic diagram of plant below), reduced chemical costs by 90 percent.

D'Appolonia was subsequently retained to evaluate current and future AMD generation sources and prepare recommendations for increasing the plant capacity to 6 MGD as part of a mine expansion plan. Based on a comprehensive water quality and flow monitoring program and water budget analysis, design flows from the proposed longwall mine developments were established. Design modifications were prepared for the lime storage, slaker and mix systems and to increase the capacity of the discharge channels. An additional settling pond was included in the modification to improve clarification.

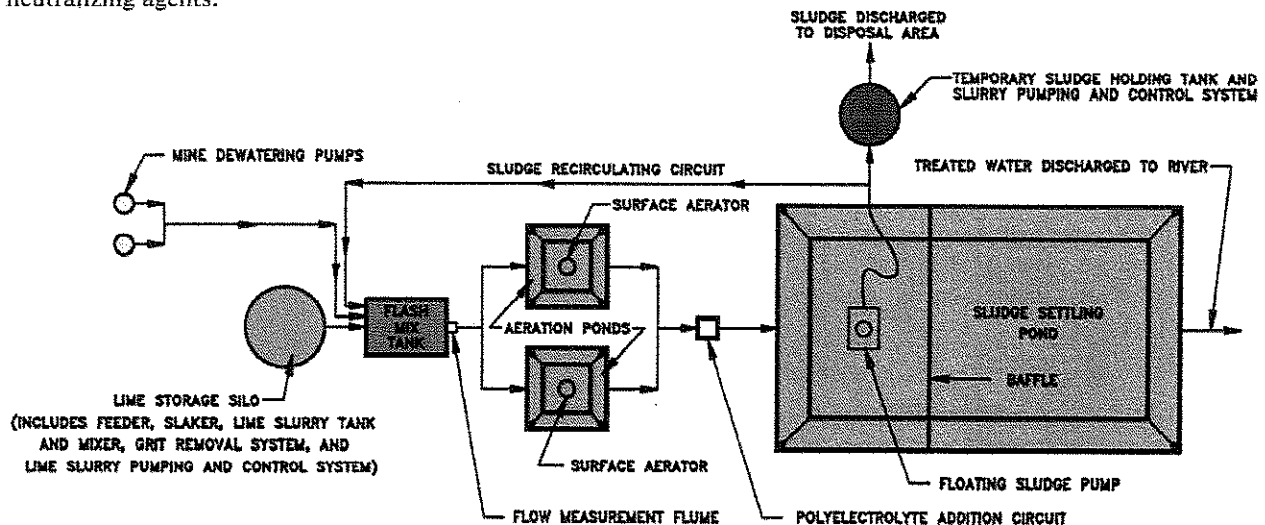
In addition to mine water treatment, D'Appolonia has performed studies in the Appalachian Region and other coal fields to control AMD generation and flow from mines and waste disposal sites using concepts involving isolation, sealing and neutralizing agents.



Lime storage bin, lime slaker and control unit, flash mix tank, and aeration system for treatment of AMD.



AMD Treatment facility: Settling pond with floating baffle and capstan mounted sludge removal system in foreground and lime storage silo in background.



Schematic diagram of the 4-million-gallon per day acid mine drainage plant.

PROJECT PROFILE

COAL REFUSE IMPOUNDMENT DESIGN AND EXPANSION

The project initiated with planning studies for a coal refuse disposal facility and immediately followed on with design and permitting services for a 160-acre coal refuse impoundment. Approximately 30 borings and 10 test pits were initially completed by D'Appolonia to complement available geotechnical data for evaluation of aeolian and till deposits to depths in excess of 100 feet. The design consisted of a 60-foot-high diked impoundment using coarse coal refuse for disposal of fine coal refuse slurry. The embankment dikes included a partial clay liner during the initial stages, internal drains, a decant system to control the impoundment level and return clarified water to the processing plant, and surface drainage structures.

