

**Response to
Expression of Interest
for Professional Mapping
and Design Services at the
Bond Forfeited Permits of
Masteller Coal Company
S-125-82 and S-10-85
in Mineral County, West Virginia**

DEP16555

July 2014

Prepared for:

West Virginia Department of Environmental
Protection
Office of Special Reclamation
601 57TH Street SE
Charleston, WV 25304

Prepared by:

Cardno MM&A
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July 18, 2014

Mr. Frank Whittaker
West Virginia Department of Environmental Protection
Office of Special Reclamation
601 57TH Street SE
Charleston, WV 25304

Cardno MM&A

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Subject: Professional Mapping and Design Services at the Bond Forfeited Permits of Masteller Coal Company (S-125-82 and S-10-85) in Mineral County, West Virginia

Dear Mr. Whittaker:

Cardno MM&A is pleased to provide this Expression of Interest to provide engineering and remedial design services for reclamation and remediation of bond forfeiture sites. Cardno MM&A is an engineering, hydrogeological, and geological consulting firm that has specialized in coal mining and related professional services for over 35 years. As Marshall Miller & Associates (prior to our recent merger with Cardno), our professional staff of mining and civil engineers, geologist, hydrogeologists, chemists, biologists, and environmental scientists has provided assistance and support to the mining industry, regulatory agencies, and related concerns throughout the Appalachian area and beyond. We offer specialized expertise and experience in mine drainage treatment, hydrogeology, and engineering design that is well-suited to the needs of the special reclamation program. We also have construction oversight capabilities, and offer that service as needed. With our merger with Cardno in 2012, we now have expanded capabilities in a very wide array of environmental and engineering applications. We believe that we can provide to you a comprehensive range of specialized services appropriate to your project needs.

Enclosed are materials expressing our qualifications, a discussion and an organizational discussion as to how we plan to structure the work, resumes of selected personnel who may be involved in the work, and supportive completed forms.

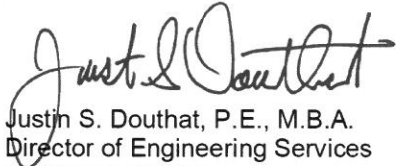
Sincerely,



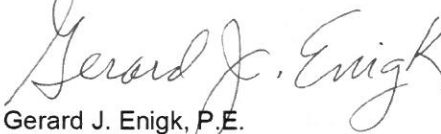
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Enclosures

File: WVDEP-DEP16555 Masteller Coal Company 07 14 14.docx

Table of Contents

1	Company Overview	1
2	Contract Scope of Services	1
3	Qualifications and Experience	2
4	Use of Subcontractors	2

Appendix

Attachment B

Cardno MM&A OSR Consultant Qualification Questionnaire
Subcontractors OSR Consultant Qualification Questionnaire

Attachment C

OSR and Related Project Experience Matrix

Signed State Forms

Proposed Staffing and Statement of Experience

Additional Company Information

1 Company Overview

Cardno MM&A (formerly Marshall Miller & Associates) was founded in Bluefield, Virginia, in 1975 as a geology and geophysics consulting firm. Our growth and diversification into engineering and other earth science-related fields led to the creation of several branch offices located throughout the east and Midwest regions of the country, and these satellite offices afford Cardno MM&A the opportunity to better serve our clients throughout these regions. Our parent company, Cardno Limited, has about 8,200 staff working in 300 worldwide office locations, with ongoing project work across more than 85 countries.

Today, Cardno MM&A is an approximately 160-personnel consulting firm providing full services in geology and hydrogeology, and in civil, environmental, geotechnical, and mining engineering. These professional services are strongly supported by in-house capabilities in: surveying and mapping; remedial construction including contaminated media remediation, stabilization, and disposal; underground storage tank removals; Geoprobe® direct push services; downhole geophysical, video, and acoustic televiewer logging; construction inspection; and computer-aided design (CAD) and geographical information science (GIS) systems.

Our professional staff is comprised of hydrogeologists, geologists, civil and environmental engineers, mining engineers, hydrologists, environmental scientists (biologist, chemists, etc.) and risk assessors. Certifications of staff members include Professional Engineers, Certified Professional Geologists, a Certified Groundwater Professional, Licensed Remediation Specialists, Certified Class B UST Closure/Removal specialist, OSHA and OSHA Supervisors, Certified Lead and Asbestos Inspectors, Certified Reclamation Specialists, and many other licenses and certifications. The company's diversity and depth of experience in geology, hydrogeology, engineering, geotechnical issues, and construction oversight provides clients with an interdisciplinary team that is well equipped to contend with the complex issues so often involved with sites that are overseen by the West Virginia Department of Environmental Protection, Office of Special Reclamation (WVDEP-OSR).

Cardno MM&A is well-known by our clients and various regulatory agencies for our strength in hydrogeological, civil, and geotechnical investigations. Our client base includes state and county governments, diverse industries, mining companies, and water supply providers. We are involved in hydrogeological investigations and remediation on a daily basis, and have evaluated surface and groundwater impacts for a wide variety of contaminants, including numerous acid mine drainage investigations in diverse hydrogeologic settings and involving diverse industries. Cardno MM&A has a long-standing working relationship with the WVDEP, having worked on numerous projects included in various WVDEP-administered programs. Those include, but may not be limited to: the Voluntary Remediation Program (VRP), the Landfill Closure-Assistance Program (LCAP), the Leaky Underground Storage Tank Program (LUST), the Small Operator's Assistance Program (SOAP), and work under the Uniform Environmental Covenants Act (UECA). We have also worked for regulatory agencies in other states on projects with similar goals and objectives.

2 Contract Scope of Services

The WVDEP-OSR requests qualification statements for the purposes of entering into a contract for a "full service" Architectural/Engineering (A/E) design for the following bond forfeited permit sites: Masteller Coal Company (S-125-82 and S-10-85). The sites are listed in the Expression of Interest (EOI) under WVDEP Number 16557.

As outlined in the EOI, a myriad of project goals and objectives are listed relating to the mapping of mine permit areas, property owner boundaries, and engineering design to assist the WVDEP-OSR in completing land reclamation and water treatment. The A/E firm will provide drawings, specifications, and engineering design services to prepare construction documents for the following general work items, as applicable:

-
- > Prepare work areas by clearing and grubbing;
 - > Install new and refurbish existing drainage controls and erosion protection (sediment ponds, sediment ditches, and diversions);
 - > Locate, protect and/or avoid existing utility lines, poles, gas lines, etc. Also, coordinate with utility companies for locating and relocating existing facilities and/or providing for new utility services;
 - > Construct new and upgrade existing access roads, and install culverts;
 - > Install mine seals, and subsurface drains;
 - > Perform blasting designs and pre-blast surveys, if needed for reclamation of site;
 - > Eliminate existing highwalls by backfilling and regrading with materials available onsite, or designated borrow area sites nearby;
 - > Install surface water ditches where appropriate to control runoff;
 - > Repair or eliminate any slip areas on partially backfilled highwalls;
 - > Regrade/remove sediment ditches when not needed;
 - > Reshape, and add lime amendments to any potentially toxic coal refuse piles;
 - > Condition, stabilize, and revegetate disturbed land by the plan view acre, based on post-mine land use from permit files and landowners;
 - > If long term water treatment is anticipated on the site, prepare and regrade areas to accommodate space for structures or facilities;
 - > Design efficient passive and active water treatment and pumping systems which minimize maintenance and meet NPDES water quality standards;
 - > Design appropriate sludge handling facilities on site; and
 - > Final site cleanup.

3 Qualifications and Experience

Cardno MM&A has been involved with numerous investigations that are included as part of the previously-outlined scope of services. We have conducted site investigations and compiled information to design both active and passive treatment systems for acid mine drainage (AMD) discharge, as well as for other contaminants. We have also provided construction oversight for a wide range of disciplines including, but not limited to: site grade work, construction, site remediation, landfill closure design and construction, and drilling programs. Our engineers are proficient in developing construction design drawings, specifications, engineering cost estimates, and can assist the WVDEP-OSR in the project bidding and award of construction contract.

A summary of a few of our more recent and relevant projects are shown on "Attachment B" as are qualifications of key staff members. Complete and detailed resumes for key individuals are also included herein.

4 Use of Subcontractors

As part of the project goals and objectives outlined in the EOI, Cardno MM&A may find it necessary to utilize several outside subcontractors to provide various specific services, depending upon the project scope and requirements. Those services may include, but may not be limited to: drilling, monitoring well installation, water

quality analyses, and soil/rock geochemical analyses, aerial photography, and development of site mapping. The following subcontractors could potentially be utilized as part of the contract:

Subcontractor	Location	Responsibility
J. L. Sexton and Son	Tazewell, VA	Drilling/Monitoring Well Installation (Exclusive of Geoprobe® work)
Tuck Mapping Solutions, Inc.	Big Stone Gap, VA	Aerial Photography / Mapping
Research Environmental & Industrial Consultants, Inc.	Beaver, WV	Laboratory Services (Geochemical Soil/Rock Analyses)

The "Consultant Qualification Questionnaire" is included herein for each of the subcontractors listed above. Those subcontractors deemed to have Small, Women and Minority (SWaM) certification are also shown herein (this applies to J. L. Sexton and Son, and Tuck Mapping Solutions). In the event it becomes necessary to utilize any subcontractor not listed above, the WVDEP-OSR will be provided with the appropriate A/E documentation for each in order to be approved prior to commencing any work on the project.

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION OSR CONSULTANT QUALIFICATION QUESTIONNAIRE				Attachment "B"
PROJECT NAME DEP16555	DATE (DAY, MONTH, YER) 07/22/2014		FEIN NUMBER 540989421	
1.FIRM NAME Cardno MM&A	2.HOME OFFICE BUSINESS ADDRESS 534 Industrial Park Road, Bluefield, VA 24605		3.FORMER FIRM NAME Marshall Miller & Associates	
4.HOME OFFICE TELEPHONE 276-322-5467	5.ESTABLISHED (YEAR) 1975	6.TYPE OWNERSHIP <div style="display: flex; justify-content: space-between; margin-top: 5px;"> INDIVIDUAL CORPORATION </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> PARTNERSHIP JOINT-VENTURE </div>		6A.WV REGISTERED DBE (Disadvantaged Business Enterprise) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> YES NO </div>
7. PRIMARY OSR DESIGN OFFICE: ADDRESS/TELEPHONE /PERSON IN CHARGE/ NO. OSR DESIGN PERSONNEL EACH OFFICE 534 Industrial Park Road, Bluefield, VA 24605 / 276-322-5467 / Ronald H. Mullenex / 24				
8. PRINCIPAL OFFICERS OR MEMBER OF FIRM Scott Keim, President Ron Mullenex, Sr. Vice President Joe Vance, Sr. Vice President		8A. NAME, TITLE, & TELEPHONE – OTHER PRINCIPALS Peter Lawson, Executive Vice President 304-255-8937 John Feddock, Sr. Vice President 859-263-2855 Hans Naumann, Sr. Vice President 859-263-2855		

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

9. PERSONNEL BY DISCIPLINE

<u> </u> ADMINISTRATIVE <u> </u> ARCHITECTS <u>2</u> BIOLOGISTS <u>7</u> CADD OPERATORS <u> </u> CHEMICAL ENGINEERS <u>14</u> CIVIL ENGINEERS <u>3</u> CONSTRUCTION INSPECTORS <u> </u> DESIGNERS <u> </u> DRAFTSMEN	<u> </u> ECOLOGISTS <u> </u> ECONOMISTS <u> </u> ELECTRICAL ENGINEERS <u> </u> ENVIRONMENTALISTS <u> </u> ESTIMATORS <u>38</u> GEOLOGISTS <u> </u> HISTORIANS <u>3</u> HYDROLOGISTS	<u> </u> LANDSCAPE ARCHITECTS <u> </u> MECHANICAL ENGINEERS <u>24</u> MINING ENGINEERS <u> </u> PHOTOGRAMMETRISTS <u> </u> PLANNERS: URBAN REGIONAL <u> </u> SANITARY ENGINEERS <u> </u> SOILS ENGINEERS <u> </u> SPECIFICATION WRITERS	<u> </u> STRUCTURAL ENGINEERS <u>1</u> SURVEYORS <u> </u> TRAFFIC ENGINEERS <u>63</u> OTHER <u>155</u> TOTAL PERSONNEL
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TOTAL NUMBER OF WV REGISTERED PROFESSIONAL ENGINEERS IN PRIMARY OFFICE: 6

*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? YES NO

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

11. OUTSIDE KEY CONSULTANTS/SUBCONSULTANTS ANTICIPATED TO BE USED. Attach OSR "Consultant Qualification Questionnaire"		
NAME AND ADDRESS: Research Environmental & Industrial Consultants, Inc. (REIC) 225 Airport Industrial Park Road Beaver, WV 25813	SPECIALTY: Laboratory Services	WORKED WITH BEFORE <div style="text-align: center;"> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO </div>
NAME AND ADDRESS: J.L. Sexton and Son PO Box 1267 North Tazewell, VA 24630	SPECIALTY: Drilling / Monitoring Well Installation	WORKED WITH BEFORE <div style="text-align: center;"> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO </div>
NAME AND ADDRESS: Tuck Mapping Solutions, Inc. 4632 Aerial Way Big Stone Gap, VA 24219	SPECIALTY: Aerial Photography / Contour Mapping Services	WORKED WITH BEFORE <div style="text-align: center;"> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO </div>
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE <div style="text-align: center;"> <input type="checkbox"/> YES <input type="checkbox"/> NO </div>
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE <div style="text-align: center;"> <input type="checkbox"/> YES <input type="checkbox"/> NO </div>

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

12.	A.	Is your firm experienced in Acid Mine Drainage water treatment and remediation?	
		YES Description and number of projects:	Cardno MM&A has been involved in more than a dozen projects involving acid mine drainage water treatment and remediation. Those projects typically include site investigations to evaluate mine discharge rates, water quality assessments of the discharge and any receiving surface water bodies, and loading calculations. Utilizing this data, along with other site information (such as layout, discharge requirements, etc.), effective remediation plans have been designed utilizing both active (chemical treatment) and passive (anoxic limestone drains, bio-cells, etc.) treatment systems.
			NO
	B.	Is your firm experienced in soil analysis and coal refuse analyses?	
		YES Description and number of projects:	Cardno MM&A has been involved in numerous (greater than 100) projects that involve soil and coal refuse analyses. These analyses for both soil and coal refuse included both geochemical and geotechnical testing. Soil and coal refuse analyses have been performed for a wide range of applications including, but not limited to: mine permitting and probable hydrologic consequence (PHC) evaluations; slope stability; borrow material for use in the construction of containment cells for segregation of potentially acid-producing/selenium leaching material, as well as for suitability of landfill cover material; foundation work; and landslide investigations.
			NO
	C.	Is your firm experienced in hydrology and hydraulics for handling mine water discharges on mining sites?	
		YES Description and number of projects:	Cardno MM&A has been involved with more than 50 projects that involve handling of mine discharge water. Many of these projects are for the permitting process, but some are specialty projects associated with mine water treatment and mine dewatering.
			NO
	D.	Does your firm produce its own aerial photography for development of contour mapping and have your own surveying crew?	
		YES Description and number of projects:	
		NO	Cardno MM&A maintains a full-time survey crew, but we subcontract aerial photography services, should these be needed for development of contour mapping.
	E.	Is your firm experienced in design of highwall elimination, grading and material handling plans for land reclamation?	
		YES Description and number of projects:	Cardno MM&A has been involved in numerous projects (greater than 25) that involve evaluations for highwall elimination (backfilling), as well as material handling plans for land reclamation. We often prepare reclamation plans (surface and deep) as part of Sections N, O, and R of the mine permitting process. We also prepare cost liabilities for site reclamation activities for potential purchase transactions.
			NO

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR OSR PROJECT DESIGN (Furnish complete date but keep to essentials)						
NAME & TITLE (Last, First, MI) Mullenex, Ronald H., Sr. Vice President Principal in Charge	YEARS OF EXPERIENCE <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">YEARS OF OSR DESIGN EXPERIENCE</td> <td style="width: 50%; padding: 5px;">YEARS OF OSR RELATED DESIGN EXPERIENCE</td> </tr> <tr> <td style="text-align: center; padding: 5px;">0</td> <td style="text-align: center; padding: 5px;">0</td> </tr> </table>		YEARS OF OSR DESIGN EXPERIENCE	YEARS OF OSR RELATED DESIGN EXPERIENCE	0	0
YEARS OF OSR DESIGN EXPERIENCE	YEARS OF OSR RELATED DESIGN EXPERIENCE					
0	0					
Brief explanation of responsibilities <u>Coordinate and oversee all aspects of project work to ensure completeness, accuracy, and that all project schedules are met. Direct involvement of all work related to geology, hydrogeology, and remediation. Extensive work in mine permitting associated with geology and probable hydrologic consequences, including identification of potential acid and selenium-producing and materials handling plan.</u>						
EDUCATION (Degree, year, specialization) Master of Science, 1975, Geology Bachelor of Science, 1971, Geology						
MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS <ul style="list-style-type: none"> - American Institute of Professional Geologists - Geological Society of America, Coal Geology and Hydrogeology Divisions - Society of Mining Engineers of Association of Mining, Metallurgical, and Petroleum Engineers - Sigma Gamma Epsilon (Earth Sciences Honorary Fraternity) - Association of Ground Water Scientists and Engineers, Division of National Ground Water Association - Association of Engineering Geologists - American Society of Mining and Reclamation - International Mine Water Association 	REGISTRATION (Type, year, state) <ul style="list-style-type: none"> - Certified Professional Geologist, 1979, National - Certified Groundwater Professional, 1991, National - Licensed Remediation Specialist, 1998, West Virginia - Professional Geologist, 1984, Virginia - Professional Geologist, 1994, Kentucky - Professional Geologist, 1994, Pennsylvania - Professional Geologist, 1991, Tennessee - Professional Geologist, 1996, North Carolina - Professional Geologist, 1987, South Carolina - Professional Geologist, 2000, Georgia 					

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR OSR PROJECT DESIGN (Furnish complete date but keep to essentials)		
NAME & TITLE (Last, First, MI) Enigk, Gerard J. Manager of Engineering	YEARS OF EXPERIENCE	
	YEARS OF OSR DESIGN EXPERIENCE 0	YEARS OF OSR RELATED DESIGN EXPERIENCE 0
Brief explanation of responsibilities <u>Designed, prepared permits, and conducted feasibility studies for reprocessing and reclamation of coarse and fine coal refuse areas. Managed industrial demolition of and site reclamation of coal preparation and base metals processing plants. Completed various types of mine planning and engineering design, and designed mine seals as well as completed blasting designs.</u>		
EDUCATION (Degree, year, specialization) Master of Science, 1994, Environmental Science Bachelor of Science, 1976, Mining Engineering		
MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS - Society of Mining Engineers	REGISTRATION (Type, year, state) - Professional Engineer, 1983, West Virginia	

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR OSR PROJECT DESIGN (Furnish complete date but keep to essentials)		
NAME & TITLE (Last, First, MI) Amick, Charles M. Sr. Project Engineer (Civil)	YEARS OF EXPERIENCE	
	YEARS OF OSR DESIGN EXPERIENCE 0	YEARS OF OSR RELATED DESIGN EXPERIENCE 0
Brief explanation of responsibilities		
<u>Performed engineering services related to all aspects of the collection and treatment of wastewater and stormwater. Has designed collection and conveyance systems for mine water treatment, as well as design structures associated with surface and groundwater remediation.</u> <u>coordinated and performed civil engineering consulting services for a wide range of activities.</u>		
EDUCATION (Degree, year, specialization) Master of Business Administration, 1996, Management Science Bachelor of Science, 1978, Civil Engineering		
MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, year, state) - Professional Engineer, 1983, West Virginia - Registered Land Surveyor, 1995, West Virginia - Professional Engineer, 1986, Virginia - Professional Engineer, 2006, Pennsylvania - Professional Engineer, 2006, Ohio - Professional Engineer, 1986, Maryland - Professional Engineer, 2008, Georgia - Professional Engineer, 2009, Florida	

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR OSR PROJECT DESIGN (Furnish complete date but keep to essentials)		
NAME & TITLE (Last, First, MI) Meek, Floyd A. Sr. Project Manager / Chemist	YEARS OF EXPERIENCE	
	YEARS OF OSR DESIGN EXPERIENCE 0	YEARS OF OSR RELATED DESIGN EXPERIENCE 0
Brief explanation of responsibilities <u>Performed numerous engineering/environmental studies related to the prevention and/or mitigation of mine drainage (e.g. acid, selenium, other metals, etc.), and has served on an appointed task force to develop mining practices which will prevent acid drainage. He has designed many mine discharge treatment systems, including system types, sizing, chemical types and application rates (for active treatment), and life expectancy for passive treatment systems.</u>		
EDUCATION (Degree, year, specialization) Bachelor of Science, 1977, Chemistry		
MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, year, state) - Professional Engineer, 1991, West Virginia	

EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

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

AutoCADD-Drafting

Carlson Mining (formerly SurvCADD) – Civil and Mine Design Software

SedCad – Hydrology Analysis

REAME – Slope Stability Analysis

EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

15. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS THE DESIGNATED ENGINEER OF RECORD				
PROJECT NAME, TYPE & LOCATION	NAME & ADDRESS OF OWNER	NATURE OF YOUR FIRM'S RESPONSIBILITY	ESTIMATED CONSTRUCTION COST	PERCENT COMPLETE
<ul style="list-style-type: none"> - Davis Wetland Remediation Site - AMD Collection and Treatment Design - Lee County, Virginia 	<p>Commonwealth of Virginia Department of Mines, Minerals, and Energy 3405 Mountain Empire Road Big Stone Gap, VA 24219</p>	<p>Cardno MM&A conducted a site investigation for the purpose of preparing a design and treatment plan for acid-mine drainage issuing from an old abandoned mine, with the ultimate goal of reducing the TDS loading. The DMME required that the mine initially be dewatered, and Cardno MM&A prepared a mine dewatering plan along with a temporary mine water containment and active treatment system design during the mine dewatering. We evaluated groundwater and mine discharge water quality, mine seepage rates, mine head level and pool volume, depth to bedrock and groundwater, and optimum mine dewatering rates.</p> <p>For long-term mine water discharge treatment, we designed a collection and passive treatment system that will minimize active maintenance via a series of treatment structures consisting of an anoxic limestone drain, reducing and alkaline producing system (anaerobic wetland and passive biochemical reactor), and polishing ponds. The design also included close coordination with various utility entities, access road design, erosion and sediment control structures, design of containment structures for disposal of sludge generated during temporary active treatment, and coordination with the State Highway Department since structures were planned on both sides of a state maintained roadway. Cardno MM&A also prepared a long-term operation and maintenance plan, construction drawings and bid specifications, as well as an engineering cost estimate.</p>	<p>~\$90,000 (Site evaluation, construction design, and specifications)</p> <p>~\$475,000 (Construction)</p>	<p>~95% (Evaluation, construction design, and specifications)</p> <p>0% (Project will go out for construction bid in near future)</p>

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

<ul style="list-style-type: none"> - Cliffs Logan County Coal - Permitting and Selenium Mitigation - Logan County, West Virginia 	<p>Cliffs Logan County Coal, LLC 119 Rich Creek Road Lyburn, WV 25632</p>	<p>Cardno MM&A provided permitting, design, and engineering services to obtain regulatory permitting for treatment of waters in excess of the selenium surface water standard. Cardno MM&A provided several design concepts for the capture and treatment of selenium water emanating from an abandoned mine discharge, as well as several discharges in excess of the selenium standard from valley fills. We were successful in obtaining a permit (including a probable hydrologic consequence) to transfer a selenium mine water discharge from one mine to another, and were successful in completing a construction design for that transfer.</p> <p>We also completed a SMCRA permit revision as well as an Underground Injection Control (UIC) permit to collect valley fill discharges in excess of the selenium surface water quality standard, and transport and inject those waters into an abandoned mine void. We designed a mine dewatering plan to keep mine pool head levels at an elevation that would not be susceptible to a mine blowout. We also determined projected high flow discharges from storm events that will likely fall below the selenium water quality standard and can bypass the injection collection system and discharge to the receiving stream. Cardno MM&A also designed a centralized biochemical reactor to passively treat those valley fill discharges not injected into the abandoned underground mine workings.</p>	<p>~\$2,750,000 (Permitting and Construction)</p>	<p>~75% (Permitting nearing completion; bioreactor cell construction not yet started)</p>
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EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

<ul style="list-style-type: none"> - AmericanMountaineer Energy Mine and Refuse Complex - Permitting/Design - Near Wallace, West Virginia 	AmericanMountaineer Energy, Inc 46226 National Rd St. Clairsville, OH 43950	Cardno MMA provided design, engineering, and permitting services to help obtain the required permits. Our team of mining engineers, biologists, geologists, and support staff managed the project from the gathering of baseline environmental data through to final issuance of the permits. Permit work included, but was not limited to: delineation of potential acid-producing material and materials handling design, probable hydrologic consequences, site reclamation plans, and sediment and erosion control design features.	~\$400 million	~85%
<ul style="list-style-type: none"> - Former Rail Yard Remediation - Site Assessment/Design/ Remediation - Princeton, West Virginia 	Joint Venture Between: Pounding Mill Quarry 171 St. Clairs Crossing Bluefield, VA 24605 And Norfolk Southern Corporation 1200 Peachtree Street, NE Box 13 Atlanta, GA 30309	Cardno MM&A conducted an assessment of site soils, groundwater, and river sediments for various chemicals of concern, including petroleum, PCBs, and metals. As part of the investigation, we conducted a Human Health and Ecologic Risk Assessment of soils, surface and groundwater, and sediments. We designed and implemented an active remediation system for the removal of free product. Other tasks included as part of the project included the design and implementation of a 16-acre cover system; development of geotechnical specifications for earthworks (grading), cover material, and cover placement; and specifications for geomembrane and geotextile materials. Cardno MM&A also obtained necessary permitting (including NPDES requirements); developed and installed erosion and sediment control structures; conducted site clearing and grubbing; and met with local government and state government officials throughout the project.	~\$900,000	~85%
TOTAL NUMBER OF PROJECTS:			TOTAL ESTIMATED CONSTRUCTION COSTS:	
4			\$~404,215,000	

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

16. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS SERVING AS A SUBCONSULTANT TO OTHERS					
PROJECT NAME, TYPE & LOCATION	NATURE OF FIRMS RESPONSIBILITY	NAME & ADDRESS OF OWNER	ESTIMATED COMPLETION DATE	ESTIMATED CONSTRUCTION COST	
				ENTIRE PROJECT	YOUR FIRMS RESPONSIBILITY
NA					
17. COMPLETED WORK WITH IN LAST 5 YEARS ON WHICH YOUR FIRM WAS THE DESIGNATED ENGINEER OF RECORD					
PROJECT NAME, TYPE & LOCATION	NAME & ADDRESS OF OWNER	ESIMATED CONSTRUCTION COST	YEAR	CONSTRUCTED (YES OR NO)	
- Leer Mine Complex - Longwall Mine - Near Grafton, West Virginia	Arch Coal Leer Mining Complex 1200 Tygart Drive Grafton, WV 26354	~\$350 million	2011	Facility constructed. Cardno MM&A provided state and federal permitting, engineering design, and construction drawings and bid documents.	
- Longview Power, LLC - Coal Fired Power Plant - Maidsville, West Virginia	Longview Power, LLC 1375 Fort Martin Road Maidsville, WV 26541	~\$1 billion	2011	Facility constructed. Cardno MM&A provided earthwork, wetland, and bridge design, NPDES permitting, and construction drawings and specifications.	
- Toney Fork West - Surface Coal Mine - Near Man, West Virginia	Cliffs Logan County Coal, LLC 100 Market Street, Suite A Man, WV 25635	~\$10 million	2010	Facility constructed. Cardno MM&A designed and obtained Article 3 and Article 11 NPDES permits.	
- Joes Creek - Surface Coal Mine - Near Orgas, West Virginia	Coyote Coal Company, LLC 500 Lee Street, Suite 900 Charleston, WV 25301	~\$30 million	2009	Facility constructed. Cardno MM&A designed and obtained an Article 3 permit.	

