REQUEST FOR PROPOSALS
(RFP)

RFP # 12-06-PJ

Issue Date:	March 2, 2012
Title:	Uranium Study
Commodity Code:	91843
Issuing Agency:	Commonwealth of Virginia Department of Environmental Quality Attn: Patsy Jones, Contract Officer P. O. Box 1105 Richmond, VA 23218
Using Agency And/Or Location Where Work Will Be Performed:	Department of Environmental Quality Department of Mines, Minerals and Energy

Initial Period Of Contract: From Date of Award Through November 30, 2012.

Sealed Proposals Will Be Received Until 2:00 p.m. on April 3, 2012 For Furnishing The Services Described Herein.

All Inquiries For Information Should Be Directed To: Patsy Jones, Contract Officer, Phone: (804) 698-4335 or E-mail: Patricia.Jones@deq.virginia.gov. **Questions will be accepted until close of business on March 12, 2012.**

IF PROPOSALS ARE MAILED, SEND DIRECTLY TO THE ISSUING AGENCY SHOWN ABOVE. IF PROPOSALS ARE DELIVERED BY COURIER OR HAND DELIVERED, DELIVER TO: 1st Floor Receptionist Desk, Department of Environmental Quality, Attn: Patsy Jones, Contract Officer, 629 East Main Street, Richmond, VA, 23219.

In Compliance With This Request For Proposals And To All The Conditions Imposed Therein And Hereby Incorporated By Reference, The Undersigned Offers And Agrees To Furnish The Services In Accordance With The Attached Signed Proposal Or As Mutually Agreed Upon By Subsequent Negotiation.

Name And Address Of Firm:
Marshall Miller & Associates, Inc.
534 Industrial Park Road
Bluefield VA
Zip Code: 24685
eVA Vendor ID or DUNS Number: E3942
Fax Number: (276) 322-5460
E-mail Address: joe.vance@mma1.com

Date: April 3, 2012
By: Joseph B. Vance
(Signature In Ink)
Name: Joseph B. Vance
(Please Print)
Title: Senior Vice President
Telephone Number: (804) 240-5313

PREPROPOSAL CONFERENCE: A mandatory preproposal conference will be held at 9:30 a.m. on March 13, 2012 at the Department of Environmental Quality, 629 East Main Street, Richmond, VA, 23219. Reference: Section VII herein. NO ONE WILL BE ADMITTED AFTER 9:40 a.m. If special ADA accommodations are needed, please contact Patsy Jones at 804-698-4335 by March 9, 2012.

Note: This public body does not discriminate against faith-based organizations in accordance with the *Code of Virginia*, § 2.2-4343.1 or against an offeror because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment.

1-276-322-5467 | www.mma1.com
534 Industrial Park Road | Bluefield, VA 24605-9364

Kansas | Kentucky | Louisiana | North Carolina | Tennessee | Virginia (3 locations) | West Virginia (2 locations)

April 3, 2012

Ms. Patsy Jones, Contract Officer
Mr. Richard Weeks, Contract Administrator
Commonwealth of Virginia
Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Re: RFP # 12-06-PJ Request for Proposal for Uranium Study
(Commodity Code: 91843)

Dear Ms. Jones and Mr. Weeks:

Following is a response to your **Request for Proposal** *(RFP)* issued March 2, 2012, to provide literature analysis and recommendations, technical advice and assistance, and assistance with preparing various environmental monitoring recommendations related the mining of uranium if the current moratorium is lifted so that your department can act in the Commonwealth's best interests in the promulgation and administration of rules and regulations for mining-related activities.

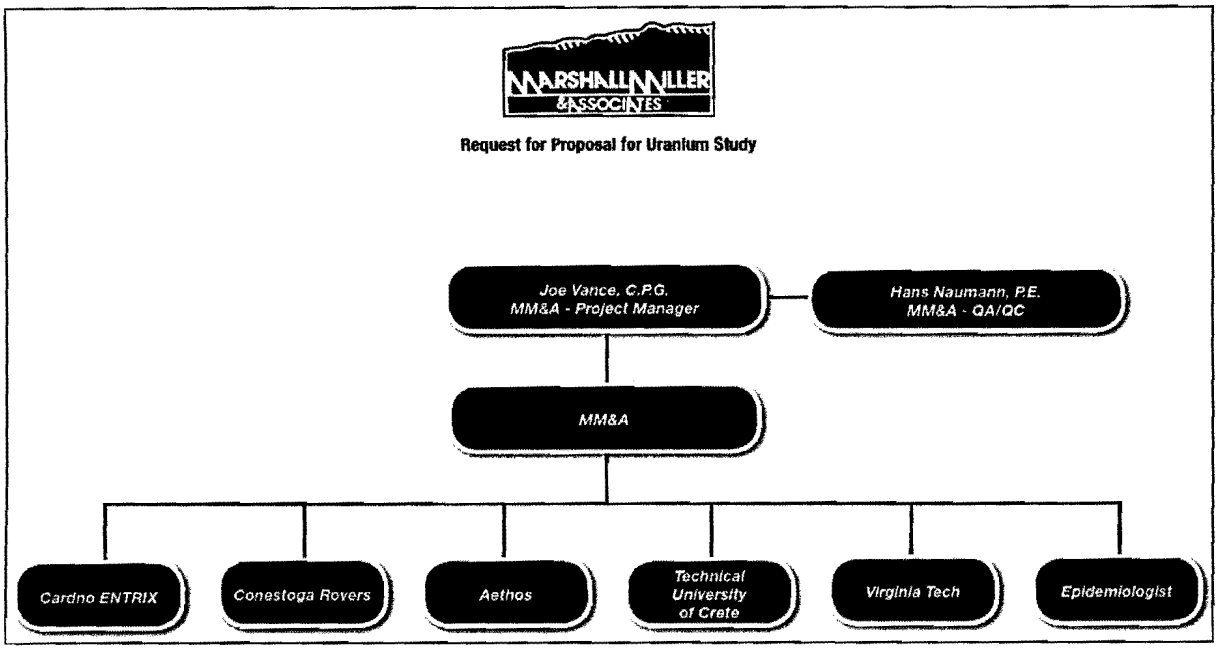
As a certified small business in Virginia, Marshall Miller & Associates (MM&A), a diverse consulting and engineering firm headquartered in Bluefield, Virginia, with additional offices in Ashland and Blacksburg, offers a wide spectrum of services to energy-related clients worldwide. Since 1975, MM&A has evolved into a leader in the areas of civil, mining, environmental and investigative engineering, and energy and mineral resources identification.

Our experience is both broad and deep, with professionals who have years of analytical, interpretational and technical experience in very specific geologic and engineering disciplines that include locations both here and abroad. We will commit to provide thoughtful and balanced recommendations for your consideration as you meet the unique needs of the Commonwealth in this particular charge.

MM&A's qualifications include specific experience in the geological and mining evaluation of the Coles Hill uranium deposit located in Pittsylvania County, Virginia. From our three offices in Virginia, we will utilize a seasoned staff of geologists, hydrologists, and mining engineers who are qualified to assess regulatory matters due to their education, training, and experience in

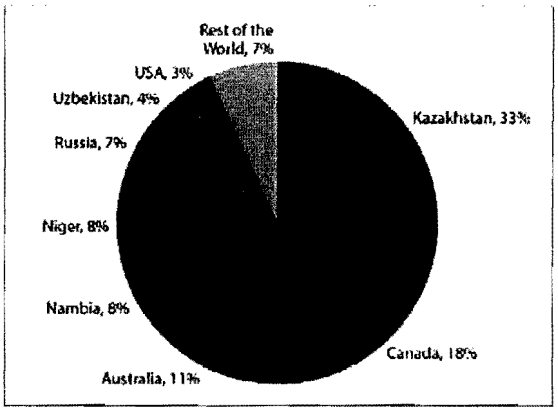
their fields of specialties. Last, but not least, our staff that will be assigned to this project has litigation and mediation experience.