With increases in coal production and to accommodate co-disposal of refuse with combustion ash, the coal refuse disposal facility was expanded to a design height of 100 feet using upstream construction over areas of slurry deposition. As part of the expansion, approximately 20 geotechnical borings were drilled for performing field vane shear testing on foundation soils and the settled fine coal refuse and for obtaining relatively undisturbed samples. Additionally, eight seismic piezocone soundings were performed to determine the strength, compressibility and shear wave characteristics of these deposits. A laboratory testing program was performed on samples from the exploratory borings and test pits to determine



Finger drains under construction at coal refuse disposal facility in Illinois.

index, consolidation, static and dynamic strength parameters (cyclic triaxial testing). Engineering analyses included seismic hazard assessment, evaluation of liquefaction potential, finite element dynamic response and seepage modeling, and limit-equilibrium stability analyses in support of the design.

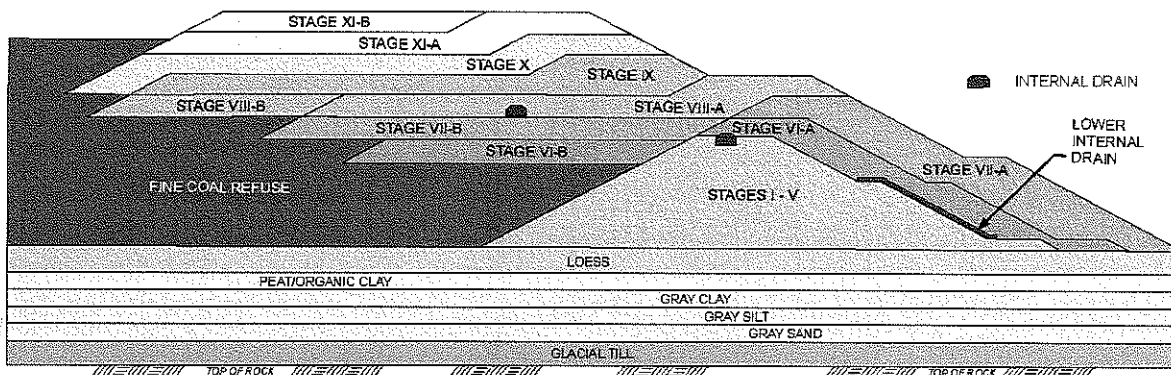
An extensive instrumentation program comprising more than 50 piezometers (standpipe, pneumatic and vibrating wire) was implemented along 14,000 feet of impoundment dike for monitoring piezometric levels. Most recently, survey monuments and four inclinometers were installed for detecting the em-

bankment response to continued construction and operation.

Finite element modeling using PLAXIS was also performed to evaluate potential deformations with expansion of upstream construction to the ultimate embankment height.

D'Appolonia's responsibilities at the site have also included providing support in obtaining federal and state permits. Based on Potential Failure Mode Analysis (PFMA), impoundment breach analyses were performed to identify potential downstream impacts, prepare inundation maps, and create an Emergency Action Plan (EAP). Various

scenarios relative to the size of the breach and the quantity of tailings released were evaluated. D'Appolonia is also providing periodic review of construction and refuse material parameters at the facility.



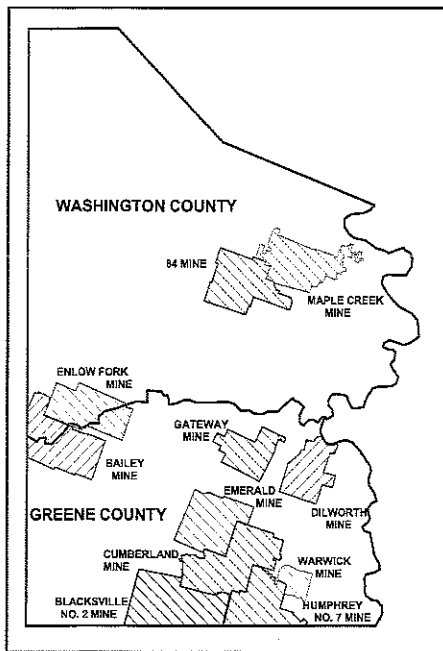
Profile of coal refuse embankment and subsurface layers.

PROJECT PROFILE

REMOTE SENSING OF FORESTLAND ABOVE LONGWALL MINING AREAS

D'Appolonia was engaged by the Pennsylvania DEP Bureau of Mines and Reclamation to conduct remote sensing of forestland above longwall mining areas in Washington and Greene Counties, Pennsylvania. The work included the following tasks:

- Sites Selection
- Subsidence Analysis
- Remote Sensing
- Imaging Analysis
- Ground Truthing



Location of longwall mines in study.