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

18. COMPLETED WORK WITHIN LAST 5 YEARS ON WHICH YOUR FIRM HAS BEEN A SUB-CONSULTANT TO OTHER FIRMS (INDICATE PHASE OF WORK WHICH YOUR FIRM WAS RESPONSIBLE)					
PROJECT NAME, TYPE & LOCATION	NAME & ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST OF YOUR FIRM'S PORTION	YEAR	CONSTRUCTED (YES OR NO)	FIRM ASSOCIATED WITH

EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

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 Office of Special Reclamation.

20. The foregoing is a statement of facts

Signature: Ronald H. Mullenex Title: Sr. Vice President

Date: 7/18/14

Printed Name: Ronald H. Mullenex

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85

DEP16555

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION			
OSR CONSULTANT QUALIFICATION QUESTIONNAIRE			Attachment "B"
PROJECT NAME DEP16557	DATE (DAY, MONTH, YER) 6/19/2014		FEIN NUMBER 55-0668654
1.FIRM NAME Research Environmental & Industrial Consultants, Inc.	2.HOME OFFICE BUSINESS ADDRESS 225 Airport Industrial Park Road Beaver, WV 25813		3.FORMER FIRM NAME NA
4.HOME OFFICE TELEPHONE 304-255-2500	5.ESTABLISHED (YEAR) 1984	6.TYPE OWNERSHIP INDIVIDUAL <input type="checkbox"/> CORPORATION PARTNERSHIP <input type="checkbox"/> JOINT-VENTURE <input type="checkbox"/>	6A.WV REGISTERED DBE (Disadvantaged Business Enterprise) YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
7. PRIMARY OSR DESIGN OFFICE: ADDRESS/TELEPHONE /PERSON IN CHARGE/ NO. OSR DESIGN PERSONNEL EACH OFFICE			
8. PRINCIPAL OFFICERS OR MEMBER OF FIRM Clarence L. Haile, Ph.D.		8A. NAME, TITLE, & TELEPHONE – OTHER PRINCIPALS Clarence L. Haile, Ph.D., Executive Vice President 304-255-2500	

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

9. PERSONNEL BY DISCIPLINE

<u>11</u> ADMINISTRATIVE	<u> </u> ECOLOGISTS	<u> </u> LANDSCAPE ARCHITECTS	<u> </u> STRUCTURAL ENGINEERS
<u> </u> ARCHITECTS	<u> </u> ECONOMISTS	<u> </u> MECHANICAL ENGINEERS	<u> </u> SURVEYORS
<u>3</u> BIOLOGISTS	<u> </u> ELECTRICAL ENGINEERS	<u> </u> MINING ENGINEERS	<u> </u> TRAFFIC ENGINEERS
<u>1</u> CADD OPERATORS	<u> </u> ENVIRONMENTALISTS	<u> </u> PHOTOGRAMMETRISTS	<u>91</u> OTHER
<u>1</u> CHEMICAL ENGINEERS	<u> </u> ESTIMATORS	<u> </u> PLANNERS: URBAN REGIONAL	Chemists/Lab Techs
<u> </u> CIVIL ENGINEERS	<u>1</u> GEOLOGISTS	<u> </u> SANITARY ENGINEERS	
<u> </u> CONSTRUCTION INSPECTORS	<u> </u> HISTORIANS	<u> </u> SOILS ENGINEERS	
<u> </u> DESIGNERS	<u> </u> HYDROLOGISTS	<u> </u> SPECIFICATION	<u>108</u> TOTAL PERSONNEL
<u> </u> DRAFTSMEN		<u> </u> WRITERS	

TOTAL NUMBER OF WV REGISTERED PROFESSIONAL ENGINEERS IN PRIMARY OFFICE: 1

*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? YES NO

11. OUTSIDE KEY CONSULTANTS/SUBCONSULTANTS ANTICIPATED TO BE USED. Attach OSR "Consultant Qualification Questionnaire"

NAME AND ADDRESS: None	SPECIALTY:	WORKED WITH BEFORE <div style="text-align: right;"> <u> </u> YES <u> </u> NO </div>
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE <div style="text-align: right;"> <u> </u> YES <u> </u> NO </div>

EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ YES _____ NO
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ YES _____ NO
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ YES _____ NO
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ YES _____ NO
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ YES _____ NO

EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

12. A. Is your firm experienced in Acid Mine Drainage water treatment and remediation?

YES Description and number of projects: _____

NO

B. Is your firm experienced in soil analysis and coal refuse analyses?

YES Description and number of projects: _____ Over 24 year's experience with multiple projects and clients _____

NO

C. Is your firm experienced in hydrology and hydraulics for handling mine water discharges on mining sites?

YES Description and number of projects: _____

NO

D. Does your firm produce its own aerial photography for development of contour mapping and have your own surveying crew?

YES Description and number of projects: _____

NO

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85

DEP16555

E. Is your firm experienced in design of highwall elimination, grading and material handling plans for land reclamation?

YES Description and Number of Projects: _____

NO

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

NAME & TITLE (Last, First, MI)

Clarence L. Haile, Executive Vice President and
Laboratory Director

YEARS OF EXPERIENCE

YEARS OF OSR DESIGN EXPERIENCE

YEARS OF OSR RELATED DESIGN EXPERIENCE

Brief explanation of responsibilities

Direct and lead chemical and/or biological analysis of environmental samples

EDUCATION (Degree, year, specialization)

BS Chemistry (1970), MS Organic Chemistry (1972), Ph.D. Environmental Chemistry (1977)

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Chemical Society

REGISTRATION (Type, year, state)

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES RESPONSIBLE FOR OSR PROJECT DESIGN (Furnish complete date

EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

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

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

15. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS THE DESIGNATED ENGINEER OF RECORD				
PROJECT NAME, TYPE & LOCATION	NAME & ADDRESS OF OWNER	NATURE OF YOUR FIRM'S RESPONSIBILITY	ESTIMATED CONSTRUCTION COST	PERCENT COMPLETE
None				
TOTAL NUMBER OF PROJECTS:		TOTAL ESTIMATED CONSTRUCTION COSTS: \$		

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

16. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS SERVING AS A SUBCONSULTANT TO OTHERS					
PROJECT NAME, TYPE & LOCATION	NATURE OF FIRMS RESPONSIBILITY	NAME & ADDRESS OF OWNER	ESTIMATED COMPLETION DATE	ESTIMATED CONSTRUCTION COST	
				ENTIRE PROJECT	YOUR FIRMS RESPONSIBILITY

EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

17. COMPLETED WORK WITH IN LAST 5 YEARS ON WHICH YOUR FIRM WAS THE DESIGNATED ENGINEER OF RECORD				
PROJECT NAME, TYPE & LOCATION	NAME & ADDRESS OF OWNER	ESIMATED CONSTRUCTION COST	YEAR	CONSTRUCTED (YES OR NO)
None				

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

18. COMPLETED WORK WITHIN LAST 5 YEARS ON WHICH YOUR FIRM HAS BEEN A SUB-CONSULTANT TO OTHER FIRMS (INDICATE PHASE OF WORK WHICH YOUR FIRM WAS RESPONSIBLE)					
PROJECT NAME, TYPE & LOCATION	NAME & ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST OF YOUR FIRM'S PORTION	YEAR	CONSTRUCTED (YES OR NO)	FIRM ASSOCIATED WITH

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

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 Office of Special Reclamation.

20. The foregoing is a statement of facts

Signature: CHL Title: Exec. Vice Pres.

Printed Name: Clarence L. Haile

Date: 10 June 2014

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION			
OSR CONSULTANT QUALIFICATION QUESTIONNAIRE			Attachment "B"
PROJECT NAME DEP16557	DATE (DAY, MONTH, YER) 6/19/2014		FEIN NUMBER 541479170
1.FIRM NAME J.L. Sexton and Son	2.HOME OFFICE BUSINESS ADDRESS PO Box 1267 North Tazewell, VA 24630		3.FORMER FIRM NAME
4.HOME OFFICE TELEPHONE 276-988-9012	5.ESTABLISHED (YEAR) 1977	6.TYPE OWNERSHIP INDIVIDUAL	6A.WV REGISTERED DBE (Disadvantaged Business Enterprise) NO
7. PRIMARY OSR DESIGN OFFICE: ADDRESS/TELEPHONE /PERSON IN CHARGE/ NO. OSR DESIGN PERSONNEL EACH OFFICE			
8. PRINCIPAL OFFICERS OR MEMBER OF FIRM Joshua L Sexton, Operations Manager Pam Sexton, Office Manager		8A. NAME, TITLE, & TELEPHONE – OTHER PRINCIPALS	

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

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 Office of Special Reclamation.

20. The foregoing is a statement of facts

Signature:  Title: Operations Manager

Date: 6/05/2014

Printed Name: Joshua L. Sexton

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Small, Women and Minority (SWaM) Vendors Search

<< Return to the SWaM Vendors Search

Search by **company name = J. L. Sexton and Son**
 The following result(s) sorted by company name.

Total 1 search result(s)

SWaM Type	SWaM Cert#	Expiration Date	Company Name/Mailing Address	Pcard	Description of Services
S	669171	01-24-2017	J. L. SEXTON AND SON Doing Business As: PO BOX 1267 N. TAZEWELL, VA 24630 Contact: JOSHUA SEXTON Phone: (276)988-9012 Fax: (276)988-0391	N	NIIP Code and Description 76508 EXPLORATION ENVIRONMENTAL GEOTECHNICAL DRILLING SERVICES 91216 EXPLORATION ENVIRONMENTAL GEOTECHNICAL DRILLING SERVICES 92683 EXPLORATION ENVIRONMENTAL GEOTECHNICAL DRILLING SERVICES 92685 EXPLORATION ENVIRONMENTAL GEOTECHNICAL DRILLING SERVICES 96261 EXPLORATION ENVIRONMENTAL GEOTECHNICAL DRILLING SERVICES

Note

- MS or WS in the SWaM Type column indicates the business also has small business certification.
- Before printing, ensure that your browser print setup is set to landscape.

Expiration date with * indicates that business is pending for recertification.

Expiration date with ** indicates that business currently has 'Provisionally Approved' status. The Department of Minority Business Enterprise (DMBE) must receive all required supporting documents 15 days prior to the expiration date to allow processing or the certification will automatically expire.

Company name with *** indicates that business is a "Service Disabled Veteran owned" business.

1-1 of 1

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 Virginia Department of Minority Business Enterprise
 1111 East Main Street, Suite 300 Richmond, VA 23219
 Phone: (804) 786-6585
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EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION			
OSR CONSULTANT QUALIFICATION QUESTIONNAIRE			Attachment "B"
PROJECT NAME DEP16557	DATE (DAY, MONTH, YER) 6/19/2014		FEIN NUMBER 54-1568570
1.FIRM NAME Tuck Mapping Solutions, Inc.	2.HOME OFFICE BUSINESS ADDRESS 4632 Aerial Way (PO Box 760) Big Stone Gap, VA 24219		3.FORMER FIRM NAME Tuck Engineering
4.HOME OFFICE TELEPHONE 276-523-4669	5.ESTABLISHED (YEAR) 1985	6.TYPE OWNERSHIP INDIVIDUAL <input checked="" type="checkbox"/> CORPORATION PARTNERSHIP <input type="checkbox"/> JOINT-VENTURE <input type="checkbox"/>	6A.WV REGISTERED DBE (Disadvantaged Business Enterprise) YES <input type="checkbox"/> X NO <input type="checkbox"/>
7. PRIMARY OSR DESIGN OFFICE: ADDRESS/TELEPHONE /PERSON IN CHARGE/ NO. OSR DESIGN PERSONNEL EACH OFFICE			
8. PRINCIPAL OFFICERS OR MEMBER OF FIRM Robert H. Tuck, PE, LS, CP; President		8A. NAME, TITLE, & TELEPHONE – OTHER PRINCIPALS	

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

9. PERSONNEL BY DISCIPLINE

<input type="checkbox"/> ADMINISTRATIVE	<input type="checkbox"/> ECOLOGISTS	<input type="checkbox"/> LANDSCAPE ARCHITECTS	<input type="checkbox"/> STRUCTURAL ENGINEERS
<input type="checkbox"/> ARCHITECTS	<input type="checkbox"/> ECONOMISTS	<input type="checkbox"/> MECHANICAL ENGINEERS	<input checked="" type="checkbox"/> 2 SURVEYORS
<input type="checkbox"/> BIOLOGISTS	<input type="checkbox"/> ELECTRICAL ENGINEERS	<input type="checkbox"/> MINING ENGINEERS	<input type="checkbox"/> TRAFFIC ENGINEERS
<input checked="" type="checkbox"/> 2 CADD OPERATORS	<input type="checkbox"/> ENVIRONMENTALISTS	<input checked="" type="checkbox"/> 7 PHOTOGRAMMETRISTS	<input checked="" type="checkbox"/> 9 OTHER
<input type="checkbox"/> CHEMICAL ENGINEERS	<input type="checkbox"/> ESTIMATORS	<input type="checkbox"/> PLANNERS: URBAN REGIONAL	
<input checked="" type="checkbox"/> 4 CIVIL ENGINEERS	<input type="checkbox"/> GEOLOGISTS	<input type="checkbox"/> SANITARY ENGINEERS	
<input type="checkbox"/> CONSTRUCTION INSPECTORS	<input type="checkbox"/> HISTORIANS	<input type="checkbox"/> SOILS ENGINEERS	
<input type="checkbox"/> DESIGNERS	<input type="checkbox"/> HYDROLOGISTS	<input type="checkbox"/> SPECIFICATION	<input checked="" type="checkbox"/> 24 TOTAL PERSONNEL
<input type="checkbox"/> DRAFTSMEN		<input type="checkbox"/> WRITERS	

TOTAL NUMBER OF WV REGISTERED PROFESSIONAL ENGINEERS IN PRIMARY OFFICE: _____

*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? YES NO

11. OUTSIDE KEY CONSULTANTS/SUBCONSULTANTS ANTICIPATED TO BE USED. Attach OSR "Consultant Qualification Questionnaire"

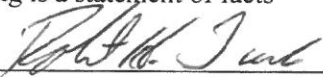
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ YES _____ NO
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ YES _____ NO

EXPRESSION OF INTEREST

The Masteller Coal Company S-125-82 and S-10-85
DEP16555

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 Office of Special Reclamation.

20. The foregoing is a statement of facts

Signature:  Title: President

Printed Name: Robert H. Tuck

Date: June 4, 2014

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Small, Women and Minority (SWaM) Vendors Search

<< Return to the SWaM Vendors Search

Search by **company name = tuck Mapping**

The following result(s) sorted by company name.

Total 1 search result(s)

SWaM Type	SWaM Cert#	Expiration Date	Company Name/Mailing Address	Pcard	Description of Services
S	654123	12-24-2016	TUCK MAPPING SOLUTIONS, INC. Doing Business As: P.O. BOX 760 BIG STONE GAP, VA 24219 Contact: ROBERT H. TUCK Phone: (276)523-4669 Fax: (276)523-4673	N	NIGP Code and Description 90510 AERIAL SURVEYS 90505 AERIAL PHOTOGRAPHY 90504 AERIAL PHOTOGRAMMETRY SERVICES 92586 SURVEYOR SERVICES, LAND

Note

- MS or WS in the SWaM Type column indicates the business also has small business certification.
- Before printing, ensure that your browser print setup is set to landscape.

Expiration date with * indicates that business is pending for recertification.

Expiration date with ** indicates that business currently has 'Provisionally Approved' status. The Department of Minority Business Enterprise (DMBE) must receive all required supporting documents 15 days prior to the expiration date to allow processing or the certification will automatically expire.

Company name with *** indicates that business is a "Service Disabled Veteran owned" business.

1-1 of 1

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EXPRESSION OF INTEREST
The Masteller Coal Company S-125-82 and S-10-85
DEP16555

OSR and RELATED PROJECT EXPERIENCE MATRIX																						
PROJECT	Exp. Basis C-Corp P-Personal *	Additional info provided in Section (s) **	PROJECT EXPERIENCE REQUIREMENTS															Primary staff participation/capacity *** M-Management P-Professional				
			Forfeited Surface Mine Reclamation	Forfeited Deep Mine Reclamation	Portal/shaft closure	Hydrologic/Hydraulic design/ Eval.	Remining Evaluation	Mine / refuse fire abatement	Subsidence investigation/ mitigation	Hazardous waste disposal	Project specifications	Water quality evaluation /mitigation replacement	Construction inspection / management	Water treatment	Equipment /structure removal	Stream restoration	Geotechnical/stability	NPDES/ Stormwater preparation				
DMME Davis Wetland Remediation	C						Y				Y	Y	Y	Y		Y						
Cliffs Logan County Coal, LLC	C					Y	Y				Y	Y		Y		Y		Y				
American Mountaineer Energy, Inc.	C				Y	Y	Y				Y	Y		Y		Y		Y				
Pounding Mill Quarry / Norfolk Southern Corp	C					Y				Y	Y	Y	Y		Y		Y	Y				

*List whether project experience is corporate or personnel based or both

** Use this area to provide specific sections or pages if needed for reference

*** List primary design personnel and their functional capacity for the projects listed.

Attachment "C"



State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Solicitation

NUMBER
DEP16555

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
FRANK WHITTAKER 304-558-2316

RFQ COPY

TYPE NAME/ADDRESS HERE

V
E
N
D
O
R

Cardno MM&A
534 Industrial Park Road
Bluefield, Virginia 24605

S
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ENVIRONMENTAL PROTECTION
DEPT. OF
OFFICE OF SPECIAL RECLAMATION
105 S. RAILROAD STREET
PHILIPPI, WV
26416-9998 304-457-3219

DATE PRINTED
06/24/2014

BID OPENING DATE: 07/22/2014

BID OPENING TIME 1:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	JB		906-29		
MASTELLER DESIGN						
EXPRESSION OF INTEREST						
THE WEST VIRGINIA PURCHASING DIVISION, FOR THE AGENCY, THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, IS SOLICITING EXPRESSIONS OF INTEREST FOR PROFESSIONAL MAPPING AND DESIGN SERVICES AT THE BOND FORFEITED PERMITS OF THE MASTELLER COAL COMPANY S-125-82 AND S-10-85 IN MINERAL COUNTY, WV PER THE FOLLOWING BID REQUIREMENTS AND ATTACHED SPECIFICATIONS.						
***** THIS IS THE END OF RFQ DEP16555 ***** TOTAL:						

SIGNATURE <i>Donald H. Williams</i>	TELEPHONE 276-322-5467	DATE 7/18/14
TITLE Sr. Vice President	FEIN 540989421	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

STATE OF WEST VIRGINIA
Purchasing Division**PURCHASING AFFIDAVIT**

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Marshall Miller & Associates, Inc. dba Cardno MM&A

Authorized Signature: *Donald H. Miller* Date: 7/18/14

State of Va

County of Tazewell, to-wit:

Taken, subscribed, and sworn to before me this 18th day of July, 2014.

My Commission expires 2-28, 2015



NOTARY PUBLIC

Estelle L. Linkous

CERTIFICATION AND SIGNATURE PAGE

By signing below, I certify that I have reviewed this Solicitation in its entirety, understand the requirements, terms and conditions, and other information contained herein; that I am submitting this bid or proposal for review and consideration; that I am authorized by the bidder to execute this bid or any documents related thereto on bidder's behalf; that I am authorized to bind the bidder in a contractual relationship; and that to the best of my knowledge, the bidder has properly registered with any State agency that may require registration.

Cardno MM&A

(Company)



(Authorized Signature)

Ronald H. Mullenex, Sr. Vice President

(Representative Name, Title)

276-322-5467

(Phone Number)

276-322-5460

(Fax Number)

7/18/14

(Date)

Proposed Staffing and Statement of Experience

The following summaries represent the key personnel that may be assigned as part of this contract. Personnel designated to a specific project will be assigned based on the specific project tasks and their field of expertise. It is possible, if not likely, that not all of the professional personnel listed below will be assigned to a specific project. Additionally, complete resumes are included for greater detail of their experience and qualifications.

- > **Ronald Mullenex**; Certified Professional Geologist, Certified Groundwater Professional, Senior Vice President of Cardno MM&A and Senior Principal of Cardno Limited, will serve as the Principal in Charge/Senior Consultant for the contract. He has over 37 years of experience with Cardno MM&A, and has performed and directed numerous projects throughout the region involving hydrogeologic characterization; site assessment and remediation; evaluation of water quality data; design and implementation of groundwater monitoring systems; mine hydrology; and water chemistry issues.
- > **Gerard Enigk**; Registered Professional Engineer (Mining), will serve as the lead mining engineer for the contract. Mr. Enigk currently serves as the Manager of Engineering for Cardno MM&A, and has 38 years of experience in the mining industry including work involving mine reclamation evaluations. He will oversee any and all aspects of work related to mine seal and subsurface drain design, blasting design, pre-blast surveys, highwall reclamation design, and any work associated with redesign/reshaping of coal refuse piles.
- > **Al Meek**; Registered Professional Engineer (Mining) and Chemist, will serve as the lead chemist for the contract. Mr. Meek currently serves as a Senior Project Manager for Cardno MM&A, and has over 37 years of experience in mining and in the prevention and/or mitigation of mine drainage. He will be involved in any project work related to the prevention of toxic drainage, as well as in the design of active or passive treatment systems. Mr. Meek has served on an appointed task force to develop mining practices to prevent acid mine drainage; developed and operated laboratories and programs to aid in compliance; served as lead corporate environmental affairs manager for a large coal mining company; and conducted remedial investigations and implementation programs for a wide range of environmental pollutants throughout the U.S. and some foreign countries. For nearly six years, he has researched, developed, and implemented passive biochemical reactor technology for remediation of selenium-impacted water associated with mining.
- > **Justin Douthat**; Registered Professional Engineer (mining), will serve as a mining engineer for the contract and is the Director of Engineering Services for Cardno MM&A. Mr. Douthat has over 19 years of industry experience, all with Cardno MM&A. He is proficient in geologic modelling and also administers training for the use of computer software for geologic modelling and mine planning. Mr. Douthat also provides end-of-mine reclamation plans, erosion and sediment control design construction details, as well as stockpile design.
- > **C. Myron Amick**; Registered Professional Engineer (Civil), will serve as the lead civil engineer for the contract. Mr. Amick currently serves as a Senior Project Manager in the Cardno MM&A civil engineering department and has 32 years of industry experience. He will oversee any and all aspects of work related to civil design, including, but not limited to: erosion and sediment control; utility service work; access road design; site grading work, and the design of sludge handling facilities, and passive and active water treatment systems. Mr. Amick will also oversee construction contract drawings as well as the preparation of construction specifications suitable for the letting of construction bids.
- > **Donald Phillips**; Civil Engineer and Senior Project Manager, has 36 years of industry experience. He has a wealth of expertise in materials testing, construction supervision, environmental/mining-reclamation, geotechnical investigations, and coal refuse and impoundment assessment/design. Mr. Phillips has been involved with numerous mine reclamation projects involving both the WVDEP-AML and WVDOE-AML Sections. He will be involved in any projects involving geotechnical issues related to mine highwalls, coal refuse piles, slope stability, and suitability of soil borrow material.
- > **David McChesney**; Registered Professional Engineer (Mining), is a Senior Mining Engineer for Cardno MM&A with over 33 years of industry experience. He will serve as a mining engineer as part of the contract. He utilizes various software programs for uses such as reclamation design and mine planning design. Mr. McChesney has performed end-of-mine reclamation design and cost estimates, as well as created blast plans and created procedures to document regulatory compliance.