MM&A is also experienced in managing teams of specialists and for the purpose of this proposal MM&A has assembled an extraordinarily well-qualified team. In that regard, MM&A will be working with **Conestoga Rovers & Associates** *(CRA)* (USA, Canada, and United Kingdom offices), **Cardno ENTRIX** *(Cardno)* (USA and Australian offices), **Virginia Tech** *(VT)* (USA), **Technical University of Crete** *(TUC)* (Greece), and **Æthos** (Perth, Australia) in order to meet the very broad scope of work proposed by the RFP. An epidemiologist, not engaged at the time of the submittal of this response to the RFP, will named at the appropriate time and will round out the key elements of the team. The foregoing list of participants notwithstanding, MM&A has ready access, through years of relationship building, to other highly qualified expert entities and MM&A reserves the right to reach out and to engage those entities if that need is identified in the course of fulfilling the commitments to this assignment. The proposed, integrated roles of these team members will be described in summary fashion in the course of this proposal. Resumes and qualification of staff within each of these service providers are attached for your reference.



Proposed Organization Chart

The team assembled under the direction and management of MM&A is comprised by national and international experts familiar with the mining, processing, waste disposal, and health issues related to uranium. The team is particularly aware that uranium mining is currently active in approximately 20 countries.

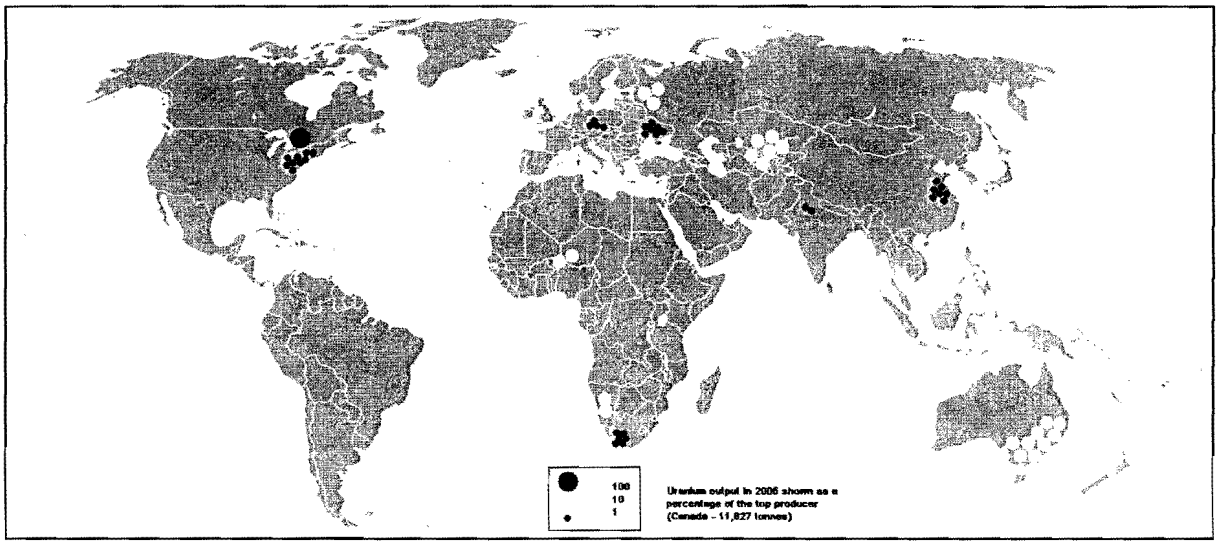


Source: Nontechnical Summary, Uranium Mining In Virginia, 2011, The national Academy of Sciences, Page 3

That said, almost every sector of the world holds uranium deposits, some of ore-grade, and many of which have been exploited from time to time. Presently about 50 uranium mines / production centers are operational. The largest conventional uranium mines are McArthur River (Canada), Ranger (Australia), Olympic dam (Australia), Krasnokamensk (Russia) and Rossing (Namibia). The largest uranium producers are Cameco, Rio Tinto, Areva, KazAtomProm and ARMZ-TVEL.

The generally recognized uranium ore mining techniques are open pit, underground, and in-situ leaching. With respect to open pit and underground mining, the actual recovery of the uranium product (U3O8) is either through a grinding/milling/leaching process or a "heap leaching process" that yields a product commonly known as "yellow cake". Alternatively, some commercial entities have successfully applied in-situ leaching (ISL), which involves leaving the ore where it is in the ground, and recovering the minerals from it by dissolving them and pumping the pregnant solution to the surface where the minerals can be recovered. In summary, conventional underground (UG) and open cast (OC) mines comprise 54% of world production, while in-situ leaching (ISL) captures 41% and by-product processes some 5%.

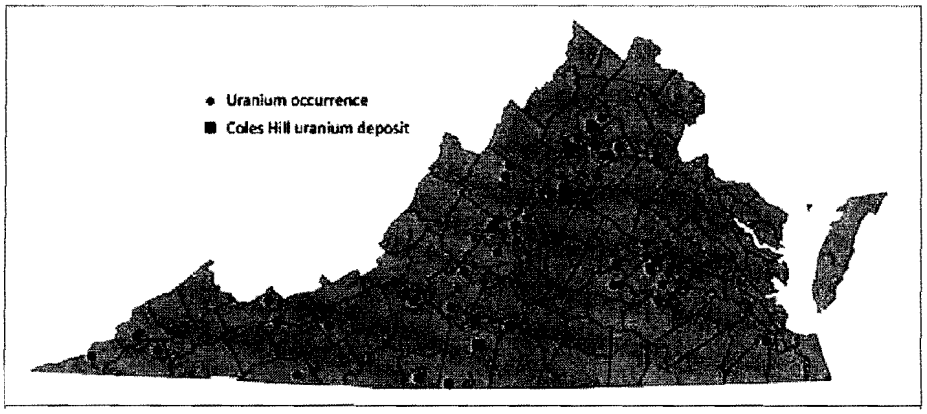
The relatively scattered nature of the sources of ore-grade uranium is depicted in the following map.