Airborne multispectral scanning data obtained for the study sites included natural color, color infrared, normalized difference vegetation index (NDVI), and day and night thermal imagery. The image data were collected for 9 study sites (3 at each of 3 mines). Additional data were obtained in the form of satellite color infrared imagery (KONOS I) and digitized aerial color photography.

Remote sensing images were analyzed using the IMAGINE software developed by ERDAS. Multiple images from the multispectral scanning were enlarged and systematically examined using the software. Areas of potentially stressed tree canopy were identified by

changes in color on the images. For the 9 study sites, 48 anomalous areas were identified from the imagery.

For the undermined study sites at the three mines selected for study, subsidence analyses were performed using the SDPS software developed at Virginia Tech. The results

facilitated the location of high tensile strain areas associated with longwall panels and the ground truthing effort and remote sensing analysis.

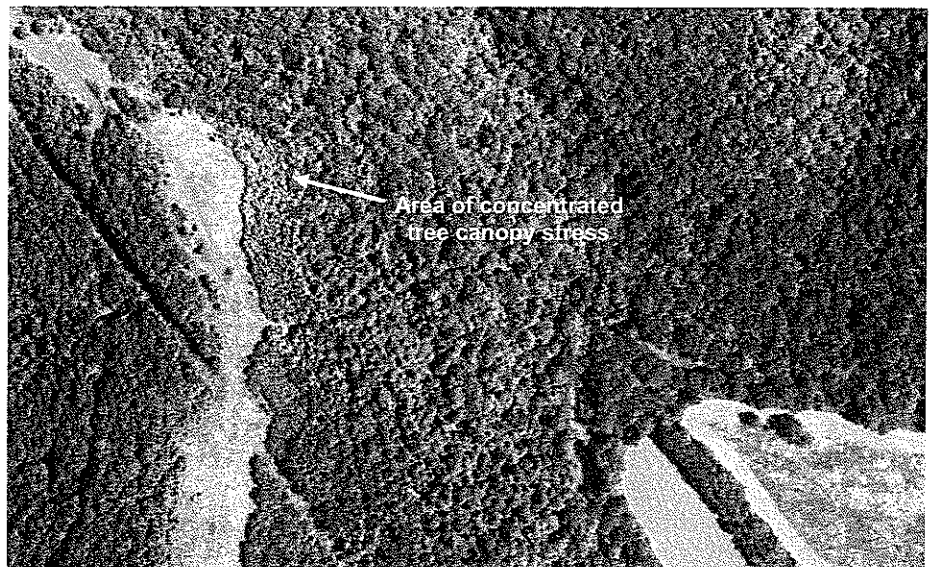
Areas of potentially stressed tree canopy identified from the imaging analysis were targeted for ground truthing to verify that they were actually stressed and to determine the cause of the stress. Additional areas associated with subsidence pools along a stream and longwall panel boundaries where high tensile strains were predicted were also surveyed.

Scarps, slides and trees with moderate to severe root damage were observed at several locations along longwall



Pool created by mine subsidence where field survey was conducted.

mine panel boundaries. Although some subsidence effects were identified, the tree canopies were found to be generally healthy. No linear zones of stressed tree canopy were identified that could be correlated with mine panel boundaries. Areas of stressed tree canopy were found in all types of predicted strain zones. The primary cause of the stressed canopy at field sites was determined to be insect infestation with the black locusts (locust leaf miner) and elms (elm leaf beetle) exhibiting the most severe damage. It was concluded that remote sensing imagery was effective for identification of tree crown stress, but that the effect of subsidence on tree crowns was generally minor.



Color infrared image of a study site showing areas of stressed tree canopy.

PROJECT PROFILE

MILLCREEK SUPERFUND SITE RESTORATION AND REDEVELOPMENT

The Millcreek Superfund Site was once a 75-acre, poorly drained, low-lying area. Beginning about 40 years ago,



Typical view of site prior to redevelopment. Note the barrels of waste materials littering the landscape.

nearly 70 acres were backfilled with foundry sand and industrial wastes. Numerous drums containing slag material, waste oils, and solvents were also disposed at the site.

A remedial design for the site was prepared by a USEPA contractor. The proposed remedial design included:

- Removal of the liquid-filled drums
- Site grading, construction of a soil cap over remaining waste materials, and grass revegetation
- Design and construction of surface water management structures (i.e., stream channel modifications, a flood control structure, and a flood retention basin).