- > **Brian Parker**; Registered Professional Engineer (Mining), is a mining engineer with 10 years of industry experience. Mr. Parker utilizes various modelling software for use in geologic modelling, mine planning, subsidence analysis, stockpile design, and surface hydrology. He also provides erosion and sediment control structure design, as well as permitting services.
- > **Earl Chornsbay**; Senior Engineering Technician, has 31 years of experience in the industry, much of which has included mine permitting. He has extensive experience in the preparation of mine reclamation plans as they relate to backfilling and regrading, as well as excess spoil disposal design. Mr. Chornsbay will be involved in project work that may require highwall backfilling and regrading.
- > **Steven Stansfield**; Professional Geologist, is a senior hydrogeologist/geologist who will serve in that capacity for this project. Mr. Stansfield has over 24 years of experience with Cardno MM&A, and has been heavily involved in many mine hydrology and water quality assessments since that time. He is highly experienced with projects of this nature, and is well versed in projects and coordination with various regulatory agencies. His experience includes, but may not be limited to: site characterization; monitoring well installation and abandonment; design of monitoring systems; surface and groundwater sampling; aquifer testing; flow monitoring; and permitting. He has been extensively involved in various projects incorporating data collection and assessment for mitigation design.
- > **Ankan Basu**; Certified Professional Geologist, will serve as a hydrogeologist/geochemist for the project. Mr. Basu has nearly eight years of experience in the industry, all with Cardno MM&A. He is highly proficient with several modelling software programs for hydrogeologic and geochemical applications, and is experienced in site characterization assessments involving many hydrogeologic applications, including well installation and abandonment; aquifer testing and date interpretation; sample collection; and reporting.
- > **Dan Diffenbach**; Licensed Surveyor, will serve as surveyor for the contract. Mr. Diffenbach is the civil engineering department's chief surveyor and provides surveying services for civil engineering, environmental, and energy related projects throughout the company. His specialties include: Global Positioning Systems (GPS) surveys, topographical surveys and mapping, property boundary surveys, floodplain elevation study surveys, as-built surveys, construction stake-outs, gas well locations/permitting, plat preparation, ALTA land title surveys, and reflectorless total station technology surveys. Mr. Diffenbach has nearly 20 years of experience.
- > **John Ralosky**; Engineering Technician, will serve as a design engineer technician for the contract. Mr. Ralosky has nearly 13 years of experience ranging from civil design drafting to engineering design. Mr. Ralosky provides civil engineering design and site layout for industrial and commercial sites, including, but not limited to: mining, railroad, and utilities. His primary areas of expertise include site development, grading, and excavation design; erosion and sediment control; mining refuse disposal facilities; and stormwater management. Mr. Ralosky is also proficient with several civil design software packages that may be employed as part of this contract.
- > **Sam Moore**; Engineering Technician, will also serve as an design engineer technician for the contract. Mr. Moore has over 36 years of experience in a civil engineering capacity, with specific expertise in surface water hydrology, erosion and sediment control, and stormwater facility design. He is also accomplished in comprehensive site design and utility layout, roadway design, subdivision development plans and design, field surveying, mine planning (mineral, aggregates, and metals), and construction specifications. Mr. Moore is proficient in the use of numerous civil engineering software packages, including any that may be used as part of this contract.
- > **Mark Clemons**; Engineering Technician, will provide construction management services in the event those are required. Mr. Clemons has 19 years of experience, much of which has been spent in a construction management capacity. He can also provide civil engineering design services for various industries such as the mining, railroad, and utility sectors.

Ronald H. Mullenex

Current Position

CPG, CGWP, Senior
Vice President / Senior
Principal of Cardno

Profession

Professional Geologist,
Certified Ground Water
Professional

Years' Experience

40

Joined Cardno

1977

Education

MS – Geology, West
Virginia University,
Morgantown, WV
BS – Geology, West
Virginia University,
Morgantown, WV

Professional Registrations

CPG

CGWP

PG – VA, SC, TN, PA,
KY, NC, GA

LRS – WV

WVDEP Approved
Person for preparing,
signing and certifying
surface mine permit
applications

Competent Person for
coal resource
determination under
JORC Code

Summary of Experience

Mr. Mullenex is a Certified Professional Geologist and Certified Ground Water Professional with over 40 years' professional experience in resource and mining geology, hydrogeology, environmental issues, and engineering applications. At Cardno MM&A, he directs geological and hydrogeological investigations, prepares and presents reports, and is frequently called upon in expert witness capacities in litigation concerning geological or hydrologic matters. He has authored a wide range of technical articles on coal resources, mining and mine drainage issues, groundwater and hydrogeology, environmental remediation, and geochemistry issues. He has also authored over 1,400 professional reports to clients in his consulting career.

A principal focus of his work in recent years has involved mineral resource evaluations and groundwater investigations in association with mining activities. Such groundwater studies include assessments of probable hydrologic consequences of mining; determination of existing and baseline hydrogeologic conditions; evaluation of hydrogeologic, geochemical, and geotechnical conditions and their potential impact on mining activities; and investigations of water quality and/or quantity impacts resulting from past mining. In mineral resource studies, his work has focused on resource distribution and classification, geologic factors affecting mineability and accessibility, and coal and tailings quality.

Mr. Mullenex earned Bachelor of Science and Master of Science degrees in Geology from West Virginia University in 1971 and 1975, respectively. He serves on the Visiting Committee for the Department of Geology and Geography at West Virginia University, and on the external advisory board for WVU's Advanced Energy Initiative. He holds certification, licensing, and/or registration as a professional geologist in seven states, and is a Licensed Remediation Specialist under West Virginia's Voluntary Remediation Program. He is a Competent Person in coal resource determination under the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Resources (JORC Code).

Affiliations

American Institute of Professional Geologists
Geological Society of America, Coal Geology and Hydrogeology Divisions
Society of Mining Engineers of Association of Mining, Metallurgical, and Petroleum Engineers
Sigma Gamma Epsilon (Earth Sciences Honorary Fraternity)
Association of Ground Water Scientists and Engineers, Division of National Ground Water Association
Association of Engineering Geologists
American Society of Mining and Reclamation
International Mine Water Association

Significant Projects

- > Explore and evaluate geologic, hydrogeologic, and geochemical issues pertaining to large coal exploration, mine planning, and Definitive Feasibility Study (DFS) in virgin area of Western Australia, including water supply, mine inflow, water quality, and materials handling investigations, and delineation and assessment of resources and classification under JORC.
- > Joint coordinator and principal investigator in compilation of environmental audit for World Bank affiliate, for large mining project in the People's Republic of China.
- > Expert Witness in litigation and regulatory administrative proceedings. Qualified as expert in hydrogeology, geology, hydrology, water quality, and geomorphology.
- > Evaluate sources, extent, and nature of impact of selenium leaching from mine disturbances into receiving streams and develop mitigation through water management and enhanced passive reduction-adsorption processes.
- > Site characterization, monitoring, and implementation of enhanced bioattenuation remediation program in fractured bedrock aquifer.
- > Hydrogeologic investigations of potential hydrologic consequences (PHC) by mining operations (numerous studies, some involving large areas).
- > Hydrogeologic and geotechnical evaluations of conditions to be encountered, potential hydrologic impacts, and design of preventive measures for advancement of underground mines beneath stream valleys (numerous studies).
- > Investigations and assessments of causative and contributory factors regarding landslides, subsidence, and flooding events, including geomorphological analysis of features.
- > Hydrogeologic investigation and development of during-construction monitoring and preventive action to prevent adverse grout migration through the aquifer during mine shaft pre-grouting and construction project.
- > Assessment of potential impact of high-extraction underground mining upon stream conditions, and worked with mine design engineering personnel to devise alternative mine plan to avoid impact to stream.
- > Investigation of acid-producing rock materials and acid drainage for large highway construction program, and work with design engineers to develop materials handling plans, drainage structures and treatment plans.
- > Hydrogeologic and geotechnical investigation of large pre-Subtitle D landfill located in karstic terrain to evaluate impact on environment and develop plans for closure.
- > Remedial Investigation and Feasibility Study of a state superfund office site, involving ground water impact by dissolved trichloroethane and related compounds in fractured bedrock aquifer. Coordinated and critiqued baseline risk assessment.
- > Served on Tazewell County, Virginia, Comprehensive Plan Committee, assessing karst impacts and ground water concerns for land use planning.
- > Development of landfill gas migration mitigation measures at sites complicated by karstic conditions and by underground mine workings.
- > Utilized ground water modeling to design extraction/injection system for aquifer remediation.
- > Hydrogeologic assessment, aquifer testing, groundwater modeling, and expert witness testimony concerning DNAPL-related contaminants in bedrock aquifer.
- > Hydrogeologic investigation of impact of abandoned underground coal mine on adjacent stream and residential water supplies; developed successful remedial plan, and monitored results.

Significant Projects (Continued)

- > Investigation of impacts to hydrologic regime resulting from underground mining in areas beneath stream valleys.
- > Investigation and delineation of impacts and design inadequacies of several solid waste landfills for closure design. Led design team of geologists, hydrogeologists, and engineers in completing closure designs, and acted as Principal Investigator in the investigation and design phases.
- > Served as Principal-in-Charge of Construction Quality Assurance/Quality Control and field inspection for landfill closure construction projects.
- > Supervision and peer review of numerous investigative reports involving leaking underground storage tanks and similar contaminant releases to ground water.
- > Detailed investigation of geologic factors controlling or influencing coal resource distribution and development potential, with analysis of potential hazards to be encountered in longwall mining.
- > Detailed depositional analysis and interpretation of coal resource distribution and factors impacting future development.
- > Regional investigation and exploration of deep coals.
- > Stratigraphic analysis and interpretation of depositional patterns responsible for producing extreme hazardous conditions encountered in mining.
- > Exploration and delineation of coal resources; prediction of mine roof hazard areas.
- > Exploration and delineation of stone resources and stone geochemical characteristics.
- > Detailed investigation and interpretation of small-scale depositional features impacting coal reserve development.
- > Study and interpretation of paleogeographic and depositional conditions controlling resource distribution in several different coal seams.
- > Geologic investigation and expert witness for properties and mining ventures involved in prosecution in Federal court.
- > Management of active oil and gas leaseholds.
- > Evaluations of oil and gas estates involved in condemnation.
- > Reserve and economic development feasibility evaluation of several thousand acres in widely scattered tracts. Served as expert witness in civil proceedings in Federal Tax Court, with beneficial results to client.
- > Mapping, investigation, and evaluation of geologic, hydrogeologic, and geomorphic features relevant to new highway construction.
- > Investigation of ground water contamination susceptibility of a regional area involving largely karstic limestone and dolomite bedrock, incorporating assessment of multiple geologic and cultural components to delineate relative hazard potential at any point within the area. Study involved evaluation of stratigraphy and lithologic factors, structural geology, soil types, remote sensing analysis of fracture systems, water table levels, ground water flow directions, recharge and discharge areas and points, and investigation of ground water communication between wells. Results used for determining relative need for sewerage construction at different points within study area.
- > Investigation of karst sinkhole subsidence and triggering mechanisms, pertaining to damage to existing structures.
- > Utilization of geologic evaluation and remote sensing analysis to locate high-yield water wells for municipalities and industries.

Significant Projects (Continued)

- > Consultation to an engineering firm regarding dye-tracing applications to define ground water flow characteristics.
- > Determination of karstic controls on ground water in evaluation of suitability of construction site.
- > Conducting geologic evaluations and remote sensing analyses, and integrating these studies to define potential ground water flow characteristics that may impact underground mining.
- > Supervision and analysis of packer testing techniques to determine permeability of formations in boreholes.
- > Utilization of geophysical logs to identify ground water flow characteristics encountered in boreholes and select optimum horizons for piezometer installation.
- > Utilization of geophysical logs and analytical data to define geochemical characteristics of rock and coal strata.
- > Site evaluation of a planned large commercial landfill facility encompassing in excess of 500 acres. Acted as project manager for field activities including planning and executing of 58-borehole geologic and hydrogeologic exploration program; access road construction in very rugged terrain, with associated sediment and erosion control; and installation of single and nested piezometers and monitoring well construction. Performed analysis of geologic, geophysical, and hydrogeologic data to evaluate suitability of site, and determined post-construction monitoring requirements in relatively complex hydrogeologic setting. Acted as primary coordinator for report and permit application preparation, incorporating investigative reports from other consultants into a comprehensive permit application package.

Professional History

1979 - Present

Senior Vice President

Responsible for office management and administration; project management, coordination, and supervision; and project reporting and presentation. Is MM&A's corporate officer member of the Radiation Safety Committee and provides management oversight of the company's geophysical logging division. Provided management oversight of drilling services division for several years. Projects involve all phases of geologic application to coal exploration, evaluation, and development in the United States and abroad; quarry stone resources and stone quality; construction and environmental site characterization; ground water and surface water investigations; investigation of mining and hydrogeologic considerations in the United States and abroad; underground injection permitting and impact assessment; and writing of technical reports. Specific experience includes coal and geologic mapping; mineral property evaluation; management and supervision of exploration programs; study of geologic factors in resource minability (geologic hazards, depositional analyses); initiation and utilization of stratigraphic and depositional environmental studies as applied to exploration and development; ground water availability, contamination, and monitoring studies; investigation of karst impacts on environmental considerations; utilization of remote sensing techniques, including lineament and fracture analyses; development of ground water monitoring strategies and systems for solid waste landfill facilities; assessment of monitoring data to determine impacts; coordination of full site investigation and remedial design teams for landfill closures and sites impacted by volatile organic compound contaminants in ground water; investigations of hydrologic impacts resulting from mining; risk assessment and development of remediation designs

for ground water contamination; development of mitigative measures for landfill gas migration; geomorphic evaluations of flooding and earth movement issues, and serving as expert witness in cases concerning mineral properties, ground water, and flood analysis.

1977 - 1979

Project Geologist

Responsible for field and in-office project management, coordination, and supervision. Projects involved primarily coal property exploration and evaluation.

1974 - 1977

Coal Geologist, West Virginia Geological and Economic Survey

Responsible for mapping, data collection, and correlation of coals in regional study of coal resources and development potential.

Publications & Presentations

- > "Selenium – Sources and Considerations for Treatment or Prevention" Wastewater Treatment and Water Quality for Indiana Coal Mines Workshop, 26th Annual Surface Mined Land Reclamation Technology Transfer Seminar, Jasper, Indiana, December 9, 2013.
- > "A Cost-Effective Approach to In Situ Bioremediation in Fractured Bedrock," The Ninth International In Situ and On-Site Bioremediation Symposium, Baltimore, Maryland, May 7-10, 2007.
- > "Stratigraphic Distribution of Selenium in Upper Kanawha-Lower Allegheny Formation Strata at a Location in Southwestern West Virginia," 22nd Annual International Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, September 14, 2005.
- > "The Floods of July 8, 2001: A Review of Characteristics, Distribution and Contributing Factors," Virginia Center for Coal and Energy Research and the Central Appalachian Section of SME, Abingdon, Virginia, April 2002.
- > "Subsidence Impacts on Ground Water," Virginia Center for Coal and Energy Research and the Central Appalachian Section of SME, Abingdon, Virginia, June 2000.
- > "Recognition of Paleosols From Wireline Logs," Predictive Stratigraphic Analysis Workshop, U.S. Geological Survey, Reston, Virginia, April 1996.
- > "Mitigation of Environmental Impacts Resulting From Mine Pool Build-up," Mine Drainage Task Force Symposium, Morgantown, West Virginia, April 1996.
- > "Integration of Hydrogeologic and Geophysical Techniques for Identification of AMD Seepage and Remedial Design," R.H. Mullenex, C.P.G., C.G.W.P., V.P. Wiram, C.P.G., H.E. Naumann, P.E., Mine Drainage Task Force Symposium, Morgantown, West Virginia, April 1995.
- > "Remedial Measures," Business and the Environment Seminar, Bluefield, West Virginia, July 1993.
- > "Hydrogeology of the Appalachian Plateau," Ground Water Hydrology, Contamination and Management: Wellhead Protection in the Appalachian Plateau, USEPA and Cook College of Continuing Education, National Mine Safety and Health Academy, Beckley, West Virginia, June 1993.

- > "Remedial Measures: Planning and Managing Closure and Post Closure Activities at your Sanitary Landfill," Business and the Environment Seminar, Bluefield, Virginia, 1993.
- > "Downhole Camera Brings Visible Benefits to Ground Water Monitoring," *World Wastes*, Vol. 35, No. 12, December 1992.
- > "Ground Water Monitoring at Sanitary Landfills – Sampling and Analysis Considerations Under Subtitle D," *World Wastes*, Vol. 35, No. 6, June 1992.
- > "Ground Water Monitoring at Sanitary Landfills – System Design Considerations Under Subtitle D," *World Wastes*, Vol. 35, No. 2, February 1992.
- > "Water-Bearing Fracture Identification Through High-Resolution Density Logging Techniques," presented at National Water Well Association Exposition Forum on Ground Water Technologies for the 1990's, October 23, 1991, Washington, D.C.
- > "Ground Water Issues," Business and the Environment Seminar, Bluefield, Virginia, 1991.
- > "Geological and Environmental Impact on Development and Construction in Our Area," Business and the Environment Seminar, Bluefield, Virginia, 1991.
- > "Preparing for an Environmentally Safe Landfill," Business and the Environment Seminar, Bluefield, Virginia, 1991.
- > "Lithologic Indicators of Geochemical Conditions of Sedimentation in Pennsylvanian Age Rocks of the Appalachian Basin," C. Blaine Cecil, U.S.G.S.; Ronald W. Stanton, U.S.G.S.; and Ronald H. Mullenex, Geological Consulting Services, Inc.; American Association of Petroleum Geologists Symposium, Charleston, West Virginia, September 1988.
- > "Geological Modeling Techniques for Evaluation of Productivity-Related Longwall Mining Roof Conditions: A Case Study," Longwall U.S.A. Conference, Pittsburgh, Pennsylvania, co-author, September 1988.
- > "Prediction of Coal Continuity, Quality, and Mining Conditions as Afforded by Depositional Analysis," Society of Mining Engineers of AIME, Fall Meeting, St. Louis Missouri, 1986.
- > "Use of Depositional Models and Stratigraphic Mapping Techniques to Determine New Coal Reserve Potentials in the Appalachian Region," AIME Annual Meeting, Chicago, Illinois, published in *Transactions*, the permanent technical literature of the Society of Mining Engineers of AIME February 1981.
- > "No. 3 Pocahontas Coal in Southern West Virginia – Resources and Depositional Trends," *West Virginia Geological Survey Bulletin B-38*, co-author 1981.
- > "Case Histories and Depositional Modeling for Classifying Reserves in the Appalachian Region," Miller, M. S., and Mullenex, R. H., American Association of Petroleum Geologists Meeting, Morgantown, West Virginia, October 1980.
- > "Major Cross-Strike Structures of the Central Sedimentary Appalachians," *Proceedings of the West Virginia Academy of Science*, Vol. 46, No. 2, 1974.
- > West Virginia Surface Mine Drainage Task Force Symposium, Morgantown, West Virginia (Annually).
- > Wastewater Treatment and Water Quality for Indiana Coal Mines Workshop, 26th Annual Surface Mined Land Reclamation Technology Transfer Workshop, Jasper, Indiana, December 9, 2013.
- > Applications of Groundwater Geochemistry, National Ground Water Association, Nashville, Tennessee, October 17-18, 2011.

- > Ground Water Geochemistry and Isotopes, National Ground Water Association Web Seminar, November 17, 2009.
- > Pump/Yield Testing Design and Transducer Data Collection, National Ground Water Association Web Seminar, April 7, 2009.
- > Geologic Sequestration Research Activities and EPA Requirements, Air & Waste Management Association Web Seminar, February 18, 2009.
- > Environmental Geochemistry of Metals: Investigation and Remediation, National Ground Water Association, Las Vegas, Nevada, March 13 – 15, 2007.
- > Basics of Natural Stream Design on Mined Lands, American Society for Mining and Reclamation/West Virginia Surface Mine Drainage Task Force, April 18-22, 2004.
- > Regional Coalfield Water Resource Symposium, Virginia Water Resource Research Center and Virginia Tech, Wise, Virginia, September 4, 2002.
- > Environmental Remediation in Coal Mining, Virginia Center for Coal and Energy Research and the Central Appalachian Section of SME, Abingdon, Virginia, June 8, 2000.
- > Low-Cost Remediation Strategies for Contaminated Soil and Ground Water, National Ground Water Association, Baltimore, Maryland, June 1–2, 1998.
- > Defining Coalbed Methane Exploration Fairways and Resources, 1997 International Coalbed Methane Symposium, Tuscaloosa, Alabama, May 1997.
- > Advanced Applications of Borehole Geophysics to Hydrogeological Investigations, National Ground Water Association, Natick, MA, October 3, 1995.
- > Capture Zone Analysis Techniques Applied to Ground Water Protection and Remediation, Environmental Education Enterprises, Columbus, Ohio, June 1993.
- > Analysis and Design of Aquifer Tests, National Ground Water Association, Columbus, Ohio, March 1992.
- > Selection and Analysis of Shallow Aquifer Tests, Association of Engineering Geologists, Chicago, Illinois, September 30, 1991.
- > Remote Sensing Applications to Hydrogeology, National Water Well Association, 1988.
- > Borehole Geophysics: Applications to Hydrogeology, National Water Well Association, 1988.
- > Modeling Ground water Flow in an Aquifer, University of Kentucky, Institute of Mining and Minerals Research, 1988.
- > Expert Witness Short Course, National Water Well Association, 1987.
- > Ground Water Monitoring in Karst Terrains, National Water Well Association, 1987.
- > Ground Water Monitoring Principles and Sampling Techniques, University of Kentucky, Institute of Mining and Minerals Research, 1986.
- > Applied Hydrology and Sedimentology for Disturbed Areas, University of Kentucky, Institute of Mining and Minerals Research, 1985.
- > Economic Evaluation and Investment Decision Methods, Colorado School of Mines, 1984.
- > Roof Control and Pillar Design, University of Kentucky, Institute of Mining and Minerals Research, 1983.
- > Technical Communications, Colorado School of Mines, 1981.
- > Handling, Preparation, and Use of Coal, American Coal Testing Institute, 1980.

Gerard J. Enigk

Current Position

Manager of Engineering

Profession

Environmental Science
Mining Engineering

Years' Experience

36

Joined Cardno

1994

Education

MS – Environmental
Science, Marshall
University, WV
BS – Mining Engineering,
The Pennsylvania State
University, PA

Professional Registrations

PE – WV

Mine Foreman
Certification, WV

OSHA 40-Hour Health &
Safety Training

MSHA Qualified
Impoundment Inspector

West Virginia Department
of Environmental
Protection (WVDEP)
Approved Person for
Surface Coal Mine and
Quarry Permits

Summary of Experience

Mr. Enigk is responsible for mine planning, design engineering, and feasibility studies of mine properties both domestically and abroad. He conducts geotechnical evaluations of mining conditions and evaluates mine subsidence associated with mine sites. In addition, he conducts environmental site assessments and evaluates post-closure obligations for mining properties.

He has:

- > Evaluated and conducted computer simulation of mine ventilation systems
- > Investigated hundreds of underground coal mine roof failures
- > Managed industrial demolition and site reclamation of coal preparation and base metals processing plants
- > Designed, prepared permits, and conducted feasibility studies for reprocessing and reclamation of coarse and fine coal refuse areas
- > Conducted weekly impoundment monitoring and prepared annual impoundment reports as required by Mine Safety and Health Administration (MSHA)
- > Completed feasibility studies for coal and non-coal mining ventures, including equipment selection and financial modelling
- > Performed operational and environmental due diligence for mining property ownership changes
- > Provided expert witness and technical support services for litigation and adjustment of industrial insurance claims

Specific Projects

- > **Zulia State, Venezuela:** Designed open-cut mine and surface facilities for coal concession
- > **Shanxi Province, China:** Designed facilities and ventilation system for operating longwall coal mine and managed engineering staff
- > **Maras Province, Turkey:** Designed open-cut lignite mine and surface facilities for 260 megawatt (MW) mine-mouth power generation station
- > **Norte de Santander Department, Columbia:** Designed multiple underground coal mines and surface facilities for conversion from traditional mining methods to mechanized mining methods
- > **La Libertad Department, Peru:** Completed site reconnaissance and prepared preliminary mine design for near-vertical underground coal mine resource in remote region
- > **Western Australia:** Designed open-cut, highwall, and underground mine and production systems, and prepared financial evaluations for coal resources

Professional History

1994 – Present

Manager of Engineering

Coordinate mine design and planning for surface and underground mineral properties and technical evaluations of mining equipment, mining property valuations, reserve assessments, and other mining engineering activities. Evaluate mine reclamation liabilities and estimate associated costs. Complete feasibility studies for coal and non-coal mining ventures, including equipment selection and financial modeling. Perform operational and environmental due diligence for mining property ownership changes. Evaluate mine refuse disposal facilities. Provide expert witness and technical support services for litigation and adjustment of industrial insurance claims. Complete evaluations of underground mining conditions and ground control methods. Prepare geotechnical evaluations and designs for underground mine shafts, slopes, and infrastructure. Conduct operation analysis and evaluations and recommend production cost improvements at operating mines. Design remedial measures, including grouting programs for adverse ground conditions. Evaluate mine subsidence potential. Analyze mine ventilation system performance using computer applications. Supervise and mentor junior members of engineering staff. International assignments include projects in China, Venezuela, Turkey, Peru, Colombia, Australia, and Mexico.