Map Showing the Major Commercialized Uranium Mining and Processing Sites (Circa 2005)

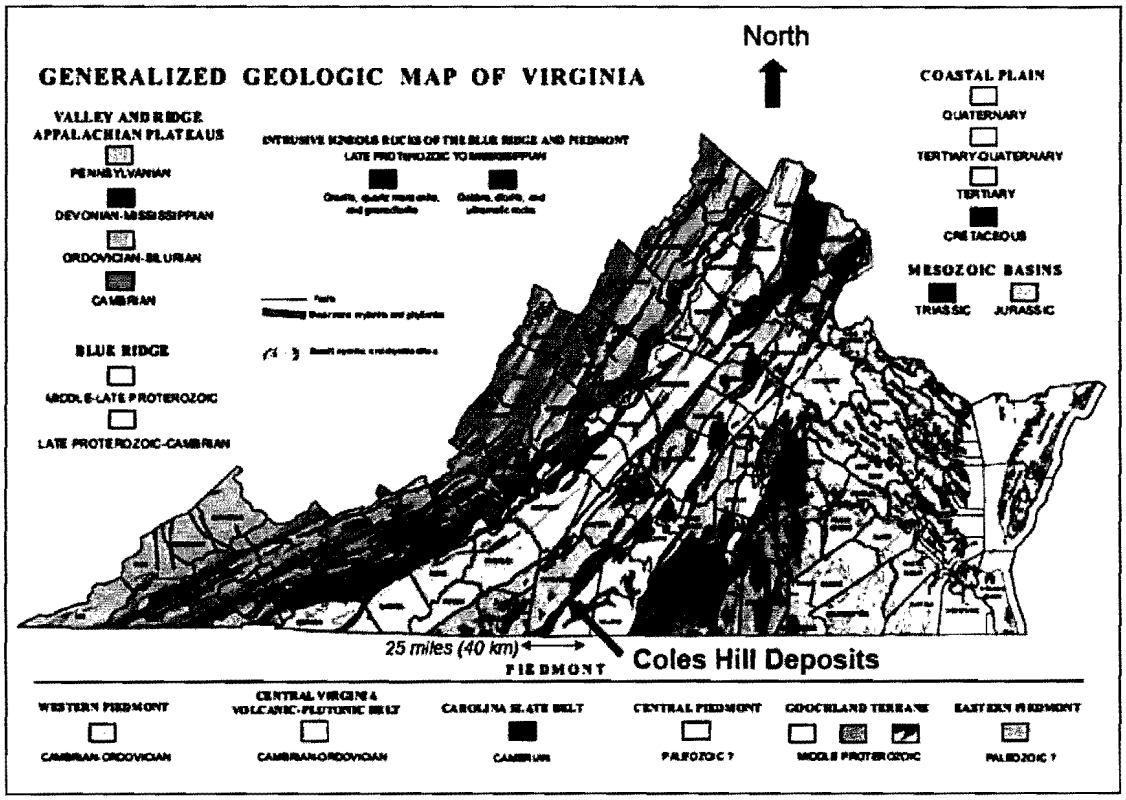
The significance of the global nature of uranium mining is that each country evolved rules and regulations with respect to the mining, milling, and waste disposal process, usually in reaction to negative events or developments. As noted in the RFP filed by the DEQ and DMME, it is the intention of the Virginia Workgroup to harvest and understand those experiences in order to assess their application to uranium mining, milling and waste disposal in Virginia.

The team is further aware that geological exploration has identified more than 55 occurences of uranium in Virginia. And, of the sites explored in Virginia so far, only the deposit of Coles Hill is large enough, and of a high enough grade, to be potentially economically viable.



Source: Nontechnical Summary, Uranium Mining In Virginia, 2011, the National Academy of Sciences, Page 3

With respect to the Coles Hill uranium deposite, MM&A has general and specific knowledge of that site through its support of a project entitled: *Technical Report on the Coles Hill Uranium Property, Pittsylvania County, Virginia, United States of America, 20 April 2009.*



General Location of Coles Hill Uranium Deposit in Pittsylvania County, Virginia (From Virginia DMME and Technical Report on the Coles Hill Uranium Property, Pittsylvania County, Virginia, United States of America, 20 April 2009, page 10)

As noted in the documents offered by DEQ and DMME precedent to the RFP, Virginia's high water table and heavy rainfall is in contrast to the typically dry, Western states of North America where uranium mining has taken place. Consequently, as the RFP points out, federal agencies have little experience developing and applying laws and regulations in locations with abundant rainfall and groundwater, such as Virginia. Furthermore, because of Virginia's moratorium on uranium mining, it has not been necessary for the Commonwealth's agencies to develop a regulatory program that is applicable to uranium mining, processing, and reclamation.

The challenge facing the DEQ and DMME is the assembly of a rational and technically supportable set of rules and regulations that will guide the design construction, operation, and monitoring of the uranium mining, processing, and reclamation processes, so that near-to moderate-term environmental effects are significantly reduced if not eliminated.

Moreover, information in our proposal follows your outline in **III. Statement of Needs with an action plan for each of your queries.**

Per IX.I. (page 22) The Project Manager will be Joseph B. Vance, C.P.G. and he will be available to respond to your agency's queries within twenty-four (24) hours of receipt of an e-mail or telephone call.

E-mail Address: joe.vance@mma1.com
Telephone Number: 804-201-4658

We are pleased to provide this response, and we look forward to providing additional information related to your uranium study RFP upon your request.

Respectfully,

Hans E. Naumann

Hans E. Naumann, Jr., M.S., P.E.
Senior Vice President
Marshall Miller & Associates, Inc.

Presents

A Proposal for
Uranium Study
RFP # 12-06-PJ
Commodity Code: 91843

April 3, 2012

Table of Contents

A. Initial Literature Analysis and Recommendations

DELIVERABALE: Initial Report - Due: three (3) weeks after contract award date. The contractor shall provide one (1) copy of the report electronically and six (6) hard copies.

To deliver the initial literature analysis and recommendations, *MM&A will coordinate among a complex parallel track investigation of rules and regulations in existence in the United States of American as well as its protectorates. Assisting MM&A will be selected staff from Conestoga Rovers, Cardno ENTRIX, and Virginia Tech. MM&A is fortunate to have counterparts in the appropriate disciplines monitoring the activities or groups of individuals from these consultancies. In a similar manner, regulatory-familiar consultancy staff in the United Kingdom, Greece and Australia will report to MM&A the regulatory climate in South America, Europe, Africa and Austral-Asia. Given the brevity (3-weeks) the deliverables will comprise a matrix which presents in summary fashion the key regulatory elements from each significant state or province (USA and Canada) and country examined in the course of this assignment.*

Virginia & Other Relevant Studies: Utilizes summaries prepared by the Workgroup of existing Virginia uranium mining studies (National Academy of Sciences/National Academies Press [NASINAP], Virginia Beach, Fairfax, Roanoke River Basin Association, Chmura Economics and Analytics, and RTI International, and the 1984 Senes Assessment of Risk and associated Uranium Task Force Report), as well as other relevant studies, and makes recommendations concerning findings of these studies that are relevant to Virginia's existing regulatory framework that would apply to uranium mining and milling.

MM&A staff and team members familiar with the above-recited documents and reports *will be assigned to the compilation of a matrix of comments that can be used for comparison and analysis purposes. The final component of this part of the assignment will be the development, prioritization and reporting of recommendations with respect to Virginia's existing and anticipated updated regulatory framework.*

Existing Regulatory Programs: Compares existing uranium mining and milling regulatory programs including Nuclear Regulatory Commission (NRC), any agreement state programs, and international programs (such as Australia, Canada and France), and recommends provisions from within those regulatory programs that are relevant to the Commonwealth and would be effective in Virginia.

***Based on extensive discussions on the matter, MM&A and CRA** will take the lead on research on regulatory programs in the individual states and provinces of the United States and Canada, as well as federal rules, as they may apply. This work is expected to be complex and demanding in light of the short time frame, thus employees from Cardno ENTRIX are expected to be team players in this component of the assignment. It is expected that specialty regulations related to the milling and processing of uranium ore will require the involvement of professors at Virginia Tech and the Technical University of Crete.*

MM&A will divide regulatory jurisdictions and make additional focus on those with known uranium resources (e.g.; Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, and Wyoming). A specific team member will focus review on these states, and the others will review remaining jurisdictions and NRC regulations. Regulation review will be performed primarily by on-line regulation review and will be supplemented with contact to state regulatory programs by telephone and local CRA personnel from offices in Golden, Colorado, Omaha, Nebraska, Albuquerque, New Mexico, and Austin Texas as needed.