Prior to remedial construction, the "potentially responsible parties" for the site (PRP Group) obtained the lead for the project from the USEPA. D'Appolonia served as technical consultant to the PRP Group. A technical review, focused on the design scope, constructability, and construction costs of the government-prepared remedial design documents, was performed. Review of the drawings and specifications identified inconsistencies and non project-

specific details, subjective design criteria, and incomplete details for construction, especially for items pertaining to surface water management issues.

Most noteworthy, the government's design, if constructed, would have increased the potential for downstream flooding and would have required significant off-site property easements. In addition, the proposed grading plan would not have permitted redevelopment.

After review of the proposed remedial design, D'Appolonia developed a revised remedial design and construction bid package. Services performed by D'Appolonia included:

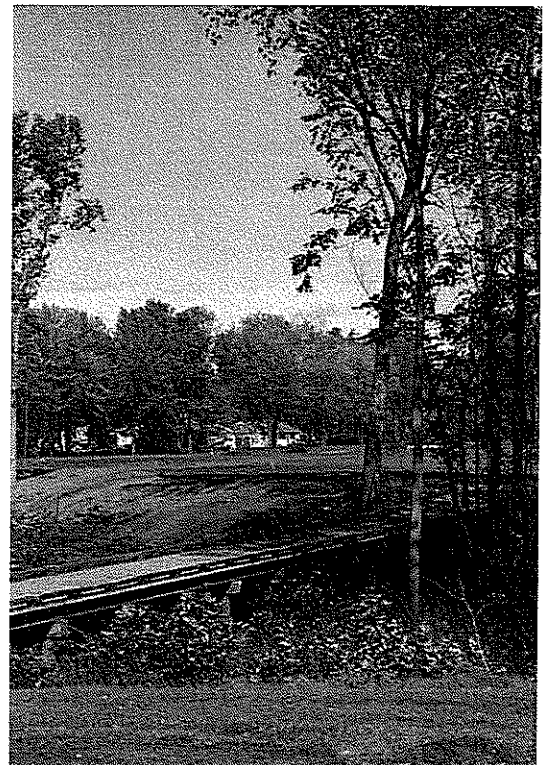
- Detailed hydrological and hydraulic analyses to support recommended design modifications for surface water structures and channel improvements.
- Detailed hydrological and hydraulic analyses to support recommended design criteria alternatives and design modifications for items pertaining to the surface water management issues.
- Development of conceptual adaptive reuse options for the site including nature trails, baseball and soccer fields, nine-hole golf and pitch and putt courses and a golf driving range.

Based on hydrologic/hydraulic analyses, design modifications for the surface water management issues were recommended and approved, representing an

estimated construction cost savings of \$1.3 million, providing a significant reduction in off-site property easements and a reduction in the potential for downstream flooding.

The nine-hole golf course (for which D'Appolonia prepared a detailed conceptual design) was the selected site reuse option and was approved by the local township and the USEPA. The construction of this remedial solution has resulted in an estimated savings of more than \$2 million over the government's proposed remedial design and will eliminate long-term maintenance costs for the PRP Group. The selected reuse option also provides a recreational benefit to the local community without altering the performance of the capping remedy. D'Appolonia was responsible for monitoring of construction activities associated with the golf course construction.

The golf course was opened to the public in May 2002. D'Appolonia continues to provide monitoring services at the site.



View of Millcreek Golf Course following site remediation and redevelopment.