1991 – 1994

President

Coordinated purchase of existing business from previous owner. Responsible for all supervisory and administrative activities, including purchasing and sales, for post-consumer material recycling facility. Supervised industrial demolition and environmental remediation activities of field crews at industrial sites.

1987 – 1991

Chief Engineer

Responsible for coordinating and/or preparing all mining plans and environmental permits for start-up of coal mining operations for a company operating two deep mines and one surface mining operation. Evaluated the feasibility for coal production from three separate fine coal impoundments. Completed surveying, mapping, and environmental permit revisions for elimination of impoundments and for final reclamation for four coal refuse disposal areas. Supervised impoundment breaching, regrading, and revegetation work. Conducted weekly impoundment inspections. Prepared annual impoundment reports required by MSHA. Developed contract mining agreements and evaluated prospective contract mining companies

1976 – 1987

Mining Engineer/Assistant Mine Foreman

Principal duties included mine planning and design including production, ventilation, haulage, ground control and service systems. Supervised mine ventilation system changes. Completed several hundred time study analyses of underground mining equipment. Coordinated projects such as facility construction and evaluation of new equipment. Investigated over 200 mine roof failures. Supervised design and preparation of underground opening, NPDES, and mine environmental permits.

F. Allen Meek

Current Position

Senior Project Manager

Profession

Mine Engineering

Years' Experience

35

Joined Cardno

2013

Education

BS – Chemistry, Salem
University, Salem, WV

Professional Registrations

PE – WV

Summary of Experience

F. Allen Meek, Senior Project Manager for Cardno MM&A, is a chemist and Registered Professional Engineer with a great depth of experience in mining and prevention and/or mitigation of mine drainage. His previous experience includes having served as chief mining engineer for a large surface and underground mining complex; served on an appointed task force to develop mining practices to prevent acid mine drainage; developed and operated laboratories and programs to aid in compliance; served as lead corporate environmental affairs manager for a large coal mining company; and conducted remedial investigations and implementation programs for a wide range of environmental pollutants throughout the US and some foreign countries. Over the last five years, he has researched, developed, and implemented biochemical reactor technology for remediation of selenium-impacted waters associated with mining.

Professional Highlights

- > Since 2008, Mr. Meek has worked with clients (most of the major US coal companies) in complying with regulatory imposed Selenium compliance schedules and Selenium corrective action plans resulting from litigation. The primary activities associated with this work have included the following:
 - Completed hydrologic monitoring and modeling to develop design flow rates (for treatment) at seven large (1000-5000 acre) surface coal mining operations.
 - Completed design of various water collection and transfer systems to equalize flow, and prevent non-compliance discharges.
 - Completed sampling and analysis programs to develop design selenium concentrations.
 - Completed and evaluated alternative selenium treatment technologies. Both bench and pilot scale evaluations that included:
 - Applicability and performance of technology
 - Conceptual design
 - Costs to construct and operate
 - Completed demonstration testing utilizing Biochemical Reactor technology, for selenium removal, for 150 weekly periods.
 - Utilized design criteria developed from demonstration testing to design and complete seven full scale selenium treatment systems at large scale surface coal mine operation.
 - The systems have operated successfully and are typically 10% of the cost of other selenium treatment technologies.

Professional Summary continued

- > Served as lead corporate environmental affairs manager for one of the largest coal mining companies in the US. Developed Corporate Environmental Policies and Procedures. Coordinated division engineering and operational management in developing programs to achieve both long and short term environmental goals. Actively participated in state and national associations to achieve reasonable laws and regulations. Advised divisional staff on technical matters such water treatment, remediation, materials handling, and treatment
- > Served as Chief Mining Engineer for a large surface and underground mining complex:
 - Responsible for mine planning, operational engineering support, capitol improvement
 - Coal Preparation, coal quality modeling and forecasting, coal quality control and supervision of coal laboratory
 - Cost forecasting and budgeting, environmental compliance, product quality control
 - Facility Design and improvement projects
- > Conducted research from Laboratory phase through large-scale implementation of acidic mine drainage prevention techniques for coal and hard rock mining operations. Served on Government appointed "Surface Mine Drainage Task Force" which researched and produced "Suggested Guidelines Manual" for surface mining in acid producing overburdens:
 - Served as Mining Engineer in the implementation of large-scale "Acid Mine Drainage prevention techniques" in full-scale surface coal mining operations. This was in affiliation with the West Virginia Acid Mine Drainage Technical Advisory Committee. A government appointed group, of the leading researchers in the field, tasked with the development of mining techniques that would prevent acid mine drainage from acid producing mining area
- > Developed and operated water and geochemistry laboratory and program to comply with Clean Water Act and Surface Mining Act for major mining company. Developed specialized analytical procedures and methods widely accepted in the mining industry
- > Served as VP Operations for organization tasked to handle all environmental remediation for its parent company (major US oil, gas, and chemical company). Included development of environmental reserve and expenditure of these reserves in the completion of environmental remediation projects aimed at reducing corporate environmental liability. Personally managed projects in excess of \$70 million in environmental reserves
- > Project Manager of "Superfund" remediation project involving 500K cubic yards of contaminated sediment removal in a Marine environment. Project included construction of a confined disposal facility. Responsibility included overall project completion, cost, and attainment of remediation objectives from design through execution: \$50 million project.

- > Project Manager of Remedial Investigation/Feasibility Study (RI/FS) for multiple chemical manufacturing facilities producing: chlorine/caustic, chloromethanes, various chlorinated solvents, phenols, Dioxin, oil refineries, and mining operations. Have completed work in Kentucky, Louisiana, Texas, California, Kansas, Washington, West Virginia, Pennsylvania, Canada, and Ecuador.
- > Project manager for implementation of interim and final corrective action plans at multiple sites across US. Projects include excavation, treatment and disposal, SVE, consolidation and capping, Alkaline and acid insitu addition, Insitu biological enhancement, groundwater containment through pump and treat, Insitu oxidation, DNAPL recovery, Dual phase LNAPL recovery, Natural attenuation etc.
- > Project manager for the remediation of contaminated sites associated with major US oil field (largest in California). Included drilling sites, sumps, pits, landfarms, etc. Included interaction with regulatory agency (DTSC), business partners, and former owners of the field
- > Project manager of former oil refinery (Proposed NPL) that had been fully developed (2,500 residents living on the former site). Project involved lead removal action, indoor air mitigation, and dual phase free product recovery. Work included active participation with city officials and property owners
- > Served as principle representative in the sale of many industrial properties for redevelopment and reuse. All properties were impacted by former operation, requiring innovative marketing, regulatory cooperation, varies indemnification mechanisms and purchase and sales agreements. Property sales in excess of \$50 million.
- > Served as an "Expert Witness" in multiple cases dealing with environmental and coal related litigation.

Professional History

2013 – Present

Senior Project Manager

2008 – 2013

Project Manager/Engineer

1993 – 2008

Vice President of Operations/Project Manager

1978 – 1993

Corporate Manager of Environmental Affairs

Publications

- > "Selenium Treatment, Arch-Eastern, Birch Mine", Mine Drainage Task Force Symposium, Morgantown, WV, March 2013.
- > "Selenium Treatment, Arch-Eastern, Birch Mine", Mine Drainage Task Force Symposium, Morgantown, WV, March 2012.
- > Authored Chapter 6.7 in Book titled "Surface Mining". Chapter Title "Water and Air Management". Classic reference and textbook published by Society of Mining Engineers. Widely used by the working engineer and engineering student.
- > "Acid Mine Drainage Treatment Systems: Chemicals and Costs." Published in National Mined Land Research Center Publication titled "Acid Mine Drainage" 1995.
- > "Evaluation of Acid Preventative Techniques used in Surface Mining". Society of Mining Engineers Conference. Denver Co., February 1991.
- > "Assessment of Acid Preventative Techniques Employed at the Island Creek Mining Co. Tenmile Site" WV Task Force Proceedings, 1991.
- > "Development of a Procedure to Accurately Account for the presence of Siderite during mine overburden analysis". Surface Mine Drainage Task Force, 1981.

Justin S. Douthat

Current Position

Director of Engineering Services

Radiation Safety Officer

Profession

Engineer

Years' Experience

17

Joined Cardno

1995

Education

MBA - The Pennsylvania State University, University Park, PA

BS - Mining & Minerals Engineering, Virginia Tech, Blacksburg, VA

AA&S - Engineering, SVCC, Richlands, VA

Professional Registrations

PE - AR, IL, KS, KN, LA, NC, VA, WV

SME - Registered Member (4028345)

OSHA 40 Hour Health and Safety Training

OSHA 8 Hour Supervisory Health and Safety Training

MSHA Qualified Impoundment Inspector

40 Hour Radiation Safety Officer Training

Summary of Experience

Mr. Douthat directs engineering services for the company's energy and mineral resources clients, including those in the aggregates and industrial mineral industries.

His experience includes geologic modeling, reserve calculations, mineral valuations, mine planning and production timing using Carlson Mining® computer software. In addition, he performs end-of-mine reclamation and closure cost assessments that meets the requirements of *Accounting Standard Codification Topic 410 (ASC 410) Accounting for Asset Retirement Obligations*.

He administers training for the use of Carlson Mining® computer software for geologic modeling and mine planning both in the United States and abroad.

Mr. Douthat also coordinates and supervises a company-wide radiation safety program that includes the safety training of geophysical well logging personnel in order to maintain compliance with federal and state nuclear regulatory authorities.

Specifically, he has:

- > Prepared and/or served as a Qualified Person (QP) on multiple technical reports for the public filing of coal resources and coal reserves including those for the U.S. Securities and Exchange Commission, Canadian National Instrument 43-101 Standards for Disclosure of Mineral Projects (NI 43-101) and the Joint Ore Reserves Committee (JORC) code
- > Conducted reserve estimations for both aggregates and industrial minerals clientele that included reviews of potential acquisition properties or expansion areas as well as definition of maximum reserve potential for as-configured operating properties
- > Designed pits for quarries that maximized reserves with a focus on erosion and sediment control
- > Completed amendments to mining permits for submittal to state agencies
- > Worked closely with quarry operations personnel to produce overburden removal and disposal plans along with the associated cut and fill volume estimates for future quarry expansion areas
- > Prepared multiple construction bid packages to include overburden removal and disposal area designs, haul road design and relocation, and all associated erosion and sediment control design construction details
- > Coordinated aerial surveys for topographic mapping and stockpile inventory purposes, and prepared stockpile inventory volume calculations
- > Provided detailed mine planning that included reserve/resource assessment and mine production timing for surface and underground operations utilizing Carlson Mining® computer software

Professional History

2012 – Current

Director of Engineering Services

Responsible for coordination and management of various energy and mineral resources engineering services and projects for clients in the coal, aggregates and industrial minerals industries

2001 – 2012

Project Engineer

Responsible for coordination and management of various energy and mineral resources projects including geologic modeling, reserve calculations, mine planning and production timing for coal reserves using SurvCADD[®] (now Carlson Mining[®]) computer software. Performed end-of-mine reclamation and closure cost assessments including requirements of Financial Accounting Standard No. 143 (*FAS 143 Accounting for Asset Retirement Obligations*). Administered training for the use of SurvCADD[®] computer software for geologic modeling and mine planning both in the United States and abroad. Either directly provided or managed reserve estimation services to aggregates and industrial minerals clientele, including reviews of potential acquisition properties or expansion areas as well as definition of maximum reserve potential for as-configured operations. Performed ultimate pit design and mine planning for maximization of quarry reserves. Responsible for quarry permitting projects, including erosion and sediment control design, including completion of permit amendment submittals to state agency officials. Worked closely with quarry operations personnel to produce overburden removal and disposal plans along with the associated cut and fill volume estimates for future quarry expansion areas. Prepared multiple construction bid packages to include overburden removal and disposal designs, haul road design and relocation, and all associated erosion and sediment control design construction details. Responsible for the coordination of aerial surveys for topographic mapping and stockpile inventory purposes, and prepared stockpile inventory volume calculations.

1998 - Present

Radiation Safety Officer

Coordinate and supervise company-wide radiation safety program including the safety training of geophysical well logging personnel, and ensure compliance with federal and state nuclear regulatory authorities.

1996 - 2000

Mining Engineer, Assistant Geophysical Director

Responsible for detailed mine planning including reserve/resource assessment and mine production timing for surface and underground operations using SurvCADD[®] (now Carlson Mining[®]) computer software. Conducted geotechnical and ground control investigations for underground mine roof support requirements, including special requirements for shallow-cover stream crossings. Performed mine subsidence assessments including computer prediction modeling and mitigation recommendations. Assessed shaft and portal site locations based on geotechnical analysis. Responsible for analyzing mine ventilation requirements, shaft-sizing, and ventilation network analysis using VNETPC computer software. Conducted operations analyses including coal processing, materials handling and product allocation, and detailed cut/fill volume calculations using computer methods. Performed valuations of mining operations and properties, as well as equipment and related facilities. Conducted assessments of end-of-mine life reclamation liabilities including calculation of earthwork quantities and costs. Provided engineering support in assessing damage claims due to blasting and

subsidence, as well as assessing dust control measures as a result of complaints from public. Managed daily operations of Geophysical Logging Department.

1995 - 1996

Geophysical Logging Engineer

Gamma-Density geophysical logging of coal exploration wells, hydrogeological and video logging for the purpose of determining ground water infiltration points and fracture/bedding plane locations for environmental wells.

Summer 1994

Engineering Assistant

Tarmac Mid-Atlantic (Jack Plant), Petersburg, Virginia

Performed time studies of work cycle times in quarry pit. Updated and maintained equipment maintenance schedule. Assisted in collection of crushed stone samples for quality control. Assisted in construction activities of crushing and screening plant upgrades

1993

Underground Utility Assistant

Consolidation Coal Company (Buchanan Mine), Mavisdale, Virginia

Assisted in maintenance of underground mine including construction of seals and overcasts, conveyor belt moves for new production sections and other general utility tasks.

Publications

- > "Engineering Aspects of Synfuel Plant Projects," April 20, 2001, Lexington, Kentucky, presented at the Central Appalachian Section of the Society of Mining Engineers Conference, co-author John E. Feddock, P.E.

Certifications

- > Registered Professional Engineer, Illinois, Certification No. 062-060237
- > Registered Professional Engineer, Kansas, Certification No. 19273
- > Registered Professional Engineer, Kentucky, Certification No. 25239
- > Registered Professional Engineer, North Carolina, Certification No. 033311
- > Registered Professional Engineer, Virginia, Certification No. 035270
- > Registered Professional Engineer, West Virginia, Certification No. 17219
- > Registered Professional Engineer, Arkansas, Certification No. 13918
- > Registered Professional Engineer, Louisiana, Certification No. 34909
- > OSHA 40 Hr. Health and Safety Training, 29 CFR 1910.120, Certification No. 7432
- > OSHA 8 Hr. Supervisory Health & Safety Training, 29 CFR 1910.120, Certification No. 2717
- > MSHA Qualified Impoundment Inspector
- > 40 Hour Radiation Safety Officer Training

Memberships

- > Registered Member of the Society for Mining, Metallurgy and Exploration (SME) of AIME, Member No. 4028345

C. Myron Amick

Current Position

Senior Project Manager

Profession

Civil Engineering

Years' Experience

31

Joined Cardno

2005

Education

BS, Civil Engineering,
West Virginia Institute of
Technology, 1978

MBA, Virginia Tech,
1996

Professional Registrations

PE – VA, WV, OH, PA,
GA, FL, MD

Registered Land
Surveyor – WV

Roadway Worker
Protection Training

Summary of Experience

Mr. Amick has experience is predominately in the field of water, wastewater and stormwater. Has served as both project engineer and project manager on numerous projects involving wastewater collection and pumping systems, water distribution and pumping systems, and treatment systems for both water and wastewater. He has been involved in projects from conception through construction; involvement includes rehabilitation and renovations to existing facilities as well as completely new water and wastewater facilities.

Significant Projects

- > Design of Cool Ridge/Flat Top Wastewater Collection and Disposal System, Shady Spring PSD, Raleigh County, West Virginia.
- > Design and construction services for an interceptor sewer replacement for the Town of Athens, Mercer County, West Virginia.
- > Design of upgrades to three (3) of Prince William County Service Authority's Sewage Pumping Stations near Gainesville, Virginia.
- > Design of grinder pump pressure sewer system and pump stations for Allegany County, Maryland.
- > Design of Ashland Scenic Campground wastewater collection and treatment system, McDowell County, West Virginia.
- > Design of water mains along Haycock Road and Lee Highway in the City of Falls Church, Virginia.
- > Design of upgrades to the Water Filtration Plant, Town of Leesburg, Virginia.
- > Design of a water main across the Lewes and Rehoboth Canal, to serve the City of Rehoboth Beach, Delaware.
- > Design and construction of two elevated water storage tanks (2,000,000 gallons each) for Prince William County Service Authority, Prince William County, Virginia.
- > Hydraulic Study of Fire Flow, CSXT Selkirk Rail Yard, Selkirk, New York.
- > Winding View Subdivision water distribution pipeline design and two water booster stations, Raleigh County, West Virginia.

Professional History

2005 – Present

Senior Project Engineer

Responsible for project management on civil, and environmental projects while performing a variety of tasks in engineering design and construction services including the following:

- Studies to evaluate municipal water and wastewater needs of towns and public service districts.
- Wastewater collection systems including grinder pump pressure and conventional gravity sewers.
- Wastewater pumping facilities including submersible and vertical turbine pump stations.
- Design of landfill caps and surface drainage for existing landfills.
- Design of storm water drainage systems and sediment ponds.
- Design of ground water remediation projects.
- Engineering design report and design services for upgrades to industrial wastewater treatment plants.
- Preliminary engineering report on recommended upgrades to industrial water and wastewater systems.
- Design and bid phase services for rail yard equipment wash pad projects which include oil/water separators, pump stations and maintenance buildings.
- Design of transmission fuel pipelines and re-fueling facilities.

1997 – 2005

Project Manager

Responsible for report preparation, design, supervision of technical support personnel, project budgeting and scheduling, preparation of plans and specifications, cost estimations and construction administration and serving as primary client contact for projects of the type listed below:

- Studies to evaluate municipal water and wastewater needs of towns and public service districts.
- Wastewater collection systems including grinder pump pressure and conventional gravity sewers.
- Wastewater pumping facilities including submersible and vertical turbine pump stations.
- New wastewater treatment facilities and upgrades to existing treatment facilities, including extended aeration and SBR plants.
- Site development plans for municipal sewage facilities.
- Engineering services proposals that included: scope of work, man-hour estimates, project scheduling, and cost estimation.

1984 – 1994

Project Manager

Responsible for technical supervision, project budgeting and scheduling. Projects involved report writing, preparation of plans and specifications, cost estimations and

construction administration for numerous types of facilities including the following:

- Reports to evaluate water and wastewater needs for towns and public water and sewer authorities.
- Wastewater collection systems including pressure, vacuum, and gravity sewers.
- Water and sewage pumping facilities, including upgrades to existing stations
- Upgrades to existing water and wastewater treatment facilities.
- Site development plans for municipal water and sewage facilities for review and approval by local government agencies.
- Water distribution systems in sizes through 36-inches.
- Water storage tanks, both elevated and ground storage, in capacities through 2 million gallons.
- Served as client representative for the review of land development plans.

1979 – 1984

Project Engineer

Responsible for technical support for projects of type outlined above prior to relocation to Washington, DC.

Select Project Experience

- > Work experience is predominately in the field of water, wastewater and stormwater. Has served as both project engineer and project manager on numerous projects involving wastewater collection and pumping systems, water distribution and pumping systems, and treatment systems for both water and wastewater. Been involved in projects from conception through construction; involvement includes rehabilitation and renovations to existing facilities as well as completely new water and wastewater facilities.
- > Involvement in water and wastewater projects in the concept phase includes preparation of preliminary engineering reports, examining project costs, system hydraulics, and overall project feasibility. Design phase involvement includes engineering calculations, preparation of construction contract documents consisting of drawings and technical specifications. Involvement in the construction phase of projects has included construction administration duties consisting of attendance at monthly progress meetings, review of contractors' pay requests, review of shop drawings, and general project supervision.
- > Over 27 years experience in sanitary engineering and extensive experience in the states of West Virginia and Virginia. Also worked on projects in Maryland and Delaware. Accomplishments include: design of the first vacuum sewer system in the State of West Virginia, design of the first public water treatment system in the State of Virginia to utilize a granular activated carbon filter for treatment, and design of three (3) elevated water storage tanks of two million gallon capacity.

Select Landfill Projects

- > Landfill Cap/Cover Design and Construction Oversight, NSRC Canal Ridge Landfill, Cincinnati, Ohio
- > Landfill Cap/Cover Design, Alcoa 107 Landfill, Alcoa, Tennessee.

Selected Site Development and Storm Drainage Projects

- > Haul Road Box Culvert Design, Vulcan Materials, Sanders Quarry, Warrenton, Virginia.
- > Sediment Pond Design, Vulcan Materials, Amelia Quarry, Amelia, Virginia.
- > Plans for two (2) potable water booster stations for Prince William County Service Authority, Prince William County, Virginia.
- > Plans for three (3) two million gallon elevated water storage tanks for Prince William County Service Authority, Prince William County, Virginia.

Selected Industrial Wastewater Projects:

- > Equipment Wash Pad Improvements, NSRC Pitcairn Intermodal Rail Yard, Wall, Pennsylvania.
- > Pump Station Upgrade, NSRC Oliver Rail Yard, New Orleans, Louisiana.
- > Pump Station Upgrade, NSRC Enola Rail Yard, Enola, Pennsylvania.
- > Industrial Sewer System Cleaning, Inspection, and Mapping, CSXT Frontier Rail Yard, Buffalo, New York.
- > Free Product Recovery Trench Design, NSRC Debutts Mechanical Facility, Chattanooga, Tennessee.
- > Free Product Recovery Trench Design and Construction Services, NSRC, Ft. Wayne Rail Yard, Ft. Wayne, Indiana.
- > Industrial Wastewater Monitoring and Diversion System Design, NSRC Rickenbacker Intermodal Facility, Lockbourne, Ohio.
- > Preliminary engineering report for upgrades to the CSXT Boyles Rail Yard wastewater treatment plant, Birmingham, Alabama.
- > Engineering design report for upgrades to the Norfolk Southern Spencer Rail Yard wastewater treatment plant, Linwood, North Carolina.
- > Design and construction services for a new equipment wash pad for the Cincinnati Intermodal Facility at the Norfolk Southern Rail Yard, Cincinnati, Ohio.
- > Design and construction services for a new equipment wash pad for the Norfolk Southern Voltz Rail Yard, Kansas City, Missouri.

Selected Fuel Pipeline Projects:

- > Relocation of Underground Fuel Pipeline Design, NSRC Inman Rail Yard, Atlanta, Georgia.
- > Relocation of Fueling Platform Utilities Design, NSRC Brosnan Rail Yard, Macon, Georgia.
- > Relocation of Fueling Platform Utilities Design, NSRC John Sevier Rail Yard, Knoxville, Tennessee.
- > Relocation and Replacement of Fueling Platform Utilities, NSRC Brosnan Rail Yard, Macon, Georgia.

- > Emergency Tank Car Unloading, NSRC Shaffers Crossing Rail Yard, Roanoke, Virginia.
- > Relocation and Replacement of Fueling Platform Utilities, NSRC Buckeye Rail Yard, Columbus, Ohio.

Selected Water Projects:

- > Hydraulic Study of Fire Flow, CSXT Selkirk Rail Yard, Selkirk, New York.
- > Winding View Subdivision water distribution pipeline design and two water booster stations, Raleigh County, West Virginia.
- > Ashland Scenic Campground water treatment and distribution system design, McDowell County, West Virginia.
- > Danese Public Service District Waterline Extension Study, Fayette County, West Virginia.
- > Drews Creek/Peachtree Waterline Extension Study, Raleigh County Public Service District, West Virginia.
- > Water Treatment Plant and Distribution System Upgrade Study, Town of Rhodell, West Virginia.
- > Engineering report presenting alternative water system designs and associated costs for Page-Kincaid PSD, West Virginia.
- > Design of two (2) 50,000 gallon water storage tanks for Bull Run Mountain Sanitary District in Prince William County, Virginia.
- > Engineering report presenting alternative water system designs and associated costs for Spruce Fork PSD, West Virginia.
- > Design and construction of two elevated water storage tanks (2,000,000 gallons each) for Prince William County Service Authority, Prince William County, Virginia.
- > Design of water transmission mains for the Town of Leesburg, Virginia.
- > Plan review for Charles County, Maryland, Department of Public Works for a period of over two years.
- > Design of water mains along Haycock Road and Lee Highway in the City of Falls Church, Virginia.
- > Design of upgrades to the Water Filtration Plant, Town of Leesburg, Virginia.
- > Water treatment plant construction/renovation project for the Town of Grantsville, Calhoun County, West Virginia.
- > Design of a water main along Wellington Road for Prince William County Service Authority, Prince William County, Virginia.
- > Design of a water main along Dorman Street for the City of Harrington, Delaware.
- > Design of a water main across the Lewes and Rehoboth Canal, to serve the City of Rehoboth Beach, Delaware.
- > Design of Water System Improvements, Pocahontas High School, Pocahontas County, West Virginia.