International Emerging Standards: S ummarizes pertinent information and studies from such groups as the International Atomic Energy Agency, the World Nuclear Association, etc. and provides recommendations based on t his review that are relevant to the Commonwealth's regulation of the life span of uranium mining and milling including recommendations regarding modern best international practices and other emerging standards and technologies. Identify internationally accepted best practices that can be implemented to mitigate the risk of radioactive releases, discussing technologies available to reduce emissions and maintain a focus on pollution prevention and reduction.

***In this regard, MM&A will coordinate and supplement the efforts of CRA**, whose London, United Kingdom, office will be directed to examine British, German and French regulations with respect to international best practices for mitigation of radioactive releases from mining, milling, and waste disposal processes. Similarly, staff from the Technical University of Crete will assemble and parse the regulations of Eastern Europe and Africa. Last but not least, a woman-owned business stationed in Perth, Australia, with access to colleagues with considerable experience in Australian uranium mine and milling permitting processes is expected to coordinate with Cardno's Australian office to provide the requisite insight to the Austral-Asian component of the world (Australia, India, China).*

Backstopping all of the foregoing activities are staff from Virginia Tech whose expertise in mining and milling methods aside, have close affiliation to major

universities in Europe, Asia, and Australia from which special insights to specific items of interest can be collected for analysis purposes.

Discussion of Deliverables with Respect to Component A of the RFP

***The reviewers will prepare a matrix** to facilitate review citing information on the regulations identified. Initially, the list will include the following items:*

- Jurisdiction
- Agency
- Citation
- Siting Protocols
  - Geotechnical
  - Demographic
  - Environmental Impact Statement Requirements
- Permit Requirements
  - Setbacks
  - Modeling Procedures (air, water, catastrophic events)
- Operating Requirements
  - Environmental Media Monitoring
  - Generic Media Standards
  - Generic Operating Limitations
  - Limitations on Operating Schedule
- Regulatory Monitoring
- Health and Safety Provisions for Worker Safety (beyond MSHA) and Monitoring
- Closure and Reclamation
- Bonding Requirements
- Stakeholder Review

Differences in regional conditions between the Commonwealth and these other jurisdictions, such as climatological and population density, will be noted with potential ramifications in regulatory needs. In particular, this study will note and evaluate the differences in regulations prepared for use in drier climates of the western U.S. and Canada, which is different from the regulatory needs in the Commonwealth, where higher precipitation can be expected to result in greater transfer of contaminants by dissolved or particulate (i.e.; erosive) forms.

The investigative team will highlight key provisions of reviewed regulatory programs, particularly those that provide a useful or practical means to ensuring that the siting, construction, operation, monitoring and closure of mining and milling operations are performed in a manner that is safe to the health of the Commonwealth's people h and the environment in areas surrounding potential uranium mining.

The subcontractors, under the direction of MM&A, will provide the results of their reviews in a form amenable for incorporation into a summary report. The completion of review matrices on existing regulations will be supplemented by draft narrative language describing the general provisions of the regulations and the general regulatory approach, the key subjects and control tools and instruments of permitting and authorization.

Provisions that may be recommended for further consideration by the Workgroup will be identified.

MM&A will target completion of the subcontractor's preliminary summaries at two weeks following project award, to allow time for MM&A to use the information in the formulation of a draft report. The Subcontractors' personnel will be available to work with MMA in drafting the report, as MMA requests, to facilitate completion of this task within the required three weeks after award of contract.

Management of the Research Team

***The Research Team** will be supervised and guided by the Project Manager and designated Project Advisors to properly focus the efforts of the team players, provide interim review of findings and monitoring progress, and, where needed, provide additional resources. Supplemental guidance will be provided by the subcontractor's technical area experts, who have media-specific or other technical specialties pertinent to any environmental regulatory program.*

The Project Manager, Advisors and Technical Experts proposed for this segment of work present a significant breadth of experience in the principles of environmental protection. Its team management and technical experts have worked on many of the projects which have dealt with radiological constituents.

For instance with CRA alone, its current knowledge of the application of NRC guidelines is based on work on groundwater monitoring at nuclear power plant facilities, and applications on remedial work at sites in Ohio, Minnesota and Illinois. In particular, MM&A will point out that CRA is working closely with Canadian nuclear regulatory requirements in the design of remedial facilities for radiologically impacted environmental media in Port Hope, Ontario. Similar experience will be brought to play by Cardno, VT, TUC, and Æthos.

B. Ongoing Technical Advice and Assistance to Commonwealth of Virginia Uranium Workgroup

DELIVERABLE: Interim Analyses of Issues - Due: As needed for meetings with the Workgroup.

DELIVERABLE: Final Report - Due: October 15, 2012. The contractor shall provide one (1) copy of the report electronically and six (6) hard copies.

The Department of Environmental Quality and the Department of Mines, Minerals and Energy are requesting the contractor accomplish the following tasks between the contract award date and October 15,2012 *(specific interim due dates/or issues analyses as directed by the Contract Administrator):*

Work Required: *The RFQ provides for an interim stage of working with the Workgroup to review the findings of the Initial Literature Analysis and Recommendations.*

The recommendations will be evaluated against existing DEQ and DMME regulatory framework to identify where revisions or amendments to the regulations, or regulatory authority may be needed. This review process will occur in monthly meetings between the Workgroup and MMA, with supporting presentation materials being provided to facilitate the review.

B.1. Coordinate with the Workgroup through at least monthly progress meetings to develop analyses of the following items and to develop and provide a final report. The contractor must be available to meet with the Workgroup, either face-to-face or via conference calls, as needed to develop interim deliverables and the final report.

MM&A's Role: *In respect to all of the following matters related to ongoing technical advice and assistance to the workgroup, MM&A will commit its telephone and video conferencing facilities at all of its Virginia-based offices to these activities. This will be in addition to ready access to the Richmond, Virginia, offices of the DEQ and DMME by the Project Manager who will be stationed at MM&A's Ashland, Virginia, office. Furthermore, all of the team members collected by MM&A in support of this Workgroup assignment are prepared to participate in telephone and/or video conferencing. And, other than the international partners, arrangements will be made when warranted to meet in person with the Workgroup staff in Richmond, Virginia.*

B.1.a. Compare recommendations in the initial report (referenced in A. above) to the statutory jurisdictions of the DEQ and DMME

MM&A's Role: *MM&A will take the lead role in working with the Workgroup in this phase. CRA's, Cardno's and Virginia Tech's Project Managers, advisors and technical experts will be available to assist MMA in the interim review of issues identified from each meeting with the Workgroup and perform analyses and presentation materials for follow-up review. In particular CRA, Cardno, and Virginia Tech personnel will be available to accompany MMA to the meetings with the Workgroup if requested.*

B.1.b. Identifies areas where regulatory coverage might need to be created, modified or expanded to ensure protection of public health and the environment with respect to the lifespan of mining and milling projects in Virginia and long-term site monitoring requirements;

MM&A anticipates coordinating predominantly with Cardno, VT, TUC, and Æthos to assess the adequacy of the current regulatory coverage *with respects to the external effects of any mining (opencast or underground), milling, and waste disposal. This should be expected to comprise a two-part activity in which the first balances the current state of the art in mining and milling with the over-arching commitment to safeguarding public health and the environment and the second is in anticipation of applying changes in the mining and milling process that are intended to substantially reduce the risk of external impacts but have not yet been proved feasible and/or effective. At this juncture, MM&A anticipates consulting with an epidemiologist retained for the purpose of this assignment to secure advice on general trends and likely causative stressors to the health of mine employees and neighboring residents.*

B.1.c. Recommends changes (including statutory changes) to meet these needs.