PROJECT PROFILE

FOUNDATION STUDY FOR SCHOOL LOCATED OVER ABANDONED COAL MINE

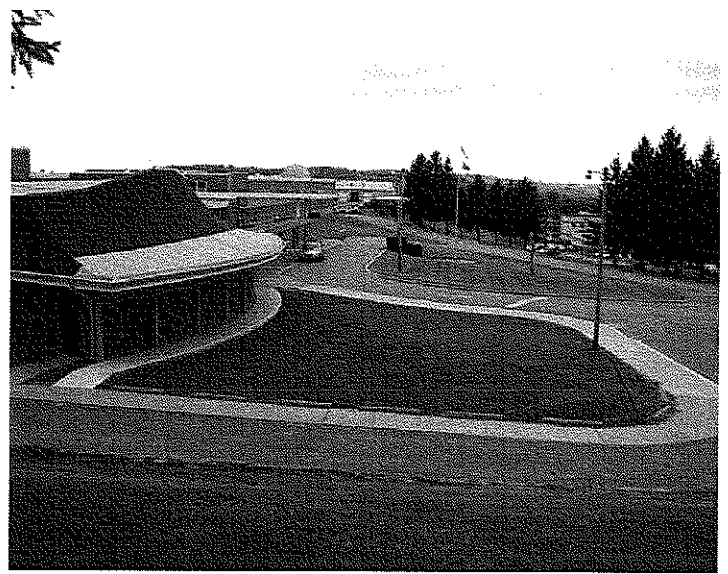
D'Appolonia was retained by the Burgettstown Area School District to perform a geotechnical exploration for the design and construction of a major addition to the Burgettstown Middle School/High School building. Our exploration program and preliminary evaluations included review of documents related to previous backfilling of abandoned coal mine workings located 60 to 70 feet below the site; review of construction plans for the existing building; surficial reconnaissance of the site; exploratory drilling and laboratory testing of soil, rock and ground water samples collected; and analysis/evaluation of the collected records and data. The location of the mine workings relative to the existing and planned new building construction are shown below.

Although available records suggested that the mine workings beneath the site were completely backfilled in the mid-1980s, D'Appolonia's test borings indi-

cated that mine workings were only partially filled and that the material used for backfilling provided little or no support to the mine roof.

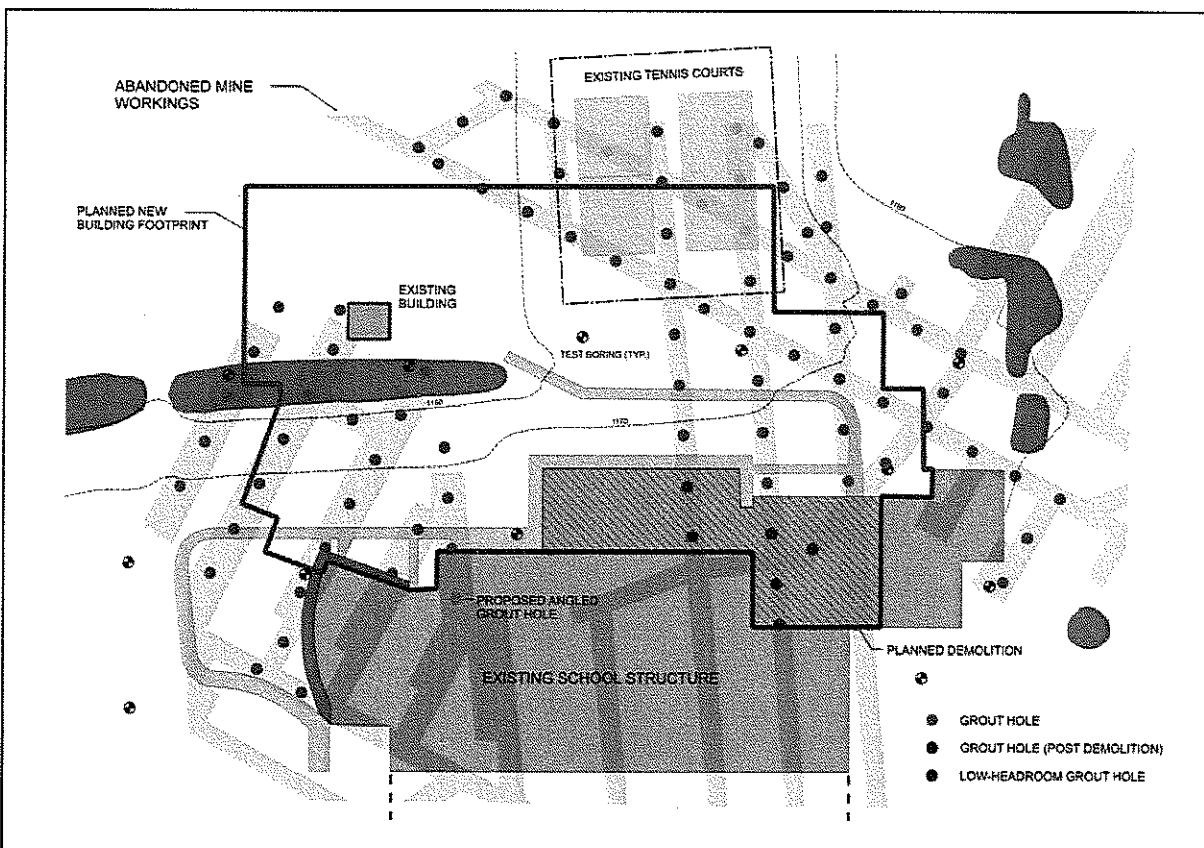
Options considered included: (1) mine void grouting to improve support of the mine roof and (2) deep foundations extended through the mine workings to isolate the structure from subsidence-related rock movements.