Selected Municipal Wastewater Projects:

- > Wastewater collection and treatment systems facility plan for the following clients: Allegany County DPW, Allegany County, MD; Charles County DPW, Charles County, MD; Red Jacket PSD, Mingo County, WV; Paint Creek PSD, Kanawha County, WV; Bramwell PSD, Mercer County, WV; London PSD, Kanawha County, WV; Town of Sand Fork, Gilmer County, WV; Silverton PSD, Jackson County, WV;

and Hamlin PSD, Lincoln County, WV, and Shady Springs PSD, WV.

- > Comprehensive sewer plans and evaluations of existing facilities at the Airport, Gainesville, Flat Branch, and Piney Branch Sewage Collection and Pumping Facilities for Prince William County Service Authority, Virginia.
- > Preliminary Engineering Reports for Shady Spring Public Service District including: Glade Springs Sewer System Expansion, Pluto Road/The Oaks Sewer System Extension, Airport Road Sewer System Extension, Cool Ridge/Flat Top Wastewater Facility Plan and Mont Phillips Sewage Collection System.
- > Infiltration/inflow studies for the City of Point Pleasant and the Town of Henderson, Mason County, West Virginia.
- > Design of Ashland Scenic Campground wastewater collection and treatment system.
- > Design of Cool Ridge/Flat Top Wastewater Collection and Disposal System, Shady Spring PSD, Raleigh County, West Virginia.
- > Design of wastewater collector sewers for the Mont Phillips area of Shady Spring Public Service District, Raleigh County, West Virginia.
- > Design of a vacuum sewage disposal system to serve Red Jacket PSD, Mingo County, West Virginia.
- > Design of wastewater pump station and collector sewers to serve the Town of Matewan, West Virginia.
- > Design and construction services for an interceptor sewer replacement for the Town of Athens, Mercer County, West Virginia.
- > Wastewater Treatment Study for the Town of Athens, Mercer County, West Virginia.
- > Design of Treatment Plant Improvements for the Town of Athens, Mercer County, West Virginia.
- > Design of a sewage collection system to serve the Beaver Area of Craigsville Public Service District, West Virginia.
- > Design of wastewater treatment plant upgrades at Shady Spring Public Service District, Raleigh County, West Virginia.
- > Design of the Airport Road / The Oaks Sewer Extension, Shady Spring Public Service District, Raleigh County, West Virginia.
- > Design of Pluto Road Sewer Extension, Shady Spring Public Service District, Raleigh County, West Virginia.
- > Design of Little Beaver Interceptor Sewer, Pump Station and Force Main, Shady Spring PSD, Raleigh County, West Virginia.
- > Design of a sewage collection system to serve the Coal River Public Service District, Boone County, West Virginia.
- > Public sewer system renovation project for the Hamlin Public Service District, Lincoln County, West Virginia.
- > Design of grinder pump pressure sewer system and pump stations for Allegany County, Maryland.
- > Design of upgrades to three (3) of Prince William County Service Authority's Sewage Pumping Stations near Gainesville, Virginia.
- > Design of a maintenance garage and lime treatment system for the City of Rehoboth Beach, Delaware, wastewater treatment plant.

Donald E. Phillips

Current Position

Senior Project Manager

Profession

Civil Engineering,
Permitting

Years' Experience

35

Joined Cardno

2013

Education

BS – Civil Engineering,
West Virginia Institute of
Technology,
Montgomery, WV

Professional Certifications

MSHA, Certified
Impoundment Inspector

Certified Monitoring Well
Driller

Certified Compaction
Inspector

Affiliations

Fayette County Solid
Waste Authority

City of Oak Hill Zoning
Appeals Board

Summary of Experience

Mr. Phillips has over 35 years of experience with subsurface investigation, laboratory testing, design engineering, permitting, reclamation design, construction materials testing, and construction monitoring projects throughout Central Appalachia and the Illinois Basin. Mr. Phillips has served as Project Manager for industry, governmental agency, and municipal projects involving geotechnical investigation, instrumentation, and analysis, coal refuse (combined coal refuse and slurry impoundment) facility design and permitting, industrial waste disposal facility design and permitting, site design, reclamation design of refuse disposal facilities and abandoned mine lands, facility expansion evaluations, construction materials testing, construction management, and construction quality control.

Significant Projects

Impoundment projects Mr. Phillips has been involved with include:

- River Fork Impoundment, Boone County, WV
- Cherry Tree Impoundment, Kanawha County, WV
- Galatia Mine East Refuse Impoundment Expansion, Saline County, IL
- Bunkhouse Refuse Impoundment, Saline County, IL
- Ohio American Coal Company Nova Impoundment, Jefferson County, OH
- Ohio Valley Coal Company Dam No.2, Belmont County, OH
- Maple Creek Dam No.3, Washington County, PA
- Stephens Fork Impoundment, Wayne County, WV
- Trace Branch Refuse Impoundment, Wayne County, WV
- Maynard Branch Refuse Impoundment, Wayne County, WV
- Scaffold Lick Branch Impoundment, Martin County, KY
- Band Mill Hollow Impoundment, Wise County, VA
- Nile Stone Impoundment, Mingo County, WV
- Dunn Hollow Refuse Impoundment, Inc., Kanawha County, WV
- Indian Creek Refuse Impoundment, Boone County, WV
- Twelvepole Refuse Impoundment, Mingo County, WV
- Lick Branch Refuse Impoundment, Virginia Crews Coal Company, McDowell County, WV
- Aldrich Branch Refuse Impoundment, Mingo County, WV
- Cedar Branch Refuse Impoundment, Buchanan County, VA
- Scaffold Lick Refuse Impoundment, Pike County, KY
- Band Mill Hollow Refuse Impoundment, Wise County, VA
- Oven Fork Refuse Impoundment (Feasibility Studies), Letcher County, KY
- Nile Stone Refuse Impoundment, Mingo County, WV
- Spruce Fork No. 2 Refuse Impoundment (Breach and Abandonment Design, Mingo County, WV
- Trace Branch Refuse Impoundment, Wayne County, WV
- Moccasin Hollow Refuse Impoundment (Feasibility Studies), Kanawha County, WV
- King Branch Refuse Impoundment, Knott County, KY
- Oldhe Fork Refuse Impoundment, Webster County, WV
- Fork Creek Refuse Impoundment, Boone County, WV
- Peach Orchard Branch Refuse Impoundment, Fola Nicholas County, WV
- Maynard Branch Refuse Impoundment, Mingo County, WV

Select Projects
Continued

Mr. Phillips has been involved with the following reclamation projects:

- > West Virginia Department of Environmental Protection (WVDEP), Office of Abandoned Mine Lands & Reclamation
 - Sugar Camp Branch Refuse Pile
 - Eunice Complex
 - Ashland "Poca Land" Complex
 - Lumberport Water Supply
 - Thaxton Landslide
 - Pell School Strip #2 and Portals
 - Sugar Valley Portals Project
 - Laura Lee Mine Complex
 - Rosebud Refuse and Portals Project
 - Cranberry Refuse Pile
 - Shannon Branch Refuse Pile
 - Lick Run Impoundment Abandonment, Lick Run #2
 - Stalnaker Road Highwall & Portals
 - Curtin Structures Project, Ennis Complex
 - Red Jacket (Parker) Drainage
 - Shegon Refuse Pile & Highwall Project.

- > West Virginia Department of Energy (WVDOE), Abandoned Mine Lands Section
 - Hurricane Fork, Gordon, Frozen Branch Dawmont, Bearwallow, and East Gulf Refuse Facilities
 - Amherstdale Refuse Facilities and Mine Complex,
 - Low Gap Impoundment,
 - Harrah Mine Blow-out Project,
 - MacIntire Mine Drainage Abatement Project,
 - Bearwallow Refuse Pile,
 - Troy Town Refuse Pile,
 - Big Stick Mine Dumps,
 - Doug Gray and John Iaquinta Subsidence Abatement,
 - Longacre Refuse Pile,
 - Covel Refuse Pile,
 - Rita Structures,
 - William Browskey Highwall,
 - Lobar Tipple Project

Professional History

2013 – Present

Senior Project Manager

Cardno MM&A

Responsible for client contact, proposal preparation, coordination and management of engineering projects involving; subsurface exploration and sampling, geotechnical testing and analysis, development of design plans and specifications, permit acquisition, abandoned mine land reclamation design, construction monitoring and construction quality control for facilities such as; mine sites and preparation plants, refuse disposal facilities, refuse impounding structures, fresh water dams, industrial waste disposal facilities.

1987 – 2013

General Manager/Senior Project Manager

Esmer & Associates, Inc.

As Senior Project Manager/General Manager duties included the following:

- Management of Office Activities and Office Personnel
- Corporate Reporting and Licensing
- Corporate and Personnel Insurance
- Personnel Benefits
- Nuclear Regulatory Licensing
- Client Contact
- Proposal Preparation

Management and Supervision of:

- Subsurface Exploration Department
- Soil and Concrete Testing Laboratories
- Design Engineering Department
- Field Engineering and Construction Services Department

Department and Personnel Coordination for Engineering Projects Involving:

- Geotechnical and Geological Exploration
- Ground Water Monitoring
- Soil and Ground Water Sampling
- Geotechnical Testing and Evaluation
- Engineering Design and Development of Plans and Specifications
- Permit Acquisition
- Construction Testing and Monitoring

Projects Involved with include:

- Coal Mine and Preparation Plant Site Design
- Abandoned Mine Land Reclamation
- Dams and Impounding Structures
- Coal Refuse Disposal Facilities
- Environmental Assessments
- Sanitary Landfills
- Industrial Waste Disposal
- Shopping Centers and Commercial Developments
- Water Supply and Sanitary Sewers

1985 – 1987

Project Manager/Senior Project Engineer

Esmer & Associates, Inc.

As Project Manager/Senior Project Engineer duties included the following:

- > Client Contact
- > Proposal Preparation
- > Management and Supervision of:
 - Subsurface Exploration Department
 - Soil and Concrete Testing Laboratories
 - Design Engineering Department
 - Field Engineering and Construction Services Department
- > Nuclear Regulatory Licensing
- > Department and Personnel Coordination for Engineering Projects Involving:
 - Geotechnical and Geological Exploration
 - Ground Water Monitoring
 - Soil and Ground Water Sampling
 - Geotechnical Testing and Evaluation
 - Engineering Design and Development of Plans and Specifications
 - Permit Acquisition
 - Construction Testing and Monitoring

Projects Involved with include:

- Coal Mine and Preparation Plant Site Design
- Abandoned Mine Land Reclamation
- Dams and Impounding Structures
- Coal Refuse Disposal Facilities
- Environmental Assessments
- Sanitary Landfills
- Industrial Waste Disposal
- Shopping Centers and Commercial Developments
- Water Supply and Sanitary Sewers

1978 – 1979

Field Engineer

Esmer & Associates, Inc.

As Field Engineer, duties included: supervision of field and laboratory technicians; monitoring personnel radiation exposure; as well as, design and permit acquisition for facilities related to the coal mining industry.

David J. McChesney

Current Position

Senior Mining Engineer

Profession

Mining Engineering

Years' Experience

31

Joined Cardno

2004

Education

- > BS – Mining Engineering, Michigan Technological University, Houghton, MI

Professional Registrations

- > PE – WV, NC, CO

Affiliations

- > Society for Mining, Metallurgy, and Exploration, Inc. (SME) – Registered Member
- > International Society of Explosives Engineers (ISEE)
- > Tau Beta Pi engineering honor society; membership since 1981

Summary of Experience

Mr. McChesney performs geologic modelling, reserve calculations, mine and reclamation planning, production timing, and cost computations for active and proposed mine properties both domestically and abroad. His work experience includes coal, precious metals, and oil shale projects.

He has:

- > Performed computations for coal reserve and resource reports
- > Performed engineering design and cost computations for feasibility studies of surface coal and metal operations
- > Provided daily engineering support for coal and metal operations
- > Successfully applied mining software to predict monthly production volumes, tonnages, and qualities at active mining operations
- > Utilized similar software to sequence mining activity and schedule life-of-mine production for surface coal and precious metal operations
- > Designed reclamation surfaces incorporating geomorphic land shaping based on the GeoFluv approach and Natural Regrade software
- > Prepared budgets and devised strategies to improve productivity and comply with state and federal regulations for mining operations
- > Created and modified blasting plans to incorporate cast blasting and develop procedures to document compliance with regulatory vibration maximum values
- > Performed end-of-mine reclamation and closure cost estimates to comply with the general requirements of Asset Retirement and Environmental Obligations as stipulated in Accounting Standard Codification Topic 410 (ASC 410)
- > Performed economic justifications and look-backs for new equipment purchases
- > Extensive experience using AutoCAD, Carlson Mining, Carlson Natural Regrade, Microsoft Office products, CAT Fleet Production and Cost Analysis (FPC), and programming in Visual Basic Applications
- > Provided technical training in software application

Significant Projects

- > Magallenas Region, Chile: Provided technical and operational assistance during the initial first year of a surface coal mine
- > Western Australia: Designed a proposed open-cut and highwall mine and participated in preparing the surface mining chapter of the associated Definitive Feasibility Study
- > Queensland Australia: Provided technical assistance in evaluating an active mining operation for potential purchase

Professional History

12/2004 – Current

Senior Mining Engineer

Cardno MM&A

Responsibilities include geologic and mine modeling, mine planning, mine costing and production timing to support reserve evaluations and feasibility studies. During this time, Dave has performed these tasks:

- > Construct geologic model that requires detailed knowledge of the database and the capabilities of the modeling program. In some instances, additional code is written to resolve conflicts in the model.
- > Compute equipment cycle times and productivities based on the mine geometry, anticipated work schedule, and desired production level for mine planning. Additionally, it requires performing an iterative exercise to determine the appropriate sequence of extraction so that scheduled production levels can be achieved and maintained.
- > Evaluate and recommend improvements in the existing mine plan at client's operating mines.
- > Accompany clients on visits to potential acquisitions of mining properties to provide mining engineering expertise.
- > Design reclamation plans incorporating fluvial geomorphic land shaping methods to create stable reclamation surfaces.
- > Recommend an innovative pit sloping and parallel digging combination to handle and control ground water problems at a client's mine.

12/1998 – 09/2004

Operations Engineer

AEI Resources / Horizon Coal Company

Responsibilities were expanded to include operations engineering support for five surface operations after the company was acquired by AEI Resources. Dave successfully created geologic/mine models for the surface operations that provided the means to accurately predict production and quality results for each mine. He expanded usage of seismographs to record production blasting results. This provided sufficient data to show blast vibrations were well within the legal limits and enabled Dave to successfully convince the regulatory agency to allow large cast blast shots that ultimately helped mine higher strip ratio coals. He proposed excavation plans that maintained sufficient working areas so that equipment was effectively utilized and production goals were achieved.

11/1992 – 11/1998

Senior Mining Engineer

Zeigler Coal Company – Pike County Coal Division

Responsibilities were similar to the previous mining period except under new company ownership. Dave improved on methods of mine modeling and production-tracking to compute the volume of undesirable rehandle material that the mine was experiencing and which was impacting production goals. He modified the mine plan to reduce the mine rehandle figures to acceptable limits. Dave performed the economic justification for the purchase of a large front-end loader to increase production. His continued improvement in mine modeling enabled the company to better predict the quality of future production. He developed blast plans that were used to successfully petition the regulatory agencies to increase the blasting explosive usage per blast. Dave improved the pre-blast survey record keeping and response to blasting complaints and successfully adopted the usage of seismographs for recording blast vibrations.

06/1989 – 10/1992

Operations Engineer

Shell Mining Company – Pike County Coal Division

Responsibilities included operations engineering for surface mines that were not meeting the company's budgetary production and operating cost goals. This included constructing the first geologic and mine model for the mine properties and recognizing that increased stripping ratio that was partially contributing to increased mine cost. Dave was instrumental in improving the production record keeping, showing the economic limits of various mining equipment, and adopting low-cost cast blast and bulldozer production into the mine plan. He performed the economic justification for the purchase of two large rock trucks and the transition to a 24-hour / 7-day a week work schedule.

01/1986 – 05/1989

Mining Engineer

Shell Mining Company – BMUSA

Responsibilities included computer modeling of precious metal deposits using core drilling rock type and analytical results. Dave evaluated alternative open pit geometries to determine through incremental analysis what configuration provided the greatest metal recovery for the lowest operating cost and greatest Net Present Value by converting the block model into a dollar matrix. The effort culminated with his participation in the company's first surface gold mine in Mojave, California. He refined the mine's model to reflect the selective mining unit size, pit slopes, and cut off grades determined by the mining and processing cost. Dave updated the model on a daily basis by merging the results of production drilling with lab analysis and appending the additional data to existing drill data used in the model. This effort improved the predictability of deeper unmined reserves. He periodically modified the open pit geometry and associated ramp access to reflect the changes in the geologic model. Dave derived a new contract price agreement with the mining contractor to encourage additional mine extraction.

07/1981 – 12/1985

Mining Engineer

Shell Mining Company – Mineral Ventures Group

Responsibilities included engineering and economic evaluations of oil shale projects involving fee property and proposed Federal leases in Colorado. This included preparing a report that provided supporting computations justifying the extractable reserves in a critical land exchange effort with Bureau of Land Management that allowed Shell to consolidate its land and mineral position in the Piceance Basin. It also included field work in support of Shell's proprietary technology of in-situ extraction of shale oil.

Brian M. Parker

Current Position

Mining Engineer

Profession

Mining Engineering

Years' Experience

6

Joined Cardno

2006

Education

MS - Mining
Engineering, Virginia
Polytechnic Institute &
State University,
Blacksburg, VA

BS - Mining
Engineering, Virginia
Polytechnic Institute &
State University,
Blacksburg, VA

Professional Registrations

PE - VA

MSHA 8-Hr. Annual
Refresher, Underground
& Surface

VA - General Mineral
Miner Certification

Affiliations

SME of AIME

Summary of Experience

Mr. Parker manages aspects of mining engineering projects with a focus on:

- > Geologic modeling
- > Reserve calculations
- > Cut and fill, and stockpile volume analyses
- > Permit amendments
- > Overburden and pit design
- > Surface hydrology modeling
- > Erosion and sediment control structure design
- > Spill Prevention, Control, and Countermeasures (SPCC) plans
- > Sampling and monitoring of ground water wells
- > Processing plant optimization
- > Flotation control management

for the aggregate and industrial minerals industries.

In addition, he provides support for surface and underground mine planning, coal reserve audits and evaluations, subsidence analyses, geologic modeling, and ventilation analysis.

Significant Projects

- > **Major Aggregate and Quarry Operations:** Assisted in design of various erosion and sediment control devices for multiple aggregate sites throughout Virginia; designed multiple pit layouts for the purpose of representing pit expansion over time and ultimate pits; prepared Virginia Department of Mines, Minerals and Energy (DMME) permit amendments and design work for more than 15 different aggregate sites in Virginia.
- > **Federal Emergency Management Agency (FEMA) Certified Letter of Map Revision (CLOMR) due to Mine Expansion:** Designed tributary relocation for aggregate mine site; prepared all necessary information required for submitting CLOMR; collected information for and assisted in completing Hydrologic Engineering Centers-River Analysis System (HEC-RAS) model for CLOMR submittal; completed all mapping and application requirements for submittal of CLOMR document to county agency and FEMA.
- > **National Pollution Discharge Elimination System (NPDES) Plans:** Prepared or managed the preparation of all best management practices (BMP) stormwater pollution prevention plans (SPPP), and discharge elimination system plans for more than 40 mine sites in Virginia and North Carolina.

Professional History

2010 – Present

Mining Engineer

Responsible for providing engineering support for various energy and mineral resources projects including geologic modeling, mine planning, permitting and stockpile volume calculations.

2006 – 2010

Graduate Engineer

Assisted in the preparation of permit amendments for various aggregate operations including overburden disposal design, surface hydrology modeling, erosion and sediment control structure design, and all related written documentation required by state agencies.

2004 – 2006

Research Assistant, Mining Department

Sampled, compiled data, and assisted in research for Mine-to-Mill project. Worked directly with JKMRC, Luck Stone, and Austin Powder while performing various tasks for the project, as well as managed and supervised lab employees.

2001 & 2002

Mining Engineer Intern

While working within the phosphate industry, assisted mining engineers with processing plant projects including flotation camera and nuclear magnetic resonance testing. Sampled whirلسizers, density/gravity cyclones, flotation cells and other processing plant equipment to determine efficiency and optimum operation. Experimented with approved personal projects which were believed by company to be important areas to research. Performed many presentations on project results and the decided conclusions.

2001

Environmental Intern

Performed daily environmental tasks such as monitoring recharge ditches, sampling potable water sources, and waste water management for phosphate mining operation. Designed recharge ditch for future mining area and submitted a report used to prove water levels would remain environmentally safe.

Earl L. Chornsabay

Current Position

Senior Engineering
Technician

Profession

Designer/Drafter -
Engineering

Years' Experience

31

Joined Cardno

2003

Education

Board Drafting I and II
and AutoCAD, Fayette
Plateau Vocational
Technical Center, Oak
Hill West Virginia

Summary of Experience

Mr. Chornsabay's work includes the design and permitting aspects of mining. He performs CAD modelling and mine planning including site and construction details necessary to obtain permits or address compliance issues for various mining operations. Included in his scope of work are mine modelling/planning for site development, mineral production ratios, hydrology calculations, AOC modelling, selenium treatment system (bio-reactor) site design with construction details, stability analysis calculations and road construction design.

Significant Projects

- > **Arch Coal, Inc.** – Served as on-site Engineering Technician at the Samples Mine Complex which included CAD modelling for environmental, production, certification and budget requirements, maintaining compliance data and working with inspecting agencies, assisting with the site mine safety program, and overseeing site construction and aerial flight projects.
- > **Cardno MM&A** – Design and preparation of multiple mining operations for the purpose of obtaining permits or addressing remedial requirements as specified by various agencies. Total site design and applications utilizing the following software; Carlson 2014 (mine modelling and design including pit calculations, operational infrastructure, drainage, and final regrade), SedCad (hydrology calculations and design), Reame (stability analysis calculations), and CulvertMaster (hydrology calculations and design).

Professional History

2003 - Present

Senior Engineering Technician

Senior Engineering Technician providing SurvCadd design and mapping support for various components of permitting applications. Design background consisting of hydrology (SedCad and Piping Calculations), road design, mining development, final regrade, stability analysis calculations and air quality emissions calculations. Project design includes several contour and mountaintop operations, deep mine complexes, refuse impoundments, bio-reactor selenium treatment systems, prep-plant and load-out facilities. Hydrology including culvert and total drainage calculations for coal mining, culvert design for civil projects, and SWROA assessments.

1997 - 2003

Engineering Technician

Provide SurvCadd design and mapping for all components of mining projects. Duties included project management, coordinating survey requirements for various projects to include GPS data conversion and interpolation of point files for purpose of design, certifications, volumetric and legal issues; and soils and water analysis, for concentration readings, both lab and field including baseline, raws, and instantaneous field analysis for purpose in profiling problem areas to determine appropriate treatment scenarios, including chemical or passive treatments. Also responsible for aerial topography and orthographic imaging, including field control, timing and cost estimates for flights.

Additional file management responsibilities included maintaining and tracking permit files and related modifications; central database files management and structuring; management of lease files; DEP certification files; blasting files annual pre-blast survey request notifications; survey findings in fact, blasting structures within blasting limits and cross reference database; blasting complaint files; and discharge monitoring reports and Article 3 reporting for in-stream and groundwater monitoring locations. Worked directly with WVDEP inspectors for water quality, daily inspections, remediation requirements for violation abatements, progress mapping and reclamation status tracking and projections for compliance ratios. Generated blasting complaint coordinates tracking to blasting log and negotiated findings. Generated requests as needed for field adjustments to permit requirements for considerations, such as alternate groundwater sites and various relief features as they occurred. Also in charge of OSM oversight inspections.

1995 - 1997

AutoCAD Technician

AutoCAD work including various permitting mapping applications, such as proposal maps, drainage maps, profiles and sections, geologic cross sections, and pond details.

1994 - 1995

Inspector and AutoCAD Technician

On site inspector for two sewer line projects. On-site inspection from start to finish included field verification of work performed, calculation of pay rate for work performed, verification and enforcement of specifications for the project, and served as a representative for the Public Service District and Engineering firm in contractual disputes. Provided documentation to counter claims made by contractor to protect the client and engineering firm. Field design changes as needed.

1990 - 1994

AutoCAD Technician

AutoCAD work included plan related to landfill applications, highway design submittals, waste water treatment plant applications, including topographic mapping, construction drawings and details, cross sections, profiles, storm water management plans, subdivision design and volumetric calculations.

1985 – 1990

Designer/Assistant Manager

Designer drafting work included layout for remodeling and new construction projects involving floor plans, electrical layout, plumbing and heating applications, heat loss calculations, custom cabinetry and interior design. Provided artistic renderings and presentations to client and finance committees for large scale projects. As the Assistant manager, generated computer based contracts, maintained client data base, tracked projects, ordered materials and maintained inventories for the warehouse. Also managed projects from start to finish and estimated costs for projects and generated bid packages to secure the jobs.