MM&A anticipates that the key outcome of foregoing part B.1.b. is the categorization and prioritization of recommended changes *to both regulatory and statutory matters. Thus, work under task B.1.c. is expected to entail briefing or scribing language appropriate to each prioritized item of change. In that regard, this component of the project will be driven largely by the Workgroup staff to which MM&A will appoint appropriate technical reviewers and commenters on each item proposed. Without limiting this segment of work, MM&A further anticipates that a significant focus will be on worker health and safety, and that the settlement of that concern will predominate with the redress of external factors supporting and/or enhancing those workman's interests.*

B.2. Assist the Workgroup in preparing reports:

The contractor will assist the Workgroup in preparing information for a maximum of six (6) meetings of the Uranium Mining Subcommittee of Coal and Energy Commission to be held between the contract award date and November 30, 2012.

Address those issues listed below, as well as any other issues identified by the contractor as being necessary and relevant for an effective regulatory framework for the life cycle of uranium mining and milling in Virginia. Assist the Workgroup in the development of a draft conceptual regulatory framework.

Work Required: *Following sessions with the Workgroup, the regulatory evaluation process will proceed to meet with the Uranium Mining Subcommittee of the Coal and Energy Commission. A total of six meetings are planned, to culminate by the end of November, 2012. Reports to the Subcommittee will be required for presentation in these meetings to address items B.2.a. through B.2.k.*

B.2.a. Water Quality Monitoring plan for surface waters, including but not limited to:
(1) Ecological risks associated with radiological toxicity and radiation exposure;
(2) Impacts of mine dewatering activities;
(3) Tracking and minimizing the impacts of elevated concentrations of trace elements;
(4) Impacts of land disturbance activities and surface water run-off; and,
(5) Potential for long-term water quality degradation.

The development of Water Quality Monitoring Plan for Surface Water will involve *MM&A and its associated experts on surface water runoff control and quality preservation. This group will coordinate with the Workgroup in preparing draft documents for presentations to Subcommittees. As the subject matter suggests, this is expected to revolve around the protection of the existing surface water runoff courses, and where that is not possible the development of a definition of what changes are permissible. In that regard, Standards will have to set with respect to the appropriate precipitation "return-events" and the design of the containment, protection, or diversion facilities. This entire issue will be particularly sensitive to surface water background information and the expected post-mining uses of the land affected by the mining and milling process. MM&A will note that in all of these aspects, the team assembled by MM&A has the training, experience, hardware and software to allow an assessment of both risks and cost of implementation associated with each scenario presented to the Workgroup.*

B.2.b. Water Quality Monitoring plan for groundwater, including but not limited to:

(1) The potential impacts on groundwater associated with the construction, operation and decommissioning of a mine, mill and tailings, facility;
(2) The threats to groundwater quality related to failure of structures designed to limit movement of contaminants from the tailings into surrounding groundwater and issues associated with inadequate hydraulic isolation in below grade disposal facilities;
(3) Effects of mine dewatering on groundwater quality and quantity;
(4) Effects of mine flooding on groundwater quality and quantity; and,
(5) Effects of exploratory bore holes on groundwater quality.

Prepare Water Quality Monitoring Plan for Groundwater *to assess potential mining related impacts on groundwater quality from mine drainage, tailings and stockpile leachate, flooding and impacts from exploratory boreholes. This activity is expected to assimilate a significant body of work in respect to historical uranium mining sites in the USA as well as Canada. Similarly, the EU, CIS, and AU experiences that shaped the regulations of those segments of the world should be materially important to what the MM&A team will recommend to the Commonwealth.*

Proposed Team Players in support of this element:
MM&A, CRA and Cardno's geological and hydrological Staff

B.2.c. Air Quality Monitoring Plan, including but not limited to:

(1) Evaluation of technologies;
(2) Release of particulate matter from wind erosion of ore stockpiles, waste rock, mine tailings, processing facilities, and mine blasting;
(3) Mobilization of contaminants;
(4) Adequacy of the U.S. Environmental Protection Agency's National Emissions Standards for Hazardous Air Pollutants (NESHAP) for radon;
(5) The emission of radon from waste rock piles, ore stockpiles and windblown particulates;
(6) The potential for the release of radon from evaporation ponds and tailings impoundments; and,
(7) The release of radon during dewatering activities.

Develop Air Quality Monitoring Plan *that incorporates technologies for monitoring and mitigating particulate emissions from stockpiles and tailings and considers adequacy of NESHAPs in managing the release of constituents (radiological emissions). In particular, VT is prepared to assist the Workgroup in assessing the impacts on air-borne pollutants associated with the construction, operation, and decommissioning of mill facilities. An epidemiologist will assist in identifying specific items of concern that require particular attention in the air quality monitoring plan.*

Proposed Team Players in support of this element:
MM&A, CRA air quality Staff and VT milling expert

B.2.d. Adequacy of Virginia's Water Quality Standards for groundwater and surface waters, including but not limited to address:

(1) Water-soluble radionuclides or absorbed chemicals;
(2) The potential for the increase in radioactivity concentrations in a river/reservoir system and the exceedance of the Maximum Contaminant Level (MCL) established for radiological contaminants for drinking water, recreational use, irrigation, agricultural use, and other non-potable uses;
(3) A sampling protocol and regulatory oversight for radiological contaminants in surface water and groundwater;
(4) The potential for undiluted tailings liquids to exceed existing Safe Drinking Water Act standards for uranium; and,
(5) Identify additional water quality criteria if needed.

Assess State Water Quality Standards *for surface water and groundwater to protect against undesirable risk from emissions of constituents of concern from uranium mining and milling operations. In that regard, the MM&A team will examine the international success in capturing precursors of potentially problematic emissions and the effectiveness of the corrective actions taken in each instance.*

Proposed Team Players in support of this element:
MM&A, Virginia Tech and CRA water quality Staff. Here also, the expert Staff of VT and its counterparts in Europe, Asia, and Australia will assist the Workgroup in assessing the impacts of construction, operation and decommissioning of mill facilities.

B.2.e. Standards for the safe disposal of mine waste, including but not limited to:

(1) The potential of serious environmental problems resulting from acid mine drainage or other leachate from mine waste;
(2) Segregation and safe disposal of sub-ore grade waste rock;
(3) The safe control and disposal of uranium tailings;
(4) Mitigation of contaminants from existing sources (e.g., tailings, ore stock piles and waste rock piles) to both groundwater and surface water; and,
(5) To address on-site workers health and safety.

Develop Mine Waste Disposal Protocols for safe disposition of mine tailings and other refinement wastes. *MM&A's civil and hydrological experts in waste disposal and embankment construction will take the lead in this matter. Aside the generally accepted engineering practices that are expected to be embodied in the proposed regulations, the unique requirement of a site capable of surviving intact for the foreseeable future will be evaluated with the risk assessment experts from Cardno and CRA. Important components of this evolving regulatory framework are the standards associated with monitoring, reporting, and analyzing the performance of any waste disposal facility placed on or under the surface of the Commonwealth.*

Proposed Team Players in support of this element:
MM&A, Virginia Tech, Cardno and CRA mining milling and waste disposal staff

B.2.f. Engineering designs and best management practices designed to prevent the release of radionuclides and other contaminants from mining into ground or surface waters, including but not limited to:

(1) Minimizing the ecological risks from the loading and transportation of the uranium product and chemicals used in the processing operation;
(2) Minimizing the impacts of accidents or natural disasters or management oversight failures that impair the normal operations of the mining, processing, tailings management, or water treatment facilities;
(3) Minimizing the exposures to humans and populations of aquatic and terrestrial biota to elevated levels of radionuclides and other hazardous substances;
(4) Minimizing the exposures of the public to elevated levels of radio nuclides and other hazardous substances; and,
(5) Determining if an effective hydrogeological model is available for use at potential sites.