Construction of deep foundations at the site would have entailed support of the new structure on grade beams and extensive use of structural floor slabs,



Burgettstown Middle/High School prior to new construction.

which would have resulted in a substantial increase in construction cost over grouting of the mine voids and construction on shallow foundations. For this reason, grouting of the mine workings in the area of planned construction was recommended.



Plan view of school site showing location of mine shafts with respect to planned addition.

D'Appolonia subsequently prepared plans and specifications for construction of low-mobility grout columns in the mine (as shown) to permit building construction on shallow foundations. We also provided construction monitoring and management services during implementation of the grouting program, as well as during site grading and foundation construction.

PROJECT PROFILE

DESIGN OF 75-ACRE COAL REFUSE SLURRY IMPOUNDMENT

D'Appolonia prepared the design and permitting submittals for the construction and operation of a 75-acre coal refuse slurry impoundment for a two-million-ton-per-year coal preparation plant in Southeastern Ohio. We subsequently prepared reclamation plans for dewatering, regrading, capping and covering the disposal facility after mining operations ceased.

D'Appolonia's scope of work included exploration, testing, and analysis of site soils and mine spoil that would be used for construction of the dikes, as well as fine sediments that would constitute the coal refuse slurry. The coal refuse slurry impoundment comprised more than 4,000 feet of earthen dikes with an approximate height of 25 feet. The design included clay diaphragms for seep-

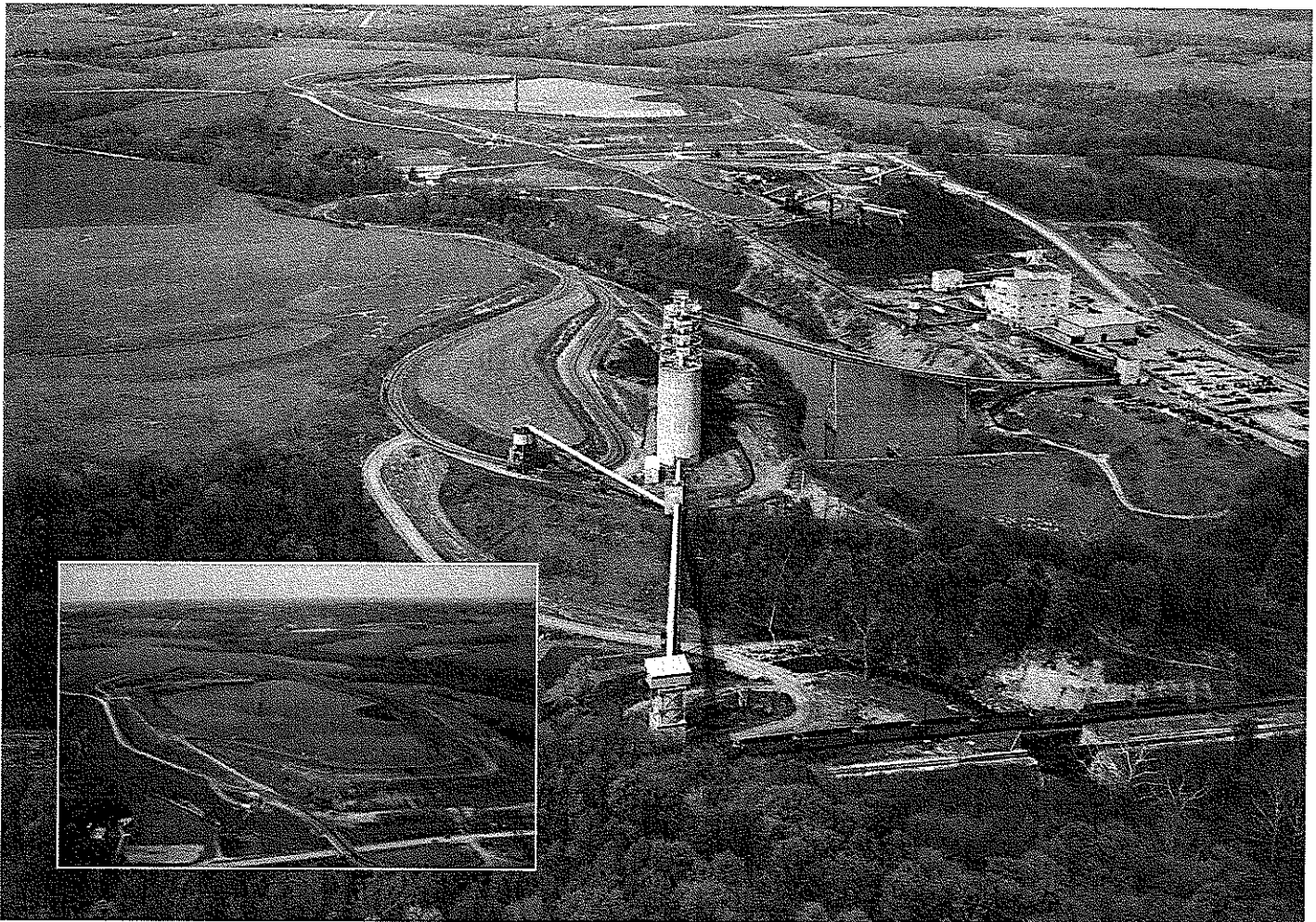
age control that provided a series of cells for settling of the slurry.