1983 – 1985

Draftsman

Draftsman work included courthouse deed research, and plotting from deed property description for the purpose of updating Fayette and Greenbrier County Tax Maps. Additional responsibilities included board drafting including linen, mylar and Leroy work, blue line reproductions, working with a stereo plotter and scribe work for aerial topography.

Continuing Education Classes and Seminars Attended

- > Extension courses in PC Troubleshooting SkillPath Seminars, Beckley, West Virginia, 2000.
- > Network Administration, St. Louis, Missouri, 2000.
- > Microsoft Office, New Horizons, Teays Valley, West Virginia, 2001.
- > 01/27/06 chornsbay.doc
- > Carlson Software Survcadd training, Charleston, West Virginia, 1999.
- > Surface Water Analysis Runoff Training WVDEP, Charleston, West Virginia, 2013.

Steven B. Stansfield

Current Position

Senior Geologist &
Hydrogeologist

Profession

Geology, Hydrogeology

Years' Experience

23

Joined Cardno

1990

Education

BS – Geological
Sciences, Virginia
Polytechnic Institute and
State University,
Blacksburg, VA

Professional Registrations

PG – TN

OSHA Health & Safety

OSHA Refresher

MSHA Part 48 Hazard
Training

Affiliations

Association of Ground
Water Scientists and
Engineers (Division of
the National Ground
Water Association)

Summary of Experience

Mr. Stansfield conducts hydrogeologic investigations related to mining hydrology, landfill evaluation, industrial contamination, and investigations involved in litigation. He has directed numerous field investigations, and authored or co-authored hundreds of reports related to geologic and hydrogeologic matters. He is often involved in using statistical applications to determine regulatory groundwater compliance for solid waste and industrial landfills, surface water applications, and mine water discharge. Results of many investigations are utilized in engineering design applications, including, but not limited to landfill cap design, and disposal and handling of material likely to create adverse environmental conditions.

Significant Projects

- > **Northern West Virginia and Southwestern Virginia:** Extensively involved in permit applications of landfills. Oversaw all field related activities that included core logging, monitoring well installation, monitoring program, aquifer testing, water sampling, and interpretation of results. Performed a due-diligence for a prospective buyer to purchase an industrial landfill facility and convert it to a solid waste facility.
- > **Northern and Northeastern West Virginia:** Managed all field activities related to landfill closure plan that included monitoring well installation, soil collection for geotechnical analysis, and water and landfill gas sampling. Involved in report preparation that addressed assessment of groundwater impact and landfill gas migration.
- > **Southwest Virginia:** Performed hydrologic investigations for landfill closures, including preparation of monitoring plans and statistical analyses. Oversaw all groundwater monitoring activities and report preparation. Performed successful alternate source demonstrations, corrective action plans, and corrective action monitoring plans; and communicated with regulatory agencies. Performed evaluations to request termination of post-closure care for industrial and solid waste landfill facilities to determine impact of termination to human health and the environment.
- > **Southern West Virginia:** Oversaw numerous field activities related to the permit application for a 10,000 ton per-day private sanitary landfill. Involved in geologic and hydrogeologic analyses of the site.
- > **Southwest Virginia:** Planned, coordinated, and reported on potential environmental impacts of a proposed four-lane highway system. This included identification of earthen material with the potential to cause adverse environmental conditions.
- > **Virginia, West Virginia, Tennessee:** Managed numerous groundwater and surface water sampling activities at landfills, mining sites, underground storage tank sites, and industrial facilities.
- > **Southwest Virginia / Southern West Virginia:** Involved in all aspects of field investigations, data evaluation, and reporting in matters related to water well and surface water claims involved in litigation due to alleged mining impact.

- > **West Virginia:** Involved in numerous projects involving mine permitting, some incorporating large acreage areas and numerous residential locations. Prepared probable hydrologic consequences and hydrologic reclamation plans, as well as long-term monitoring plans. Permits included various mining types, including deep, surface, and auger, and often involved multiple coal seams.
- > **Eastern/Northern Tennessee:** Conducted Phase I Environmental Site Assessments per ASTM E1527-94 standards. Also conducted site characterization, and implemented a monitoring and enhanced bioremediation program for an industrial facility underlain by a fractured bedrock aquifer. Involved in comprehensive Remedial Investigation/Feasibility Study and Risk Assessment.
- > **Eastern Kentucky/Southern West Virginia:** Conducted hydrogeologic and geotechnical investigations of deep mine advancement beneath stream valleys with shallow overburden.
- > **Southwest Virginia/Southern West Virginia:** Conducted pre-mining evaluations into the probable hydrogeologic consequences of mining near residential water wells and surface streams.
- > **West Virginia/Southwest Virginia/Eastern Kentucky:** Conducted coal reserve and mineability evaluations for numerous properties in the Appalachian region.
- > **Alabama:** Conducted an investigation into the potential cause of groundwater inflow into an active deep mine, and predicted potential future inflows with mine advancement
- > **Appalachian Region:** Collected and evaluated hundreds of ground and surface water samples throughout the region for various entities and causes. Groundwater samples collected from monitoring wells, residential water wells, springs, and mine discharges.

Professional History

2001 - Present

Senior Geologist/Hydrogeologist

Responsible for evaluation of landfill analytical data by statistical applications to determine regulatory compliance, and maintain close communication with regulatory agencies. Plan and coordinate project activities and manage junior level personnel. Responsible for report writing and presentation in various fields, including, but not limited to: mining hydrologic studies (Probable Hydrologic Consequences and Hydrologic Reclamation Plans) and permitting; prediction of acid-mine drainage potential in mining and construction applications; monitoring plan design; ground and surface water potential impact studies and remediation; geologic evaluations; landfill applications; and industrial contamination. Coordinate various field projects, including, but not limited to: water user inventory; ground and surface water sampling; subsurface investigations; monitoring well installation; pumping tests; stream flow monitoring; water well/surface water loss complaints; delineation of petroleum-impacted soils; landfill investigations. Several projects involved in litigation.

1993 – 2001

Project Geologist

Extensively involved in completing annual reports for solid waste facilities including the evaluation of the monitoring regime, and determination and implementation of groundwater statistical methods. Responsibilities include coordination with clients, and reporting to regulatory agencies. Involved extensively with landfill permit applications including site characterization and closure reports, water sample collection, and in the collection of landfill gas samples and evaluation, along with mitigative measures for

landfill gas migration. Also conducted groundwater sample collection and assessment of groundwater contaminants including causes, impact, and remedial alternatives at numerous industrial and privately-owned sites. Evaluated Probable Hydrologic Consequences for mining permits and conducted hydrogeologic/geotechnical studies for deep mining beneath shallow stream valley floors. Investigations into alleged water well and surface water impacts due to mining. Performed Phase I Environmental Site Assessments and CERCLA remedial investigations. Involved in numerous investigations of hydrologic impacts resulting from mining, including several studies in litigation. Have collected numerous surface and groundwater samples and measured stream flow rates for permit purposes.

1990 – 1993

Geologist

Involved in numerous geologic studies including mapping of geological factors relating to coal reserves, mineability, and potential mining hazards. Responsible for planning and supervision of coal exploration programs and property evaluations in the Appalachian Region, with specific involvement in data collection and interpretation, correlation of coals in regional studies, and technical report writing and presentation. Responsible for geologic/geotechnical core logging, management of both core and rotary drill rigs, road construction, prospect permits and bond release requests, monitoring well installation, slug and packer testing, water sampling, and detailed joint analyses of rock outcrops. Also participated in coalbed methane desorption project studies.

Summer 1985, 1986

Assistant Geologist

Assisted senior geologists in geologic core logging, mapping, coalbed methane desorption studies, and linear confirmation.

Publications

- > "A Cost-Effective Approach to In Situ Bioremediation in Fractured Bedrock," The Ninth International In Situ and On-Site Bioremediation Symposium, Baltimore, Maryland, May 7-10, 2007.

Continuing Education Classes and Seminars Attended

- > Northern Illinois University and Midwest GeoSciences Group Webinar: "Ethics for Geologists and Engineers, Realizations of Everyday Decisions and Common Behaviors", Bluefield, Virginia, February 2012.
- > ASCE Webinar: "Water Balance Modeling for Alternative Water Balance (ET) Covers", Bluefield, Virginia, April 2012.
- > NGWA Webinar (#829): "Ground Water Geochemistry and Isotopes: Do's and Don't's for Field Sampling and Analysis", Bluefield, Virginia, November 2009.
- > Air & Waste Management Association Webinar: "Geologic Sequestration Research Activities and EPA Regulations," Bluefield, Virginia, February 2008.
- > Introductory Statistics for Environmental Professionals, National Ground Water Association, St. Louis, Missouri, April 2006.
- > Accelerated Bioremediation with Slow Release Electron Donors and Electron Acceptors, Regenesys, Roanoke, Virginia, April 2005.
- > EPA Seminar on Monitored Natural Attenuation for Groundwater, Atlanta, Georgia, November 1998
- > West Virginia Mining Symposium, Charleston, West Virginia, January 1998.

- > Coal Mine Roof Rating Seminar, National Institute for Occupational Safety and Health, Sophia, West Virginia, September 1997.
- > Groundwater Statistics and Regulations, Colorado School of Mines, Atlanta, Georgia, March 1996.
- > Acid Mine Drainage Seminar, Flatwoods, West Virginia, September 1995.
- > Professional Designers/Engineers/Specifiers Seminar, Roanoke, Virginia, May 1995.
- > Preparation of Groundwater Protection Plans and Spill Prevention, Control, and Countermeasures Plans, Flatwoods, West Virginia, December 1994.
- > The Princeton Course "Groundwater Pollution and Hydrology," Princeton, New Jersey, February 1993.
- > Audit of Masters Level Course in Groundwater Hydrology, West Virginia College of Graduate Studies, Bluefield, West Virginia, 1993.

Ankan Basu

Current Position
Hydrogeologist

Profession
Geology, Hydrogeology

Years' Experience
12

Joined Cardno
2006

- Education**
- > MS – Hydrogeology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia
 - > MS – Geology, Georgia State University, Atlanta, Georgia
 - > MS – Geology, Indian Institute of Technology, Kharagpur, India
 - > BS – Geology, Jadavpur University, West Bengal, India

- Professional Registrations**
- > PG – VA, TN, KY, GA, MO
 - > CPG – AIPG
 - > Registered Member SME
 - > OSHA Annual Refresher
 - > OSHA HAZWOPER
 - > Alpha Spectrometry Training
 - > Mine Safety and Health Administration Training

Summary of Experience

Mr. Basu performs hydrogeologic, geologic, geochemical, and geotechnical investigations for Cardno MM&A. Clients include those involved in landfill applications, mining, industrial, and environmental. He is particularly proficient with several modeling software programs for hydrogeologic and geochemical applications. He has authored a number of journal articles related to geochemical issues.

Key Skills and Consulting Services

Hydrogeologic

- > Preparation of analytical and numerical models using Anaqsim, MODFLOW.
- > Aquifer testing (Packer test, Pump test, Slug test); interpretation of field data; derivation hydrologic parameters (AQTESOLV)
- > Monitoring well installation, sampling, water user inventory
- > Interpretation of wire-line geophysical logs for aquifer identification; water level and rock type determination.
- > Mine inflow prediction, inflow to slope and shaft determination, seepage through barrier estimation;
- > Stream-flow measurement and evaluation of data.
- > Hydrologic balance assessment associated with mining activities.
- > Underground Injection Control (UIC) permits preparation.

Geophysical

- > Interpretation of data from wire-line geophysical tools such as gamma log, density logs, sonic logs, caliper logs and acoustic televiewer (ATV) logs; interpret geology and define major aquifers.

Geochemical

- > Preparation of geochemical models using PHREEQC and Geochemist's Workbench
- > Evaluation of water quality data; QA/QC; Stiff and Piper diagrams;
- > Acid Base Account (ABA) and Se sampling and data analysis for all coal related projects.
- > Soil sampling and strength tests especially for slope and shaft development projects.
- > RCRA metal remediation; bioremediation, Acid Mine Drainage analysis.

Mineral Explorations

- > Qualified Person for JORC / CIM or US SEC reserve/resource studies.
- > Preparation of 3D-Geological model of mineral resources (Software: CARLSON or SurvCADD);
- > Exploration and economic assessment of natural mineral deposits, field supervision of drilling; field mapping, geologic /geotechnical and fracture (RQD) logging of core.
- > Isopach mapping; fault and lineaments delineation; preparation of geologic reports

- > Mine hazard evaluation; roof and floor mapping.
- > Sampling and analysis of Coal Bed Methane (CBM).
- > Geotechnical investigation; strength testing; Rock Mass Rating (RMR) evaluation.

Soil:

- > Geo-probe sampling, supervision of boring
- > Evaluation of geochemistry of soil from storm water basins.

Professional History

2006 - Present

Hydrogeologist

Involved in various geologic, hydrogeologic, and geochemical investigations, primarily associated with coal mining and exploration. Conduct geologic and geotechnical logging of cores as regards mine roof and floor conditions; conduct geochemical sampling and evaluation of results as to acid or other enriched drainage; conduct field supervision of exploration and hydrologic permeability testing; conduct geochemical modeling of waters to assist in hydrogeologic and/or treatment evaluations.

2004 – 2006

Research/Teaching Assistant

Designed and conducted experiments for sequential extraction of arsenic. Constructed mineral structures using various spectroscopic and microscopic methods. Taught two undergraduate environmental science introductory lab courses. As well as, taught one graduate level hydrogeology lab course.

2002 – 2004

Research Assistant/Laboratory Instructor

Performed K-Ar dating of clay minerals; compared advantages and disadvantages between K-Ar dating method and aleomagnetic dating method. Also, taught laboratory sections for undergraduate introductory geology course and graded quizzes and assignments.

Publications

- > Basu, Ankan & Schreiber, M (2012): Arsenic release from arsenopyrite weathering: Insights from sequential extraction and microscopic studies; Journal of Hazardous Materials; <http://dx.doi.org/10.1016/j.jhazmat.2012.12.027>
- > Basu, Ankan (2006): Assessment of Arsenic Mobility using Sequential Extraction and Microscopic Methods; Thesis submitted to Virginia Tech for Master of Science
- > W. Crawford Elliott, Ankan Basu, J. Marion Wampler, R. Douglas Elmore and Georg H. Grathoff (2006); Comparison of K-Ar ages of diagenetic illite-smectite to the age of a chemical remanent magnetization (CRM): An example from the isle of Skye, Scotland, Clays and Clay Minerals; June 2006; v. 54; no. 3; p. 314-323; DOI: 10.1346/CCMN.2006.0540303.
- > Blumstein, A. M., R. D. Elmore; M. H. Engel; C. Elliot; and A. Basu (2004); Paleomagnetic dating of burial diagenesis in Mississippian carbonates, Utah, J. Geophys. Res., 109, B04101, doi: 10.1029/2003JB002698.

Abstracts

- > Basu, Ankan (2004): A Comparison of K-Ar Ages of Illite to the Age of Chemical Remnant Magnetization; Thesis submitted to Georgia State University for Master of Science; 107p.
- > Basu, Ankan (2002): Metamorphic History of Sausar Belt, India; Thesis submitted to Indian Institute of Technology for Master of Science.
- > Basu A and Schreiber M; 2005. Geochemistry of arsenic in mine tailing deposits. Graduate Student Research Symposium.
- > Basu, Ankan; 2006. Assessment of Arsenic Mobility using Sequential Extraction and Microscopic Methods; Thesis submitted to Virginia Tech for Master of Science.
- > Basu A and Schreiber M; 2004. Spectroscopic and Microscopic analysis of arsenic contaminated sediments. Graduate Student Research Symposium.

Awards

- > University Gold Medal in Bachelors of Science, Jadavpur University, India, 2000.
- > National Scholarship, Government of West Bengal, India, 2000.

Continued Education and Seminars

- > Water Balance Modeling for Alternative Water Balance (ET) Covers (ASCE Webinar), April 13, 2012.
- > An Overview of Unsteady Flow Simulations Using HEC-RAS (ASCE Webinar), March 27, 2012.
- > Mine Tailings: Enumeration and Remediation, Jan 11, 2012
- > Modeling and Evaluating Mine Drainage Treatment using Geochemist Workbench (Workshop); presented by Brent Means, U.S. Office of Surface Mining; June 6, 2010.
- > Pumping test design and data collection; April 7, 2007
- > Evaluating, Optimizing, or Ending Post-Closure Care at Municipal Solid Waste Landfills Based on Site-Specific Data Evaluations; November 16, 2006
- > Ground Water and Well Microbiology: Water Well Microbiology Issues; November 16, 2006.

Technology and Software

- > 3D Geologic Modeling (CARLSON-SurvCADD)
- > Geochemical Modeling- Geochemist's Workbench, PHREEQC
- > Hydrogeologic - AQTESOLV
- > Database: Access, MySQL, Coal Data Management System (CDMS)
- > Analytical Modeling- AnAqSim
- > Numerical Modeling – Visual Modflow, PMwin, GW Vista, Model Muse
- > Programming languages: Python, JAVA-script, PHP, FORTRAN
- > Web-Development: HTML, CSS

Significant Projects

- > **Virginia/West Virginia:** Conducted annual reporting and statistical calculations for various landfill facilities. Also performed monitoring well installation, abandonment, sampling, and potentiometric mapping. Analyzed numerous groundwater quality data related to various geochemical issues for use in annual reporting and corrective action plans.
- > **Virginia/West Virginia:** Performed speciation evaluations for numerous elements for use in various geochemical applications.
- > **Southern West Virginia:** Involved in investigation and evaluation of alleged impacts by mining upon valley floor stress-relief fracture zone aquifer and private water wells. Evaluated water quality data as well as performed quality control check of laboratory analytical data.
- > **West Virginia/Virginia/Kentucky:** Conducted in situ strata permeability tests utilizing constant head pressure injection techniques in boreholes and evaluated data to determine hydraulic conductivity values for various geologic units. Data utilized for evaluations of mine advancement beneath stream valleys and potential hydrologic and mining hazard impact, as well as installation of proposed mine shafts.
- > **Southern West Virginia:** Geochemical modeling of mineral dissolution to assess amendment depletion rates; evaluate water flow paths, and saturation and stability of mine waters.
- > **Appalachian and Illinois Basin:** Performed reserve evaluations, mine planning, and hazards mapping. Performed work for most major energy and land companies with operations and properties located throughout the Appalachian and Illinois Basins. Also conducted field exploration, field mapping, logging of core samples, and sampling for geochemical and strength tests at several of those sites.
- > **Appalachian Basin:** Worked on multiple projects associated with Securities and Exchange Commission (SEC) filings.
- > **Virginia/West Virginia:** Installed monitoring wells for various uses; collected groundwater samples from monitoring wells and private water wells, and performed water user inventories.
- > **Virginia/West Virginia:** Evaluated potential mining impacts and predicted the probable hydrologic consequences from various mining types as part of permit applications.
- > **Virginia/West Virginia:** Collected and evaluated numerous rock samples for geochemical analyses for use in determining metals content and potential leaching of acid-producing materials.
- > **West Virginia:** Predicted mine inflow rates and volumes based on field conductivity data; evaluated mine dewatering requirements, seepage through barrier calculations, and inflow to slope and shaft determinations.
- > **West Virginia:** Prepared Underground Injection Control (UIC) permits to inject impacted waters into abandoned deep mine workings. Included water mixing geochemical analyses for various metals using several different water sources.
- > **Appalachian Basin:** Conducted sampling and analyses of coalbed methane (CBM) samples. Also interpreted wire-line geophysical logs for coal reserve estimations, identified aquifers and associated water levels, and determined rock types.
- > **Australia:** Conducted coal resource study under the Joint Ore Reserves Committee (JORC) code.
- > **India:** Conducted underground mapping and stratigraphic correlations at an Uranium mine.

Daniel J. Diffenbach

Current Position
Professional Surveyor

Profession
Civil Engineering

Years' Experience
19

Joined Cardno
1994

Education
BS – Applied Science,
Bluefield State College,
1994

Professional Licenses
PS – WV, VA

Hazardous Materials
First Responder –
Awareness Level

MSHA Required Basic
First Aid/CPR Training

OSHA 40 Hour Health &
Safety

OSHA 8 Hour Refresher,
AutoCAD

Roadway Worker
Protection Training

Summary of Experience

Mr. Diffenbach currently serves as the Civil Engineering Department's Chief Surveyor, within Cardno MM&A. He provides surveying services for civil engineering, environmental, and energy related projects throughout the company. Mr. Diffenbach's specialties include:

- > Global Positioning Systems (GPS) surveys
- > Topographical surveys and mapping
- > Property boundary surveys
- > Floodplain elevation study surveys
- > As-built surveys
- > Construction stake-outs
- > Gas well locations/permitting
- > Plat preparation
- > ALTA land title surveys
- > Reflectorless total station technology surveys

Significant Projects

GPS Surveys

- > WV: GPS exploratory core hole locations for Warrior Energy in Greenbrier county
- > WV: GPS exploratory core hole locations for Dave Brown Mining in Logan county
- > VA-NC: GPS aerial mapping control targets for 10+ Vulcan Materials stockpile yards
- > VA-WV: GPS aerial mapping control targets for two Pounding Mill Quarry sites.

Boundary Surveys

- > VA: VDOT Explorer Park environmental covenants restrictions boundary survey
- > WV: ALTA land title survey for JanPak industrial site in Bluefield, WV
- > WV: Property Boundary surveys for Shady Springs Sewer District sewage systems
- > VA: Property boundary survey for Town of Bluefield's annexation expansion

Topography Surveys/As-built Surveys/Design Control Surveys

- > VA: Used reflectorless total station to survey kyanite stockpiles and calculate volumes at Kyanite Mining, Inc. site
- > VA: As-built survey of downtown Bluefield city block to locate underground utilities, topography, structures, etc.
- > VA: Quality control (as-built) survey for Tazewell County's landfill construction
- > WV: Survey cross sections of several streams and bridges for Region One Planning for the development of DFIRM flood mapping projects

John R. Ralosky

Current Position

Project Engineer

Profession

Civil Engineering

Years' Experience

12

Joined Cardno

2001

Education

BS – Civil Engineering
Technology, Bluefield
State College, Bluefield,
WV

AS – Civil Engineering
Technology, Bluefield
State College, Bluefield,
WV

Professional Registrations

Roadway Worker
Protection Training

e-RAIL Safe

Summary of Experience

Mr. Ralosky provides civil engineering design and site layout for industrial/commercial type projects (e.g. Mining, Railroad, and Utility Industries).

Significant Experience

- > Erosion and Sediment Control
- > Stormwater Management
- > Site Development and Grading/Excavation Design
- > Mining Refuse Disposal Facilities

Significant Projects

- > Longview Power Site Development-Utilized three dimensional terrain modelling to for the site development for a 110 acre power generation facility. The project included erosion and sediment control measures, a series of underground piping to collect and convey runoff to stormwater ponds, wetlands mitigation, and over one and a half miles of haulage and access roads.
- > ABB Parking Facility Expansion- Rehabilitated and expanded an existing employee parking and material storage area. The project consisted of a new grading plan, erosion and sediment control plan, and underground storm water chambers for runoff collection and detention.
- > Mountaineer Resources Ambulatory Surgery Center-Site development of an eighteen acre ambulatory surgery center. Tasks included a balanced grading plan, storm water conveyance and retention devices, erosion and sediment control measures, and wetlands mitigation.
- > PEMCO Parking Lot Improvements-Relocated existing employee parking area. Project tasks included a site grading plan, erosion and sediment control measures, a storm water conveyance system, and dry swale with engineered biofiller soil for treatment of contaminated runoff water.

Professional History

2001 - Present

Civil/CAD Design Supervisor – Project Engineer

Provide support and design services with the development and design of industrial storm water detention/retention, conveyance, and treatment facilities. Create 3-D land terrain models to aid in storm water runoff analysis, earthwork calculations, and feasibility studies. Provide support and design services on various site development projects. Provide drafting support for flood studies and flood control projects, Clean Water Act related documentation, groundwater studies, asbestos and lead inspections, and stream restoration projects.

1998 - 2001

Mechanical Designer

Provided mechanical design for resin cast coil transformers. Provided sheet metal design for NEMA approved transformer and switch enclosures. Responsible for the QA/QC of mechanical design department. Provided troubleshooting and design services for metal fabrication and transformer assembly departments. Wrote computer code for Finn-Power Laser Punch for the fabrication of heavy gauge steel. Part of a research and development team responsible for automating portions of mechanical and sheet metal design for transformers and switchgear. Responsible for handling customer comments, concerns, and installation questions.

Sam L. Moore, III

Current Position

Sr. Engineering
Technician

Profession

Mining Engineering

Geology

Civil Engineering

Surface Water Hydrology

Years' Experience

35

Joined Cardno

1988

Education

SVCC

Bluefield College

Professional Registrations

OSHA 40 Hour Health
and Safety Training

E-RAILSAFE

Roadway Worker
Protection Training

Troxler Nuclear Testing
Equipment Certificate
#062494

Summary of Experience

Mr. Moore provides technical expertise in the planning, design, and reserve estimation process required for the safe and efficient removal of coal, aggregates, and other minerals.

His experience includes a diverse range of applied and practical application of basic engineering principles and technical skills.