MM&A will take the lead role in coordinating the evaluation and assessment *of existing Virginia regulations pertaining to mine waste disposal, mitigation/engineering design requirements to prevent contaminant release, and worker safety. MM&A will also present a comparison of similar regulations for other states and nations for which uranium mining facilities and regulations are in place. MM&A understands that, at a minimum, state regulations must be compatible with those of the Nuclear Regulatory Commission. Its review will examine best practices used elsewhere in the US and internationally, also. Given the timeframe to complete this work and the goal of the program, it is imperative that the work be appropriately focused in order to give VA DEQ the maximum value for the work performed. As such, this work will focus specifically on uranium-driven issues: this will not be a review of acid mine drainage regulations and impacts. Rather, the regulatory review will seek to increase the understanding of uranium mining issues as well as available and accepted engineering design and Best Management Practices used to prevent the release of radionuclides.*

In terms of this segment of work, Mr. Jim Hondros, a technical advisor to ARPANSA (Australian Radiation Protection and Nuclear Safety Agency) who also spent 12 years in operational and management roles at the WMC Olympic Dam copper and uranium mine in South Australia will represent a special resource that will supplement the considerable capabilities of MM&A, CRA, and Cardno. (Additional information regarding Olympic Dam's recently approved expansion is available here: http://www.olympicdameis.sa.gov.au/)

Last but not least, VT will be prepared to assist in a critical review of waste disposal form milling facilities, specifically related to modern approaches for solid-solid separation (dewatering, thickening, clarification)

Proposed Team Players in support of this element:
MM&A, Virginia Tech, Æthos/Hondros, Cardno and CRA mining staff

B.2.g. Necessary components of a full environmental impact analysis, including but not limited to:

(1) Timing of the environmental impact analysis;
(2) Required components, including baseline and characterization data needed; and,
(3) Legal requirements.

Compile Environmental Impact Analysis *components and develop timing to assess baseline conditions prior to mining. In addition to the expertise offered by the broad environmental engineering staff of MM&A and its partners, VT will present a critical review of optimal designs and best practices for milling operations to prevent the releases of contaminants/chemicals during the transportation, handling and utilization of the surface and ground water resources.*

The MM&A Project Team will work together, using their significant and broad mining and EIS permitting experience to provide a summary assessment of the timing and required elements of the environmental impact analysis necessary to review and permit uranium mining projects in the US. Using the project elements described above for this work, the team will assemble a matrix of information describing the required elements of the EIA/EIS work for such mine proposals. We will also provide a generic timeline indicating the components and relative timing for completion. Given the inherent complexity and variation in size and scope of mining projects it is not possible to provide a definitive timeline. However, we will present a timeline that describes the elements of the permitting process, necessary information, driving legal requirements, and general time range for completion of project elements.

Proposed Team Players in support of this element:
MM&A, CRA, Cardno, TUC, Æthos and VT staff

B.2.h. Methods for incorporating "As Low As Reasonably Achievable" (ALARA) standards into Commonwealth regulations of uranium mining and milling.

Develop recommendations for incorporation of As Low As Reasonable Achievable standards into regulations: *The MM&A Project Team will draw on the expertise and experience of the senior geologists, engineers, and permitting specialists to describe ALARA standards applied elsewhere in the US and how those standards are viewed as successful or may be in need of modification. The team recommends an open dialog/discussion with DEQ staff, with the goal being to identify methods and approaches that may be taken to incorporate ALARA standards into the Commonwealth's regulations. As we understand it, the goal is to provide meaningful and safe regulations that will be protective of the Commonwealth and public interest, while simultaneously providing appropriate regulatory requirements for the mining industry that may allow for the safe production and milling of uranium ore. The team believes that using an open dialog directly with DEQ staff will provide an optimal approach to this particular issue, and will give the team the opportunity to focus its recommendations to meet the needs of the Workgroup.*

Proposed Team Players in support of this element:
MM&A, Virginia Tech, Technical University of Crete, Æthos, Epidemiologist (to be announced), Cardno and CRA Staff

B.2. i. Methods for addressing risk of catastrophic events into the Commonwealth's uranium mining and milling regulations and the Commonwealth of Virginia's Disaster Preparedness Plan, including but not limited to:

(1) Assessment of risks;
(2) Vulnerability Analysis for security events;
(3) Risk Analysis for natural disasters (including extreme weather events such as tornadoes, hurricanes, etc.);
(4) Minimization of both long-term and short-term environmental effects of the failure of a waste containment facility or a temporary storage area;
(5) The potential for extreme flooding events;
(6) The potential for landslides and debris flows;
(7) The potential for seismic events; and,
(8) Addressing the potential impact of failures of on-site storage facilities or accidents in the loading and transportation of chemicals on groundwater quality.

Develop Financial Assurance Recommendations: *The MM&A Project Team will provide a review and summary assessment of hazard analysis and mitigation as applied in existing Virginia mining regulations. It will provide a list of methods that may be used for addressing seismic, meteorological (flood, drought), landslide, and facility slope/dam/pond failures. The team will review the geotechnical engineering design standards used in the Commonwealth's mining regulations and how these issues pertain to addressing potential future uranium mining and milling projects. This review will be completed using key Project Team staff from the member companies on this project. These key staff will use their worldwide experience to guide their input on recommended approaches and best practices to manage hazards and risks associated with facility stability and the prevention of release of contaminants to the environment.*

Proposed Team Players in support of this element:
MM&A, Virginia Tech, and Cardno Staff

B.2.j. Identification and analysis of life span financial assurance mechanisms, including but not limited to:

(1) Providing for modem mining practices for continuous rehabilitation during the life of the mining and milling operation;
(2) Ensuring that life cycle costs as well as long-term stewardship are reflected in the type of and amount of financial surety;
(3) Providing for minimization of long-tern impacts to water resources;
(4) The potential financial impact on municipal and critical infrastructure related to catastrophic or operational events; and,
(5) Liability provisions for catastrophic events.

The MM&A Project Team will assemble a review of pertinent financial assurance mechanisms applied in other states and nations, *and how those assurances may or may not be considered sufficient in case catastrophic or operational event failures occur. Using this information as a reference, the Workgroup will have additional resources to use in determining appropriate financial sureties, and the mechanisms in which those are provided to the Commonwealth, to ensure successful rehabilitation and closure of mine facilities.*

With substantial experience in mine permitting and project support in the US and worldwide, the Project Team has great depth of experience to offer in evaluating financial assurances in mining work. This team is aware that financial assurances are a very important and sometimes overlooked consideration in mine permitting. Furthermore, the team members recognize that regulations regarding financial assurances vary widely from state to state in the US. It is thus critically important that the Commonwealth devise a system that will provide appropriate assurances in place for any mining operation, including uranium mining and milling operations.