A decant system consisting of a graded filter aggregate drain and a separate multilevel decant tower and discharge pipe provided for recovery of process water. The slurry discharge piping allowed multiple deltas to be developed, approximately every 400 feet along the perimeter dikes, thus distributing the fine refuse throughout the impoundment. Expansion of the initial dikes was achieved by upstream construction to increase the facility height and capacity with operation of the coal processing plant.

D'Appolonia also prepared a reclamation plan for implementation upon termination of plant operations. The rec-

lamation plan was designed to accommodate the placement of construction demolition debris, and involved regrading the crest of the perimeter dikes to cover the settled fines, after dewatering of the impoundment. Coal combustion waste would also be used to stabilize the sediments and achieve grades for drainage.

An alternative cap and cover configuration was designed and permitted through the Ohio Environmental Protection Agency, using on-site soils and mine spoil to promote runoff, limit infiltration, and control percolation to minimal levels. Vegetative grass species that had the capacity to resist erosion and to minimize root penetration into the cap materials were specified for use as cover.



Two million ton-per-year coal processing facility located in southeastern Ohio. The 75-acre coal refuse slurry impoundment designed by D'Appolonia is shown at the rear of the main photograph and in the inset.

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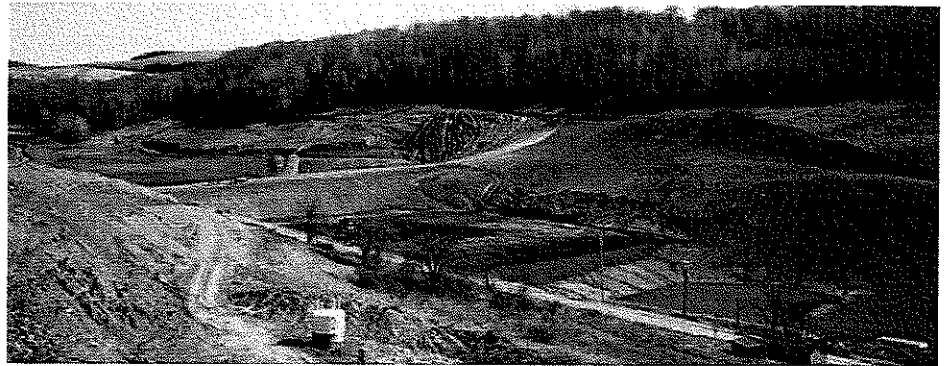
PROJECT PROFILE

DESIGN/CONSTRUCTION MONITORING OF COAL REFUSE DISPOSAL FACILITY

D'Appolonia provided engineering and construction monitoring for development of a slurry impounding coal refuse disposal facility, including:

- Geotechnical and environmental exploration and associated field and laboratory testing,
- Preparation of designs for erosion and sediment control, starter dam and disposal construction staging, appurtenant drainage and haul roads,
- Permit preparation and technical liaison with regulatory agencies, and
- Construction monitoring and documentation during site preparation and initial construction.