Specifically, his expertise includes:

- > Geologic modelling, reserve calculation, mine planning, and production timing.
- > Proficiency in the use of a variety of software, e.g. AutoCAD, Carlson Mining, Carlson Civil Suite, Microsoft Office products, Hydraflow Hydrographs, Hydraflow Storm Sewers.
- > Surface water hydrology, stormwater facility design, erosion and sediment control.
- > Basic field surveying.
- > Roadway design.
- > Quarry design and permitting.
- > Comprehensive site design, utility layout, and plan preparation for subdivisions, commercial developments, and industrial facilities.

Significant Projects

- > Western Australia: Participated in the preparation of a definitive feasibility study (DFS) for a greenfield coal mining project where he played a key role in configuring stormwater and runoff water control layouts especially in regards to plant rejects handling.
- > Eastern United States: Performs annual volumetric estimates of production for eleven aggregate production facilities in North Carolina and Virginia through analysis of photogrammetric data.
- > Southern West Virginia: Executed site design, prepared construction documents, and directed construction surveying for several multi-million dollar design-build projects in Mercer County.
- > Southwest Virginia: Planned and designed relocation of two primary highway routes in Smyth County; provided technical review and engineering services to a local municipality on various storm water issues, particularly with respect to karst terrain and residential developments; completed layout and design of a L.E.E.D. compliant 100+ acre industrial park in Giles County.
- > Virginia: Assisted client with development and production costs for establishing a quarry pit in adverse geologic conditions, enabling a transition from deep mining to surface mining; prepared necessary operating permit applications and coordinated construction surveying.

Professional History

2010 – Present

Senior Engineering Technician

Perform technical design and surface water hydrologic analyses.

2000 – 2010

Associate

Site design and plan preparation which included: project management, communication with other consultants and public entities, comprehensive planning and site layout, basic field surveying, coordination of surveys, project mapping, hydrologic evaluation and storm water facility design, erosion and sediment control planning, earthwork computations, utility layout, highway design, follow up with permitting, construction survey needs, and construction monitoring; Coal reserve evaluation; Quarry design and permitting; Subdivision design; Industrial park design; L.E.E.D. compliant projects; Also involved in technical review and development of a local government storm water ordinance along with correlating geographic, hydrologic, and geologic data for incorporation into a municipal GIS database; All facilitated through competence in a variety of computer software.

1994 – 2000

Project Manager

Responsible for project management and design engineering for a diverse range of projects; Specific experience included civil, mining, and environmental related projects such as urban development, quarry design and permitting, and landfill closure planning - all accomplished through computer assisted technologies, combined with practical experience.

1989 – 1994

Engineering Technician

Assumed an active role in an Environmental Division providing technical and graphics support in a variety of environmental assessment and remediation projects; performed contract management and inspection of local construction projects.

1988 – 1989

Engineering Technician

Mining inspector for resource management projects, responsible for monthly inspections of several deep mines and associated facilities and the generation of monthly reports for mineral owners; Technical and graphics support for engineers and geologists in mining, civil, environmental, and geological projects; Specific experience included digital terrain modeling, volume calculations, ground water modeling, surveying, erosion and sediment control planning and permitting, and storm water management, utilizing a variety of design, modeling, and hydrology specific computer software.

1987 – 1988

Engineering Technician

Duties included deep mine layout, mine mapping, ventilation plans, and subsidence control plans; Operated computer-aided design tools, coupled with a digitizer and

plotter using software such as AutoCAD, Maptech Inc.'s Survey Pac, Microhio Surveying Systems, and others; Trained co-workers in computer-aided drafting techniques.

1980 – 1986

Engineering Technician

Assigned to Technical Services Department; Duties included design work and technical dialogue for permit applications of preparation plants, refuse disposal facilities, surface mines, and deep mines; Permit design work pertained to roads, culverts, dams, sediment control structures, refuse and excess spoil embankments; Mapping of underground mines, ventilation plans, tonnage calculations for royalty payments and depletion reports; Property work, compilation and calculation of survey data, and the set up of an overlay drafting system; Also involved in basic field surveying.

1983 – 1984

Adjunct Instructor, Mine Drafting

Teaching a collegiate freshman level course in Mine Drafting.

Continuing Education Classes and Seminars Attended

- > "Eagle Point Advantage Series Training Program", Outsource, Inc., Richmond, Virginia, June, 1996.
- > "Seventeenth Annual Airport Conference", Certification "P-401" Pavement Design, Penn State University, Hershey, Pennsylvania, March, 1994.
- > "Training course for the Use of Nuclear Testing Equipment", Troxler Electronic Laboratories, Inc., Lexington, Kentucky, March, 1994.
- > "Urban Stormwater Management and Detention Pond Design Seminar", Haestad Methods, Inc., Atlanta, Georgia, May, 1994.
- > "Liner Technology and New Techniques in Waste Containment Seminar", Gundle Lining Systems, Inc., Roanoke, Virginia, December, 1994.
- > "Urban Erosion and Sediment Control for Inspectors", Commonwealth of Virginia, Department of Conservation and Recreation, Division of Soil and Water Conservation, Wytheville, Virginia, October, 1993.
- > "Basic Urban Erosion and Sediment Control in Virginia", Commonwealth of Virginia, Department of Conservation and Recreation, Division of Soil and Water Conservation, Wytheville, Virginia, October, 1993.
- > "Sediment and Erosion Control on Construction Sites", West Virginia Soil Conservation Committee, Summersville, West Virginia, January, 1993.
- > "Visible Emissions Evaluation", Eastern Technical Associates, Roanoke, Virginia, September, 1992.

Mark T. Clemons

Current Position

Project Engineer
Civil/Mining Division

Profession

Civil Engineering

Years' Experience

18

Joined Cardno

1996

Education

BS – Civil Engineering,
Bluefield State College,
Bluefield, WV

AS – General Education,
Bluefield State College,
Bluefield, WV

Professional Registrations

MSHA Certified Mining
Impoundment Inspector

WVDOT Concrete
Inspector

Virginia DCR Erosion /
Sediment Control, RLD
Inspector

Roadway Worker
Protection, E-RAILSAFE
and TWIC Certifications

Affiliations

AMERICAN SOCIETY
OF CIVIL ENGINEERS

AMERICAN CONCRETE

Summary of Experience

Mr. Clemons provides civil engineering design and site layout for industrial / commercial type projects (e.g. Mining, Railroad and Utility Industries). As well as, provide construction and geotechnical drilling oversight management pertaining to large earthwork moving operations, liner inspections, pipelines and mechanical projects; provides data collection regarding rock coring's and soil borings. Additional, duties include conducting site reconnaissance, topographic and location surveys. Preparation of bid-phase construction documents such as cost estimates, project specifications reports and storm water / erosion sediment control plans and permits.

Significant Projects

- > **Norfolk Southern Railway Company:** Provided design services such as drainage analysis, mechanical, electrical schematics, location surveys and construction oversight/management for various projects system wide.
- > **Consolidated Coal Company:** Provided construction management / impoundment inspection services on refuse facility's involving large earth moving operations and construction activities around preparation plants in West Virginia and Virginia region.
- > **Foundation Coal Company:** Provided design and construction management services on properties to improve and alleviate impacted areas containing surficial water. Conducted oversight inspections regarding construction of mineshaft seals under water.
- > **Alcoa, Inc.:** Provided construction management / inspection services for construction of an earthen landfill cap. Executed inspections on geomembrane, geosynthetic materials and erosion control installations.
- > **Ahern & Associates:** Executed laboratory analysis and performed construction services as per WVDOT specifications and guidelines for an 800 linear foot concrete span bridge structure and interchange.
- > **Letcher County Kentucky Federal Prison:** Provided construction management and geotechnical drilling oversight for site development evaluations. Executed and coordinated geotechnical drilling and community relations on multiple properties and provided on-site analysis of soil borings.
- > **KOA Campgrounds of America, Inc.:** Provided environmental coordination / sampling to locate viable water sources for a 70-acre campground site. Collected samples for ground water analysis under direct influence testing as per public health regulations and obtained permits.
- > **West Virginia Department of Environmental Protection (WVDEP):** Provided construction management / oversight for the construction of a 300,000 gallon leachate tank and pipeline.

Professional History

1996 - Present

Project Engineer

Responsible for project development/management on civil, environmental, and geotechnical projects while performing a variety of tasks in engineering and design including the following:

- > Perform on-site civil / environmental related construction management and quality assurance / quality control inspections of landfills; refuse impoundments, railway and highway transportation projects.
- > Prepare state and federal hazard mitigation and acquisition cost analysis for local and state agencies.
- > Perform deed research for residential / commercial utility easements and right-of-way.
- > Perform deed research for coal-related projects pertaining to mineral rights and land development.
- > Perform calculations for methane gas well volumes and available tax credits.
- > Perform flood investigations and analysis for residential and commercial property.
- > Perform geotechnical / structural laboratory and field-testing utilizing ASTM and AASHTO specifications for highways and bridge construction on WVDOT and VDOT projects.
- > Perform geosynthetic and geomembrane liner inspections / testing for landfills and containment structures.
- > Perform flexible pavement design on access roads and subdivisions as per VDOT specifications and requirements.
- > Perform designs of concrete slabs on grade for transportation facilities and manufactured home foundations.
- > Perform topographic, location, GPS surveys and layout on various projects utilizing total station and collection equipment.
- > Perform design of drainage collection systems for residential and commercial sites.
- > Prepare National Pollutant Discharge Elimination System (NPDES) storm water permits.
- > Prepare Spill Prevention Containment and Countermeasure (SPCC) plans.
- > Prepare site-specific health and safety plans.
- > Prepare erosion and sediment control plans.
- > Perform site investigations on environmental projects utilizing geoprobe-drilling equipment.
- > Perform aboveground storage tank inspections and construction oversight for remediation projects.
- > Perform various computer skills utilizing the latest AutoCAD, Civil Tools Pro, HMS, Excel and Microsoft Word software.

1995 - 1996

Civil Engineering Technician

Responsible for quality control inspections, construction management, survey stakeouts, and materials testing for project sites in seven states including are the following:

- > Perform construction stakeout and volumetric surveys on coal stockpiles and fly ash landfills.
- > Perform geosynthetic / geomembrane liner inspections and testing.
- > Perform materials testing on fly ash and soils.
- > Prepare spreadsheets for daily tonnage and perform comparative cost analysis for fly ash disposal.
- > Perform construction management and inspections for landfills and fly ash disposal for loadout stations.

1993 – 1995

Machinist & Safety Valve Technician

Responsible for testing and maintenance of high and low pressure valves, including the following:

- > Setting and gauging valves on boilers, turbines, tanks, and cooling units under high pressure by using safety relief valve computer software or by hydrostatic methods.
- > Perform design and machining of various parts for out dated safety relief valves.

1992 – 1993

Quality Control Technician

Responsible for quality control inspections, including the following:

- > Perform quality control inspections on prefabricated concrete units.
- > Perform material quantity take-offs on various types of concrete structures for residential construction and highway projects.

1988 – 1992

Surveying Technician

Assisted land surveyor on property and construction surveys including the following:

- > Perform duties as a rodman and chainman.
- > Perform deed research on property and drafting.



Where Experience Matters

Energy

Environmental

Engineering

Virginia

West Virginia

Kentucky

Tennessee

Kansas

Louisiana

North Carolina

Carolina



Where Experience Matters

Cardno MM&A, an international consulting firm headquartered in Bluefield, Virginia, U.S.A., offers services in the energy, environmental and engineering sectors worldwide, as well as to financial, insurance, government and various private and public sector companies. Over a 36-year history, Cardno MM&A has evolved into a leader in the mineral resource, environmental, and carbon management industries. The company's success is based on an understanding of client needs and a commitment to applying and developing advanced engineering and scientific solutions through our talented and experienced staff of geologists; hydrologists; earth scientists; and mining, petroleum, environmental, and civil engineers and other professionals.

As a leading consulting firm in the United States working in the coal and oil & gas industries, our energy-related client base consists of over 250 companies. Cardno MM&A provides advisory and technical services on project feasibility, acquisition due diligence, mineral reserve and resource reporting, and operations assessment, among other services. In the early 1990s Cardno MM&A added environmental services to provide diversification and to insulate the company from the cyclic nature of the energy business. Professional services include environmental risk assessment, remediation, environmental site assessments, environmental impact studies, hazardous waste evaluation, compliance monitoring and reporting, permitting and emergency response. Cardno MM&A offers these services to the energy and transportation industries, federal and state government agencies, financial and insurance companies, and local industrial markets proximal to our regional office locations. Our environmental client base consists of over 500 companies.

In 2005 we combined the experience and technical expertise of our energy and environmental staff to focus on emerging carbon capture and storage projects. Cardno MM&A is an active participant in multiple projects including the injection of 20,000 tons of CO₂ into an unconventional gas reservoir and various carbon footprint evaluations. Our staff is knowledgeable of the mandatory reporting rules (MRR) related to greenhouse gases (GHG) as proposed by the US Environmental Protection Agency. Cardno MM&A engineering, geological, and environmental professionals are leaders in this newly developing field which represents a natural extension of Cardno MM&A services to business sectors where we have an excellent reputation and strong client relationships.

Cardno MM&A is well positioned to continue our growth in the challenging global economic climate of 2012, and beyond. The strength and diversification of the Cardno MM&A staff gives us a solid base from which to capitalize on changing market conditions and to provide technical services to a wide variety of industries. We thank our clients for their trust and confidence in our services, and for helping us to achieve our success. Client satisfaction remains our number one goal.

Effective July 2, 2012, Marshall Miller & Associates, Inc. merged with Cardno, a global professional infrastructure and environmental services company with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno has over 200 offices with over 4,500 professionals in the Americas. This additional access to experts enables Cardno MM&A to continue to deliver the consistent, high quality services you have come to expect, while providing broader capabilities to meet your needs.

K. Scott Keim
President



Your Satisfaction is Our Focus and Goal!

Contact any of the individuals below to discuss your project requirements

- > **Scott Keim, C.P.G.**, President and Principal Geologist [Ph. 276.322.5467]
- > **Peter Lawson, M.B.A.**, Executive Vice President and Director - Energy Services [Ph. 304.255.8937]
- > **Joe Vance, C.P.G.**, Senior Vice President and Director - Environmental Services [Ph. 804.798.6525]
- > **Ron Mullenex, C.P.G.**, Senior Vice President and Principal Hydrogeologist [Ph. 276.322.5467]
- > **John E. Feddock, P.E.**, Senior Vice President and Principal Engineer; Lexington, KY Branch Manager [Ph. 859.263.2855]
- > **Hans Naumann, P.E.**, Senior Vice President [Ph. 859.263.2855]
- > **William (Bill) Dickey, P.E.**, Vice President and Principal Civil Engineer [Ph. 304.255.8937]
- > **Mike Miller, P.E.**, Senior Vice President and Principal Petroleum Engineer [Ph. 423.279.9775]
- > **Peter Christensen, P.E.**, Vice President (Colorado) [Ph. 303.800.1811]
- > **Ed Diminick, P.E.**, Senior Petroleum Engineer; Kingsport, TN Branch Manager [Ph. 423.279.9755]
- > **Vince Alaimo**, Vice President; Ashland, VA Branch Manager [Ph. 804.798.6525]
- > **Larry George, P.G.**, Raleigh, NC Assistant Vice President [Ph. 919.786.1414]
- > **Suzanne Bailey, P.G.**, Mission, KS Assistant Vice President [Ph. 913.648.4424]
- > **David Williamson, P.G.**, Shreveport, LA Branch Manager [Ph. 318.868.4848]
- > **Brent Scott, P.G.**, Environmental Division, Bluefield, VA Assistant Vice President [Ph. 276.322.5467]
- > **Jeff Almond**, Senior Permitting Consultant, Beckley, WV Branch Manager [Ph. 304.255.8937]
- > **James Mills**, Emergency Response Director, [Ph. 276.322.5467]



Representative Project and Staff Experience

Water Resources



Mine Hydrogeology
Water Quality &
Related Services

Cardno MM&A provides a complete range of integrated services and customized approaches to deliver high-quality business solutions adding value to your business.

Water Quality

Cardno professionals understand the critical regulations that drive the U.S. Clean Water Act and Safe Drinking Water Act. We have obtained permits for projects of all sizes around the U.S., and our expertise includes:

- **Local and state:** Cardno provides local and regional regulatory experts from our nationwide offices. We understand local conditions and state and municipal regulations, and are active members of regional regulatory and industry associations, committees and organizations. We also understand the importance of engaging local communities early to address their concerns and streamline the permitting and compliance process.
- **Section 404:** Cardno manages all aspects of Section 404 permitting, from wetlands assessments to mitigation. We perform rigorous analyses to help clients determine if their projects have significant nexus to waters of the U.S. and require Section 404 permitting. To facilitate that permitting, we maintain working relationships with the U.S. Army Corps of Engineers and EPA, the federal agencies responsible for administering and enforcing Section 404. We also coordinate efficiently with states and tribes, who can assume administration of Section 404 permitting in certain waters within their jurisdictions.
- **National Pollutant Discharge Elimination System (NPDES):** Our professionals have significant experience and provide integrated services to help clients obtain, maintain and update critical NPDES permits for mines and mineral processing facilities. We identify and resolve point-source pollution and will help you address consent decrees using the most efficient, cost-effective methods. We can provide direct or indirect sampling and analytical support as needed, and recommend "No Exposure" exemptions where applicable.
- **Stormwater Pollution Prevention Plans (SWPPPs):** Cardno has obtained, prepared and implemented SWPPPs at hundreds of construction sites and locations where industrial runoff occurs. We address policy, planning, and pre- through post-construction activities. Our teams' technical depth and breadth means we can review your site's features, identify potential sources of contamination, and recommend Best Management Practices (BMPs) to control or mitigate stormwater. When your customized SWPPP is approved and implemented, our state-certified SWPPP designers and practitioners will provide inspection services to ensure ongoing compliance.
- **Underground slurry injection investigation and permitting:** When the most practical method to dispose of coal waste is pumping coal slurry into abandoned underground mines, Cardno delivers the hydrogeologic expertise to prevent contamination of water supplies, and the regulatory experience to help you obtain your permit.
- **Acid Rock Drainage (ARD) Treatment:** Cardno investigates hydrologic and aquatic geochemistry parameters to determine appropriate, feasible options for treatment of ARD from old mine sites and designs treatment systems (including passive and semi-passive systems) to mitigate the impacts to receiving streams.



Groundwater Characterization of an Underground Mined Area

Cardno conducted a geological and hydrogeological study of the area to characterize the groundwater regime and circulation and determine the stability and monitorability of the mine cavity for disposal of plant refuse slurry.



Leer Mine Hydrogeological Investigation

Cardno conducted detailed geologic mapping, delineation of aquifers and aquitards, exploratory drilling and aquifer testing to identify utilization of groundwater across 27 square miles.

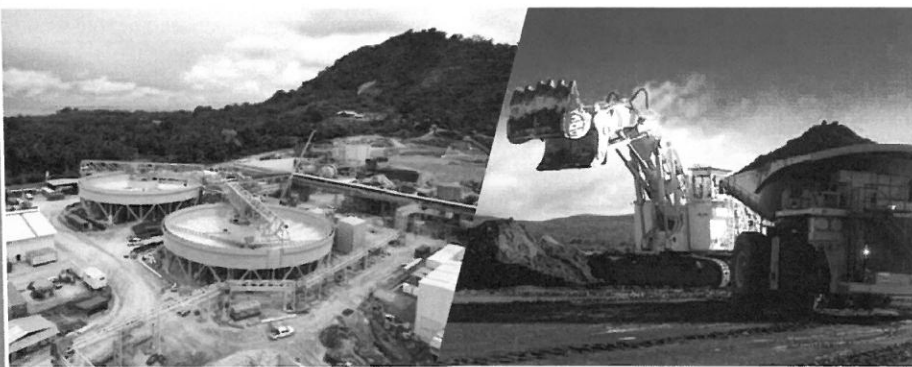


Hydrogeologic Analysis of a Limestone Mine

Cardno characterized a complex hydrogeologic regime to develop an understanding of the karst relationships and water sources for use in mine planning.



Mining



Industry experience
Customized solutions
Integrated services

Engineering and design

Our engineers have extensive experience in mining operations, understand your needs, and deliver the technical ability to meet those needs.

- > Mine design
- > Geotechnical engineering
- > Mine ventilation and seals
- > Coal refuse facilities
- > Electrical engineering

Geology and hydrogeology

Cardno professional geologists accurately predict geological conditions using state-of-the-art technologies and software platforms.

- > Mineral resource and reserve estimation
- > Geophysical logging services
- > Field exploration
- > Hydrogeologic investigations

Investment and insurance support

Cardno provides you with the industry experience needed to facilitate sound decisions and achieve success in competitive markets.

- > Feasibility studies
- > Valuations of property, plant and equipment
- > Due diligence
- > Insurance loss control surveys

Mineral transportation

We can help deliver your product through our expert analysis, planning, design and development of transportation infrastructure.

- > Comprehensive port services
- > Strategic and master planning
- > Material handling system engineering, design, and equipment selection/procurement

Operations management

Cardno understands how mining operations work, analyzes efficiency and utilization, and facilitates process improvements.

- > Operation evaluations
- > Mine cost and cash flow analysis
- > Multi-criteria decision analysis

Permitting and compliance

Our regulatory experts help you obtain the permits you need, maintain compliance with stringent regulations, protect valuable natural resources, and complete timely, efficient projects.

- > Environmental permitting, assessments, and impact statements
- > Surface Mine Control and Reclamation Act
- > Clean Water Act and Clean Air Act
- > Biological, ecological, and cultural services

Social impact management

Cardno's economic, social, and environmental approaches gain you social license and protect investment. Our international development assistance and mining industry experience provide you with invaluable expertise when working within emerging markets.

- > Community and stakeholder engagement
- > Community program design and implementation

Water management

We provide strategic guidance and technical excellence that helps you effectively manage water resources.

- > Water supply
- > Wastewater treatment
- > Groundwater

Additional service offerings

Cardno integrates the services you need to provide the right support for your projects.

- > Construction services and owner's engineer
- > Expert witness and litigation support
- > Advanced GIS capabilities
- > Laser mapping & modeling
- > Health and safety training
- > Hazardous materials and waste
- > GRI G3 reporting
- > Environmental impact mitigation
- > Reclamation and mine closure

Danang and Gaohe Coal Projects

Due to our mine design capabilities and experience and expertise with modern mining systems, Asian American Coal Inc. hired Cardno to help develop two coal projects in the Shanxi Province of China. Cardno's supervision of the development and reporting of the mining ventures led to two world-class operations that are changing the way China mines coal.

Haile Gold Mine Environmental Impact Statement (EIS) Preparation

As a third-party contractor to the Army Corps of Engineers, Cardno is preparing the EIS, including a comprehensive description of the proposed mine, environmental protection measures, reclamation, and compensatory mitigation. To help address public concerns, we are facilitating community understanding of the highly technical project using easy-to-understand text, maps, visual simulations, and an interactive web site.

Brink Mine Water Supply

Cardno identified, developed, permitted, designed and constructed a water supply system that delivers over one million gallons per day, even under drought conditions. We implemented an integrated, dual-source system by: testing groundwater supplies; developing a network of deep wells to extract scarce groundwater from granite bedrock; and designing an intake location and pipeline route to deliver water from the local Meherrin river.

Social Environmental Alliance

Cardno conducted negotiation and management of agreements between Repsol and the surrounding communities from all of Block 16 in Ecuador. We used participative planning strategies with the indigenous communities to promote sustainable development and preservation of their ancestral culture.



environmental scientists, hydrogeologists
prehensive water management services.

Cardno has helped coal operations expand and even double production within
short periods of time to meet market needs.

We can help you plan, permit, develop and manage the infrastructure you
need to transport your product to your customers.

Mining

Our mission is to maintain and develop the most experienced, educated, and committed engineering staff; and provide the highest level of customer service in our field.



Cardno provides geological and engineering services to both surface and underground mine operations throughout the world. Cardno geologists and engineers have extensive backgrounds in a variety of mining scenarios. In addition, Cardno offers surveying, drafting, computer modelling, rock testing, and geophysical logging services to meet your needs. Cardno offers the following services.

Geological Services

- > Exploration Program Development and Implementation
- > Field Mapping
- > Field Exploration Supervision
- > Geological Assessment
- > Detailed Core Logging
- > Core or Mineral Sampling
- > Geophysical Logging
- > Supervise Analytical Testing
- > Database Compilation
- > Computer-Aided Geologic Modeling
- > Reserve Computation
- > Hazard Mapping
- > Lineament Mapping

- > Geotechnical Analysis
- > Mine Roof and Floor Condition Assessment
- > Pillar Stability Analysis
- > Subsidence Studies
- > Horizontal Stress Mapping

Mining Engineering Services

- > Determine Optimum Mining Methods
- > Equipment Selection and Recommendation
- > Productivity Estimates
- > Labor Requirements and Scheduling
- > Life-of-Mine Plans for Proposed and Existing Mines
- > Mine and Facilities Layout and Planning
- > Transportation Studies
- > Environmental Site Assessment
- > Capital Requirements
- > Ventilation, Permitting and Drainage Control

Economic Analysis

- > Efficiency Studies of Equipment and Operations
- > Review and Analysis of Costs (Labor, Supplies, and Fixed Costs)
- > Capital Budget Assessments
- > Evaluation of Depreciation, Depletion and Taxes

- > Royalty Assessments
- > Discounted Cash Flow Analysis
- > Capital Justification

Property and Asset Valuation

- > Comparable Sales, Royalty Income and Operational Cash Flow
- > Fair Market and Orderly Liquidation Values
- > Sale or Acquisition Valuations
- > SEC, Canadian NI 43-101, and JORC Reporting
- > Sales Offering Brochures

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Hydrogeological and Mining Conditions Exploration and Evaluation (Leer Mine)



Cardno's mining geologists and hydrogeologists explored and characterized in detail the resource, mining conditions, and hydrogeological aspects of the mining operation, and prepared permit-acquisition document.