Proposed Team Players in support of this element:
MM&A, VT, TUC, Æthos, Cardno and CRA staff

B.2.k. Evaluation of validity and reliability of site-specific data provided by Virginia Uranium, Inc. and its contractors, and analysis of these baseline conditions at the Coles Hill site with regard to the air, water, soil, ore and waste rock, and biota issues that the Commonwealth's uranium mining and milling regulations should be expected to address. Gap analysis of site-specific data available and what is necessary for overall understanding of issues related to statutory and regulatory framework for the protection of human health and the environment.

MM&A has general as well as specific knowledge of the Coles Hill Uranium Mine (CHUM) prospect *by virtue of its involvement in its reassessment of the CHUM ore presence in 1999. This background is expected to be of material significance as the database and reports prepared by Virginia Uranium Inc. (VUI) on behalf of its CHUM prospect. Bolstering that activity will be the cumulated knowledge and experience from the precedent components of this assignment. Furthermore, MM&A proposes to parse the information provided by VUI and appoint specific expertise from MM&A as well as CRA, Cardno, and VT, TUC, and Æthos to fully identify the relevant gaps in both knowledge and applications. The outcome is expected to include a series of conclusions and recommendations from which the regulatory authorities can draw for further action.*

Proposed Team Players in support of this element:
MM&A, VT, TUC, Æthos, Cardno and CRA staff

Commentary on Parts B.1 and B.2:

MM&A will assume the lead role in meetings before the Subcommittee on these matters.

In addition, CRA's experience in surface and groundwater and air quality monitoring, modeling and assessment along with their expertise in toxicology will be highly useful for items a), b), c) and d). Its technical area experts on groundwater and surface water quality will be available to work with the Project Management team in preparing draft documents to presentations.

Technical expert project team members have performed work to assess geological conditions, evaluate mitigating technologies and design environmental action on former ore refining facilities and on nuclear generating stations. Similarly CRA's technical experts have performed air deposition modeling of particulate releases from former radiological refining facilities.

CRA's and Cardno's expertise in waste disposal, including specific and current design requirements and procedures for radiologically impacted wastes, will be useful in addressing e) and f). In that regard, CRA has specific experience in disposal facility design for Fields Brook (and extended to Ashtabula River sediments), Pfohl Brothers Landfill and the slag closure designs.

CRA can also assist in evaluation of additive work indicated on EIAs for uranium mining and milling sites using the experience of Project Advisor Al Meek, who has performed several mining EIAs in his career.

Although MM&A will take the lead on evaluation of catastrophic events, support from CRA and Cardno will be available with respect to storm water modeling groups, especially in the general assessment of methods for evaluating the potential loss of sediments from storage facilities during probable maximum storm events.

Of particular interest is that MM&A and CRA have a good deal of experience in financial assurance standards under CERCLA and RCRA statutes and could supplement primary review work by others.

CRA, Cardno, and VT are expected to work with MMA in forming a team to review the site specific information provided on the Coles Hill site in Pittsylvania County.

XI. Pricing Schedule

Payment Schedule

	Tranche	Amount
Upon Delivery of Initial Report	20%	$78,900
For Interim Analyses	50%	$197,300
Upon Delivery of Final Report	30%	$118,400
Total	**100%**	**$394,600**

XII. Attachments

XII.A. Offeror Data Sheet

This data sheet provides contact information, number of years in business and four (4) references.

ATTACHMENT A

OFFEROR DATA SHEET

Note: The following information is required as part of your response to this solicitation. Failure to complete and provide this sheet may result in your proposal being scored lower.

1. Qualification: The vendor must have the capability and capacity in all respects to satisfy fully all of the contractual requirements.

2. Vendor's Primary Contact:

   Name: Joseph B. Vance Phone: 804-201-4658 (cell) 804-240-5313

3. Years in Business: Indicate the length of time you have been in business providing this type of good or service:

   37 Years _____ Months

4. Vendor Information:

   eVA Vendor ID or DUNS Number: EVA ID: E3942 DUNS: 847445319 (Ashland) DUNS: 070424858 (Bluefield)

5. Indicate below a listing of at least four (4) current or recent accounts, either commercial or governmental, that your company is servicing, has serviced, or has provided similar goods. Include the length of service and the name, address, and telephone number of the point of contact.

   A. Company: Alpha Natural Resources Contact: Mr. Michael J. Quillen
   Phone: (276) 619-4410 Fax: (276) 628-9052
   Project: Multiple exploration, valuation, environmental
   Dates of Service: 2003-2012 $ Value: $10,000,000

   B. Company: Va. Center for Coal & Energy Research Contact: Dr. Michael Karmis
   Phone: (540) 231-5273 Fax: (540) 231-4078
   Project: Large-volume test of CO2 sequestration in unmineable coal seams
   Dates of Service: 2008-2012 $ Value: $5,000,000

   C. Company: CONSOL / CNX Gas Contact: Jim St. Peter
   Phone: (276) 596-5012 Fax: (276) 596-5059
   Project: Multiple exploration projects & geophysical logging services involving licensed radioactive materials
   Dates of Service: 1990-2012 $ Value: $5,000,000

   D. Company: Va. Dept. of Transportation Contact: Mr. Ed Wallingford
   Phone: (804) 371-6824 Fax: (804) 371-6827
   Project: Multiple contracts providing hazardous materials/environmental and groundwater services
   Dates of Service: 1993-2011 $ Value: $38,000,000

I certify the accuracy of this information.

Signed: Joseph B. Vance Title: Senior Vice President Date: 02 April 2012

Joseph B. Vance

XII.B. Small Business Subcontracting Plan

This plan shows MM&A's utilization of DMBE-certified small businesses as subcontractors in the performance of this contract.

ATTACHMENT B

Small Business Subcontracting Plan

Definitions

Small Business: "Small business " means a business, independently owned or operated by one or more persons who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, which, together with affiliates, has 250 or fewer employees, or average annual gross receipts of $10 million or less averaged over the previous three years.

Women-Owned Business: Women-owned business means a business concern that is at least 51% owned by one or more women who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, or in the case of a corporation, partnership or limited liability company or other entity, at least 51% of the equity ownership interest is owned by one or more women who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, and both the management and daily business operations are controlled by one or more women who are citizens of the United States or non-citizens who are in full compliance with the United States immigration law.

Minority-Owned Business: Minority-owned business means a business concern that is at least 51% owned by one or more minority individuals or in the case of a corporation, partnership or limited liability company or other entity, at least 51% of the equity ownership interest in the corporation, partnership, or limited liability company or other entity is owned by one or more minority individuals and both the management and daily business operations are controlled by one or more minority individuals.

All small businesses must be certified by the Commonwealth of Virginia, Department of Minority Business Enterprise (DMBE) by the due date of the solicitation to participate in the SWAM program. Certification applications are available through DMBE online at www.dmbe.virginia.gov (Customer Service).

Offeror Name: Marshall Miller & Associates, Inc.

Preparer Name: Joseph B. Vance **Date:** 02 April 2012

Instructions

A. If you are certified by the Department of Minority Business Enterprise (DMBE) as a small business, complete only Section A of this form. This shall not exclude DMBE-certified women-owned and minority-owned businesses when they have received DMBE small business certification.

B. If you are not a DMBE-certified small business, complete Section B of this form. For the proposal to be considered and the offeror to be declared responsive, the offeror shall identify the portions of the contract that will be subcontracted to DMBE-certified small business in Section B.