The coal refuse disposal facility was designed for 15.9 million tons of disposal capacity and a 19-year service life. Upstream construction was employed for the staged raising of the impounding embankment. The coarse coal refuse embankment stages were designed with internal drains for seepage control and sized for projected refuse generation rates. The facility was designed to accommodate storage of watershed runoff from the Probable Maximum Precipitation (PMP) storm event.



Soil starter dam and initial construction of downstream coarse coal refuse embankment.

D'Appolonia designed an impoundment drain to hasten consolidation of impounded fine coal refuse and to address concerns relative to potential liquefaction prompted by the substantial size of the upstream stages incorporated in the design. The impoundment drain was an innovation to coal refuse disposal practices and has performed effectively, resulting in noticeable improvements in foundation conditions for upstream embankment stages.

Construction activities monitored by D'Appolonia included development of a sediment pond and outlet works, the impoundment drain, the starter dam and dam foundation, cutoff and internal drains, the impoundment decant system and lining of drainage ditches.

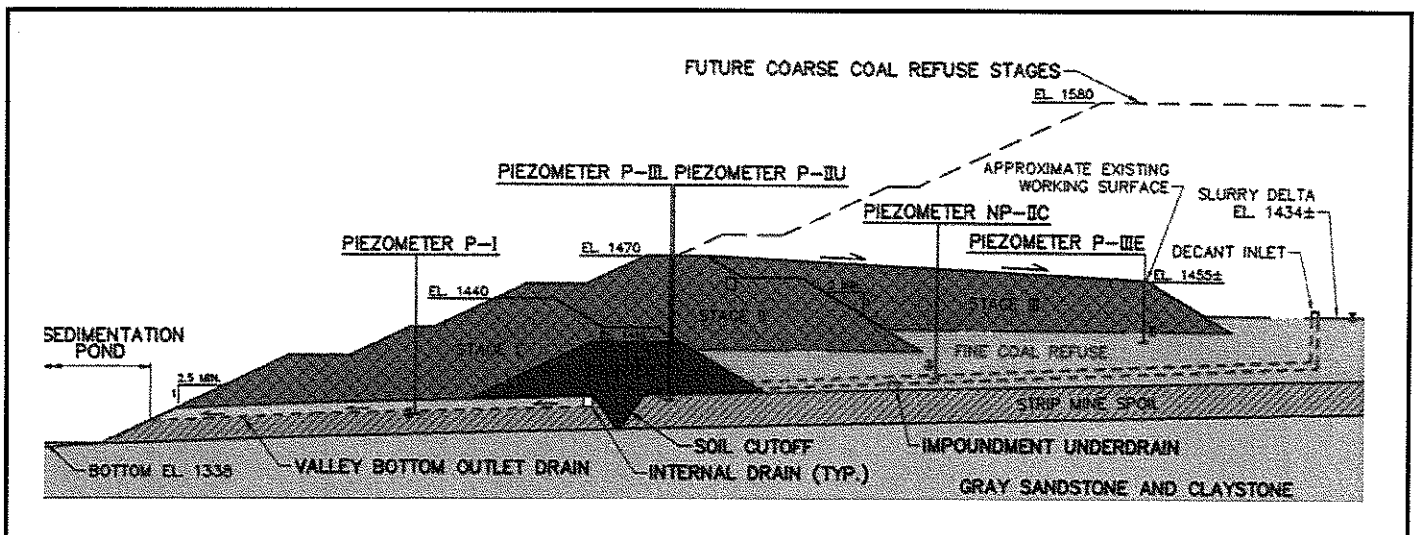
A "vuggie" (extensively solutioned) water-bearing limestone and permeable

shale strata were encountered within the dam abutments, requiring extension of the dam foundation cutoff drain up the valley slopes and construction of spring



Sediment pond and lined emergency spillway channel and decant tower.

collectors in active seepage zones. During site preparation, D'Appolonia was responsible for reviewing construction progress with regulatory agencies.



Slurry impounding coal refuse disposal facility showing embankment construction staging.