Client:
International Coal Group

Location:
Taylor County, West
Virginia

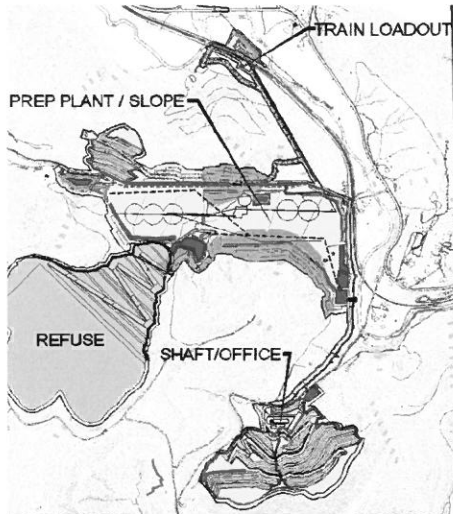
Cardno conducted or provided direct field oversight for an intensive geological-hydrogeological investigation of a 25 square mile area within which the client intended to develop a large longwall mining operation. Cardno's geologists conducted the field exploration to define the resource and to characterize and delineate the hydrogeologic regime; mapped and evaluated the stratigraphy and structural geology and its implications for mining conditions; characterized aquifer distribution and usage in the area; and characterized existing and likely post-mining groundwater chemistry. We developed mitigative approaches to prevent or minimize hydrologic impacts and provided technical and expert witness support through permit appeals actions, through to final approval.

Challenges & solutions

Characterize the resource, geologic conditions, and hydrogeologic regime.

- > Oversaw field exploration with core and rotary drilling rigs; logged, photographed, and documented core; performed geophysical logging of boreholes; conducted constant-head pressure testing of aquifer parameters; identified groundwater use across 27 square miles; collected samples and evaluated water chemistry characteristics of numerous aquifers.
- > Performed detailed stratigraphic and structural analysis of the resource and potential mine roof and floor conditions; prepared geologic hazards mapping.
- > Integrated the mine plan with the hydrogeologic setting, identifying the style and degree of impacts to various aquifers and evaluating potential water quality concerns.
- > Developed a post-mining water recirculation plan to immobilize dissolved metals.
- > Modeled post-mining recharge and discharge.

Greenfield Mine Complex Permitting



Cardno's team of industry experts are integrating design, engineering and permitting services, ultimately streamlining the permitting process for our client.

Client:

AmericanMountaineer Energy, Inc.

Location:

Harrison County, West Virginia

AmericanMountaineer is proposing to construct a greenfield mining complex including a longwall mine, coal preparation plant, a rail load-out facility and a coal refuse disposal facility. The new mine would require state mine permits, National Pollutant Discharge Elimination System (NPDES) permits, a West Virginia Public Land Corporation permit, a Section 401 Water Quality Certification, Section 404 permitting and Mine Safety and Health Administration (MSHA) permits for the mine and coal refuse area.

Cardno provided design, engineering and permitting services to help obtain the required permits. Our team of mining engineers, biologists, geologists and support staff managed the project from the gathering of baseline environmental data through to final issuance of the permits.

Challenges & solutions

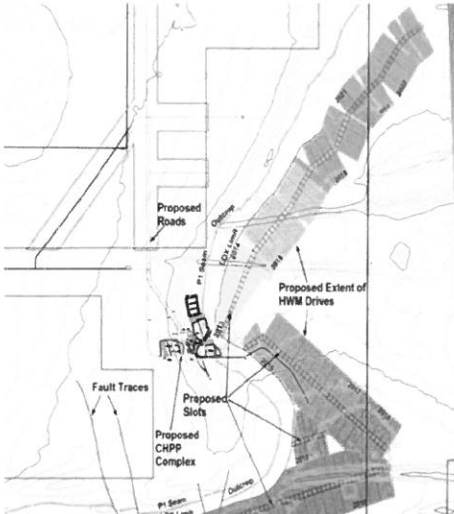
Obtain numerous permits from a multitude of state and federal agencies

- > Conducted a groundwater inventory of all wells, seeps, springs and ponds on 14,000 acres of rural land located above the proposed longwall mine
- > Delineated streams and wetlands
- > Assisted with an extensive drilling program for mineral reserve evaluation
- > Provided overburden analysis for geochemistry used during the permitting process
- > Mapped potentiometric heads and gradients in aquifers in and adjacent to planned mine
- > Investigated groundwater quality differences between aquifers
- > Conducted constant-head pressure testing in selected boreholes and intervals to characterize aquifer parameters
- > Designed internal barriers to ensure adequate safety by preventing breakthroughs from adjacent abandoned mines
- > Evaluated pre-mining and post-mining groundwater recharge and discharge conditions
- > Integrated drainage control, transportation designs, stream protection, reclamation and revegetation plan into the permitting process
- > Included multiple cross-valley fills in the excess spoil disposal plans

Provide access to a seam located nearly 600 feet below the surface

- > Designed the shaft and slope, conducting detailed hydrological analyses and planning to prevent during and post-mining acid mine drainage discharge

Definitive Feasibility Study (Duchess Paradise)



Cardno successfully completed a comprehensive, accurate feasibility study in only three years from the first major drilling campaign – an amazing turnaround time for such a complex project.

Client:
 Rey Resources Limited

Location:
 Fitzroy Trough of the
 Canning Basin, Western
 Australia

Rey Resources Limited was looking to assess the potential to develop a greenfield coal mining prospect located in a remote area of northern Western Australia. Dubbed the Duchess Paradise Project, the operation will produce low-energy, high-volatile B bituminous coal for the Asian market, particularly India.

To help our client assess the project's potential, Cardno prepared a definitive feasibility study (DFS), complete with risk assessment. We integrated a wide variety of multidisciplinary services to deliver the DFS with a quick turnaround. Due to our intimate knowledge of the project, we have also provided oncall technical and business advice for our client's Board of Directors.

Challenges & solutions

Complete a DFS for a proposed operation in a remote area of Australia

- > Mobilized exploration geologists and technical support to the project site and the client's office in Perth
- > Provided onsite management of subcontracted technical resources, exploration drilling, and geophysical logging
- > Completed exploration, data collection and analysis to support Competent Person reports
- > Evaluated resource and reserve potential, prepared JORC-compliant Competent Person reports

Deliver a DFS within a demanding schedule

- > Streamlined the project by providing integrated services to quickly complete geological/geophysical investigations, assessment of coal quality testing results, coal resource evaluations, geotechnical/stability analyses, coal mining simulations, conceptualization of coal handling and preparation plant facilities, and sequencing of surface and ground water management plans
- > Compiled and reviewed various studies performed by others to supplement our assessments and complete the project as quickly as possible

Accurately assess a complex financial situation

- > Integrated a range of financial and marketing studies
- > Assembled a detailed, multi-faceted financial model that included a camp, airport, a slot/highwall mining operation, and the commissioning, construction, and commercial operation of a port facility
- > Forecasted the impacts of Minerals Resource Rent Tax (MRRT), exchange rate, inflation, market prices, and community considerations

Groundwater Characterization of an Underground Mined Area



Cardno's groundwater characterization led to implementation of efficient and cost-effective slurry disposal.

Client:
Dickenson-Russell Coal Company

Location:
Dickenson County, Virginia

The Dickenson-Russell Coal Company needed to identify the best method to dispose of fine-grained reject material from coal cleaning operations at one of its mines in Dickenson County, VA. Typically, this slurry is disposed in either surface impoundments or in deep, underground mine cavities. While disposal in underground cavities can be more efficient and effective, migration potential must be insignificant to avoid the risk of contaminating groundwater.

Cardno conducted a geological and hydrogeological study of the area to characterize the groundwater regime and circulation and determine the stability and monitorability of the mine cavity for disposal of plant refuse slurry. We also prepared and implemented a full monitoring plan. After our extensive investigations, we determined that the slurry could not migrate across the rock strata and potentially contaminate the area.

Challenges & solutions

Deliver a comprehensive investigation

- > Installed nested deep monitoring wells
- > Completed permeability testing of specific strata
- > Developed a groundwater monitoring system tiered to identified aquifers at various depths to provide for early detection of potential migration of any dissolved contaminants

Determine groundwater circulation depths and rates

- > Characterized the structural geology and stratigraphy
- > Identified potential subsidence fracture boundaries
- > Determined water chemistry at various depths
- > Determined vertical hydraulic gradients, recharge and discharge areas
- > Developed a monitoring program

Mine Hydrology, Water Management



Client:
Confidential

Location:
Virginia

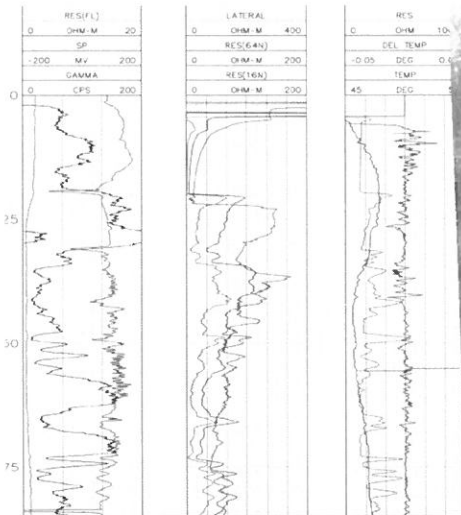
Progress of advancement of a large, deep underground mine is intermittently impeded by large inflows of groundwater through karstic features, and pumping costs are significant. Cardno, in team with another consulting group, is conducting a comprehensive mine hydrology characterization study to identify sources and areas of influx, to allow future exclusion and/or improved handling efficiency of the water.

Challenges & solutions

Characterize the complex hydrogeologic regime

- > Conduct underground mapping of inflow locations, correlate to surface features.
- > Install and monitor flumes and weirs, both underground and on the surface.
- > Monitor rainfall, measure stream flow, perform water balance assessment.
- > Sample and evaluate water chemistry and delineate different hydrochemical facies.
- > Conduct surface geological mapping relevant to shallow water storage, recharge, infiltration points, and discharge points.
- > Conduct photolineament analysis.
- > Conduct successful dye trace to confirm sources of inflow.

Ruby Mine Advancement Geotechnical and Hydrogeological Investigation



Our client advanced the mine despite difficult hydrogeological conditions because Cardno's investigation provided an accurate subsurface assessment and advancement practices that mitigated potential impacts.

Client:
 Delbarton Mining Company

Location:
 Mingo County, WV

Delbarton Mining Company wanted to advance underground mine workings beneath Trace Fork, a stream valley where the shallow depth of the mine horizon could potentially result in hydrologic interaction between the stream or shallow aquifers and the mine.

Cardno conducted a hydrogeological and geotechnical investigation of the planned advancement site, delineated subsurface flow and geotechnical characteristics, and developed recommendations for ground support and hydrologic sealing. Our efforts facilitated the mine advance, which was successfully undertaken despite difficult conditions for mine advancement.

Challenges & solutions

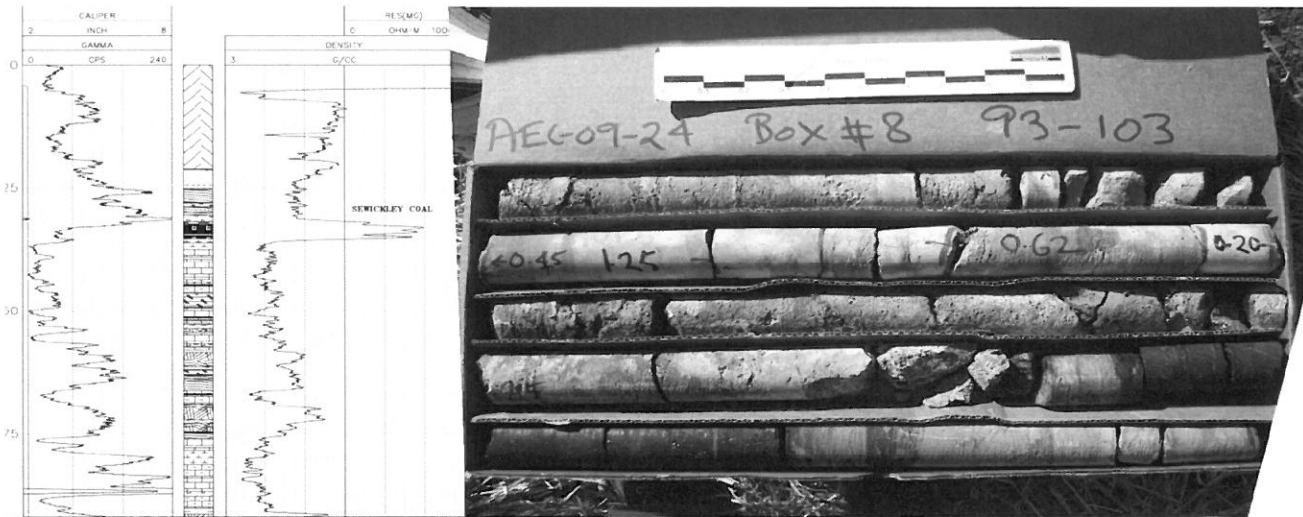
Determine subsurface conditions at the mine horizon

- > Drilled four investigative boreholes in the stream crossing area
- > Conducted specialized geophysical logging, in situ hydrologic testing, and geotechnical testing
- > Confirmed a limited dimension of weathered shale bedrock (about 32 to 38 feet) above the seam at the projected stream crossing
- > Found that the rock was highly permeable along horizontal, bedding-plane separations resulting from stress-relief mechanisms

Develop mine advancement practices to mitigate conditions

- > Using information from the subsurface investigation, expected that ground control and ground water inflow issues would require intensive mitigation, including pre-grouting, in-mine grouting, installation of supplemental support, and reduction of cut depths, place widths, and roof bolt spacings
- > Recommended hydrologic monitoring to identify background conditions and confirm the degree of impact resulting from grouting and mining
- > Determined allowable mine entry and spacing relationships
- > Determined ground support needs and installation techniques
- > Developed a grout envelope plan to protect the mine while not exerting material change upon the hydrologic regime

Mine Advancement Hydrogeological and Geotechnical Investigation



Cardno's recommended procedure prevented potential problems during mine advancement and our client found that geological conditions were just as we had predicted.

Client:
 American Energy Corporation

Location:
 Belmont County, OH

To access remaining mineral reserves, the American Energy Corporation wanted to advance a mine beneath Captina Creek, a semi-large creek that is important to the region's watershed and home to about 56 species of fish. To safely advance the mine underneath the creek, they hired Cardno to perform detailed hydrogeological and geotechnical investigations.

We determined feasibility, implications, potential consequences and precautionary measures needed for the advancement. Ultimately, our client successfully performed the advancement following Cardno's recommended procedures.

Challenges & solutions

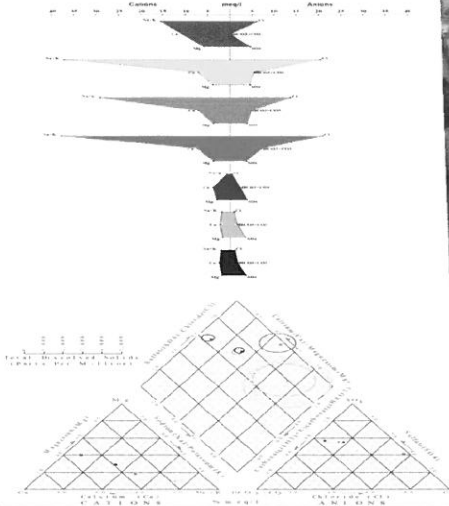
Determine subsurface conditions at the mine horizon

- > Drilled investigative boreholes
- > Conducted specialized geophysical logging, in situ hydrologic testing, and geotechnical testing
- > Demonstrated that the valley stress-relief fracture system was well-developed to a depth of about 60 feet, but that rock below that depth was of low permeability due to high clay content, and little water inflow would occur so long as no fracturing is induced
- > Determined that mine advancement had the potential to open up microfractures due to the weak nature of the immediate roof and floor rocks

Develop mine advancement practices

- > Determined allowable mine entry and spacing relationships
- > Determined ground support needs and installation techniques
- > Recommended that every effort be made to prevent strata movement in the area below the valley through minimization of entry widths and intersections and maximization of pillar sizes
- > Suggested methods to mitigate or minimize water inflow and roof stability problems
- > Recommended that in-mine grouting be applied as the mine advances

Investigation of the Source of Groundwater Inflow to a Box Cut Entrance of an Underground Coal Mine in Kentucky



Client:
Confidential

Location:
Kentucky

A box cut, or vertical slot in the ground, being excavated to serve as an entrance to an underground coal mine in Kentucky began to experience over 500 gallons per minute of groundwater inflow. The inflow was problematic for excavation activities and created a potential long-term issue for the planned mine entrance. Cardno conducted sampling of the water, measurement of flow rates and geochemical parameters, and observations of geological features in and around the box cut area. Characterization of the groundwater inflow and geochemical comparison to water in a nearby underground mine, in a nearby creek, and in a nearby pond was accomplished via Stiff and Piper diagrams. The investigation discovered that the inflow to the box cut exhibited a distinct chemical character (high chloride concentration), and was unlike the water in the nearby underground mine and waterways. Ultimately, Cardno provided a series of recommendations to lessen the inflow to the box cut and for further investigation to further determine the source of the water.

Challenges & solutions

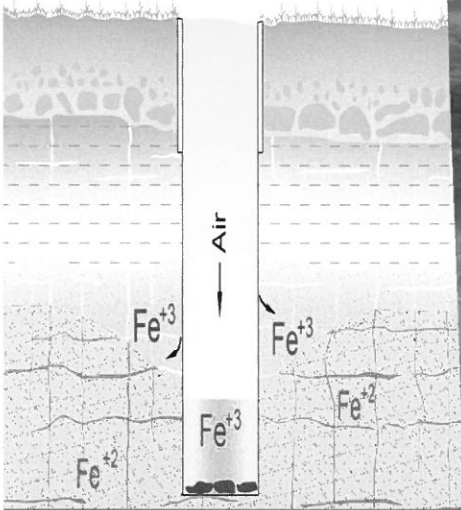
Characterize the geological and geomorphological conditions present in the area of the box cut

- > Collect field observations and research pre-mining topographic maps to determine the relationship of the box cut position to stream and valley features
- > Measure orientation of joints and bedding planes (flow paths) in the walls of the box cut
- > Observe the groundwater flow entry points in the box cut with regard to stratigraphic changes and geostructural features

Characterize the groundwater inflow and compare it to potential sources.

- > Collect samples from the box cut, an upstream pond, a receiving stream, and a nearby underground coal mine
- > Characterize the water chemistry and create geochemical diagrams to facilitate comparison to potential sources
- > Determine the comparative salinity of various area waters and evaluate sources and mixing of waters
- > Provide recommendations for water management and control

Hydrogeologic Investigation of Alleged Groundwater Impact Due to Underground Mine Injection and Surface Water Impoundment



Client:
Confidential

Location:
Central Appalachians

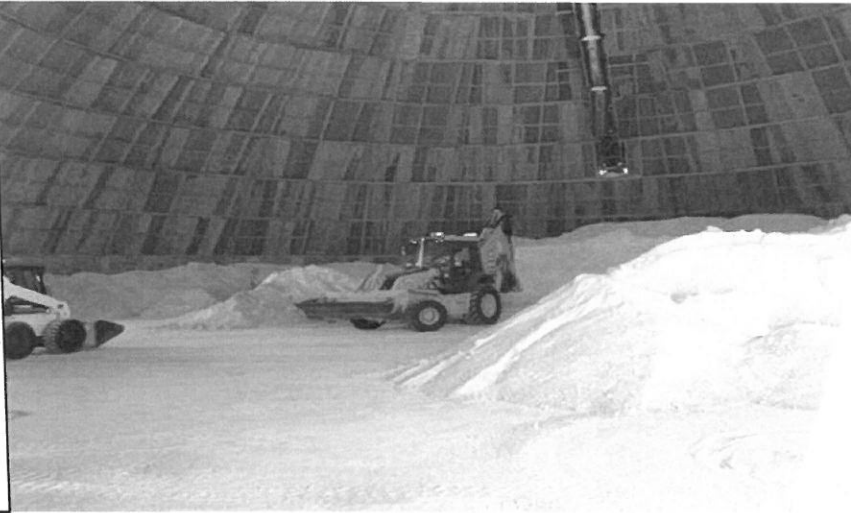
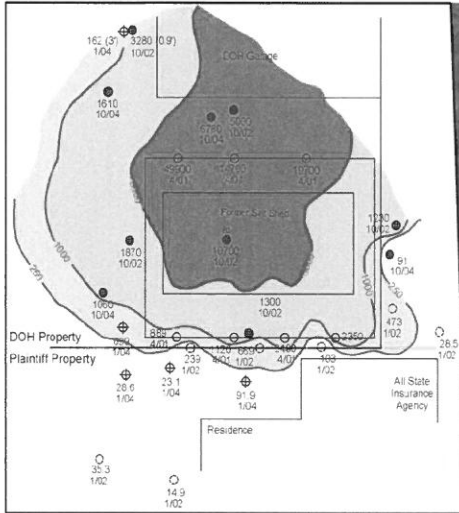
Concerns were voiced that widespread groundwater contamination had occurred due to previous coal slurry injections into abandoned underground coal mines, and to infiltration from a surface refuse impoundment. The hydrogeologic investigation incorporated a large study area involving several communities and watersheds, multiple mines in multiple coal seams, multiple injection wells, and numerous domestic wells. Cardno led the hydrogeological investigation and worked closely with other scientists and medical professionals in evaluating the potential for and likelihood of groundwater impact to water supply wells resultant from the injection operations and surface water refuse impoundment.

Challenges & solutions

Characterize the hydrogeologic regime; evaluate the mine hydrology and injection history; and build and manage a large database of information

- > Conduct geologic mapping of potential aquifers and aquitards; delineate potential mine pools, mine water flow paths and potential discharge points; and estimate potential areas of slurry flow and accumulation, as well as slurry volumes in multiple mines and coal seams
- > Determine locations of historic injection wells and delineate areas where slurry sediment may occur, and evaluate relation of domestic wells to existing deep mining
- > Develop model depicting relationship of water wells to mine pool levels and coal seam outcrop position
- > Collect water samples from numerous wells, as well as from other background water wells located outside the study area to illustrate natural occurrence of subject water parameters
- > Maintain a large and comprehensive database of all analytical results collected from various entities over time
- > Determine which water wells, if any, could potentially be impacted by the injection activities

Investigation of Alleged Chloride Contamination of Shallow Groundwater and Soil Associated with a Road Salt Storage Facility



Client:
Confidential

Location:
West Virginia

Concerns were raised that a road salt storage facility had resulted in chloride contamination of shallow groundwater and soil on a residential property adjacent to the facility. Cardno evaluated available information, which included results of water and soil testing and measured water levels in monitoring wells installed in the subject area. Based on the potentiometric data, and water and soil quality sampling results, Cardno created contour maps to determine the groundwater flow direction and the areal extent of potential soil and water impact by elevated chloride levels. Results of the evaluation concluded that the subject property was located upgradient of the salt storage facility, such that groundwater flow from the area of the facility would actually tend to travel away from the concerned resident's property. In addition, water and soil quality results indicated no consequential chloride impact on the resident's property.

Challenges & solutions

Characterize the local shallow groundwater system

- > Review information from numerous monitoring well sites and determine the reliability of the data
- > Prepare a contour map of the shallow groundwater potentiometric surface and determine the local flow direction and gradient

Determine the extent of the chloride contamination

- > Review numerous soil and groundwater chemistry laboratory reports and determine the reliability of the data
- > Map the distribution of chloride concentrations
- > Relate the chloride mapping to the groundwater system, and to the locations of the salt storage facility and resident's property

Review of Coal Mine Water Discharge Plan Involving Elevated Chloride Concentrations and In-Stream Mixing Zone



Client:
Confidential

Location:
Virginia

A coal company was pursuing a regulatory permit to allow for discharge of up to 3,000 gallons per minute of water from an underground coal mine into a nearby river. As the mine is over 1,400 feet deep, chloride concentration in the water was of primary concern, with additional concern for other parameters such as iron, manganese, strontium, barium, oxygen reduction potential (ORP), and chemical oxygen demand (COD). Cardno was asked to review the plan and provide an independent opinion as to how the proposed project would impact the environment and potential future development in the area. To form an opinion, Cardno conducted a thorough review of available information including previous studies, interviews with coal company personnel, wastewater treatment plant discharge quality data and regulatory requirements, regulatory water quality standards, and field observations. The assessment involved consideration of potential impacts to stream visibility, odor, precipitates, water quality, benthic and aquatic life, and groundwater and wells. Monitoring, inspection, and enforcement procedures were reviewed for completeness and accountability. The assessment considered the effects of the project on future development along the river, and on existing waste water treatment plants with regard to wasteload allocations. Alternative methods for mine water disposal were also outlined.

Challenges

Review and summarize all available information

- > Organize available data and determine relevance to the issues at hand
- > Identify and mitigate discrepancies in reported information

Provide an independent opinion as to the potential impacts of the proposed discharge plan

- > Evaluate the proposed plan with regard to environmental, regulatory, and developmental impacts
- > Consider the practical and technological limits affecting the proposed plan and potential alternative methods