Section A

If your firm is certified by the Department of Minority Business Enterprise (DMBE), are you certified as a **(check only one below):**

XXX Small Business

_____ Small and Women-owned Business

_____ Small and Minority-owned Business

Certification number: SWaM# 10101 Certification Date: SWaM Cert. # Exp. Date 14 Dec 2013

SBA# P0503355

DUNS# 070424858 (Bluefield office)

DUNS# 847445319 (Ashland office)

Section B

Populate the table below to show your firm's plans for utilization of DMBE-certified small businesses in the performance of this contract. This shall not exclude DMBE-certified women-owned and minority-owned businesses that have received the DMBE small business certification. Include plans to utilize small businesses as part of joint ventures, partnerships, subcontractors, suppliers, etc.

B. Plans for Utilization of DMBE-Certified Small Businesses for this Procurement

Small Business Name & Address DMBE Certificate #	Status if Small Business is also: Women (W), Minority (M)	Contact Person, Telephone & Email	Type of Goods and/or Services	Planned Involvement During Initial Period of the Contract	Planned Contract Dollars During Initial Period of the Contract
Totals $					

XII.C. State Corporation Commission Form

This provides information as requested by the State Corporation Commission regarding MM&A's registration information.

ATTACHMENT C

STATE CORPORATION COMMISSION FORM

Virginia State Corporation Commission (SCC) registration information. The offeror:

☒ is a corporation or other business entity with the following SCC identification number: 0159588-3 **-OR-**

☐ is not a corporation, limited liability company, limited partnership, registered limited liability partnership, or business trust **-OR-**

☐ is an out-of-state business entity that does not regularly and continuously maintain as part of its ordinary and customary business any employees, agents, offices, facilities, or inventories in Virginia (not counting any employees or agents in Virginia who merely solicit orders that require acceptance outside Virginia before they become contracts, and not counting any incidental presence of the offeror in Virginia that is needed in order to assemble, maintain, and repair goods in accordance with the contracts by which such goods were sold and shipped into Virginia from offeror's out-of-state location) **-OR-**

☐ is an out-of-state business entity that is including with this offer an opinion of legal counsel which accurately and completely discloses the undersigned offeror's current contacts with Virginia and describes why those contacts do not constitute the transaction of business in Virginia within the meaning of § 13.1-757 or other similar provisions in Titles 13.1 or 50 of the Code of Virginia.

****NOTE** >>** Check the following box if you have not completed any of the foregoing options but currently have pending before the SCC an application for authority to transact business in the Commonwealth of Virginia and wish to be considered for a waiver to allow you to submit the SCC identification number after the due date for offers (the Commonwealth reserves the right to determine in its sole discretion whether to allow such waiver): ☐

Marshall Miller & Associates, Inc.
534 Industrial Park Road
Bluefield, VA 24600-9364

Time Line

Activity	April				May				June				July				August				September				October				November			
	Weeks				Weeks				Weeks				Weeks				Weeks				Weeks				Weeks				Weeks			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Kick-Off Meeting (Page 21)																																
A.1 Virginia & Other Relevant Studies (Page 3)																																
A.2 Existing Regulations and Programs (Page 3)																																
Western Europe Emerging Standards (Page 3)																																
Continent, Asian Emerging Standards.(Page 3)																																
Pacific Rim Nations Emerging Standards (Page 3)																																
B.1 Coordinate with the Workgroup (Page 4)																																
B.2 Assist the Workgroup in Preparing Reports (Pages 4 - 7)																																
Total																									↑ File Report						↑ Final Meeting	

Insurance

Client#: 880993 35MARSHMIL

ACORD **CERTIFICATE OF LIABILITY INSURANCE** DATE (MM/DD/YYYY) 3/30/2012

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Amy Walker	
BB&T Insurance Services Inc. 2108 W. Laburnum Avenue, Suite 300 PO Box 17370 Richmond, VA 23227	PHONE (A/C, No, Ext): 804-678-5035	FAX (A/C, No): 8887513010
	E-MAIL ADDRESS: amy.walker@bbandt.com	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : Chartis Specialty Insurance	26883
INSURED Marshall Miller & Associates Inc 534 Industrial Park Road Bluefield, VA 24605	INSURER B : Brickstreet Mutual Insurance	12372
	INSURER C : Argonaut Insurance	19801
	INSURER D : Commerce & Industry Insurance	19410
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	GENERAL LIABILITY			PROP2772529	11/01/2011	11/01/2012	EACH OCCURRENCE	$1,000,000
	X COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$1,000,000
	CLAIMS-MADE X OCCUR						MED EXP (Any one person)	$25,000
							PERSONAL & ADV INJURY	$1,000,000
							GENERAL AGGREGATE	$2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$2,000,000
	X POLICY PRO-JECT LOC							$
D	AUTOMOBILE LIABILITY			CA2600308	11/01/2011	11/01/2012	COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	ALL OWNED AUTOS / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	X HIRED AUTOS / X NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
A	X UMBRELLA LIAB X OCCUR			PROU2772600	11/01/2011	11/01/2012	EACH OCCURRENCE	$5,000,000
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$5,000,000
	DED X RETENTION $0							$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N			WCB1002217	11/01/2011	11/01/2012	X WC STATU-TORY LIMITS OTH-ER	
B	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y	N/A		WC1021943001	11/01/2011	11/01/2012	E.L. EACH ACCIDENT	$1,000,000
C	(Mandatory in NH)			WC927608343044	11/01/2011	11/01/2012	E.L. DISEASE - EA EMPLOYEE	$1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - POLICY LIMIT	$1,000,000
A	Professional Liab Pollution Liab			PROP2772529	11/01/2011	11/01/2012	$1,000,000 Per Claim $2,000,000 Aggregate $25,000 Deductible	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

** Workers Comp Information **

Proprietors/Partners/Executive Officers/Members Excluded: Sharon Miller

CERTIFICATE HOLDER	CANCELLATION
Commonwealth of Virginia Department of Environmental Quality PO Box 1105 Richmond, VA 23218	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE K Blankenship

ACORD 25 (2010/05) 1 of 1 The ACORD name and logo are registered marks of ACORD

#S8399275/M7710108 JMG

Resumes of Key Professionals

Marshall Miller & Associates (PRIME CONTRACTOR)

Joseph B. Vance, C.P.G. (PROJECT MANAGER) – geology assessments, environmental studies, waste characterization and disposal

Vince Alaimo, environmental quality control, compliance
John Eckman, C.P.G. - geology, computer modeling, hydrology
Gerard J. Eniqk, P.E. – mine designs (surface & underground), mining property valuations, feasibility studies
K. Scott Keim, C.P.G. - geology (contributed to a National Instrument (NI) 43-101 compliant technical report in June 2008 for Coles Hill uranium property)
Peter Lawson, B.S.M.E., M.B.A. - mining engineering, valuation studies, financial operations
Ronald H. Mullennex, C.P.G., C.G.W.P - resource and mining geology, hydrogeology, environmental issues and engineering applications
Hans E. Naumann, Jr., P.E. - mining engineering, appraisals, environmental engineering

Team members listed in alphabetical order.

Æthos Consulting (Æthos)

Lisa Chandler, BSc – regulatory review, engineering
Jim Hondros, MAppSci – regulatory review, radiation protection, risk management

Cardno ENTRIX (Cardno)

Gregory A. Poremba, Ph.D. – environmental assessments, socioeconomics, public land use
Peter M. Thibodeau, Ph.D., P.G., P.H., quantitative hydrogeology, water resources, water supply, stream/wetland restoration

Conestoga Rovers & Associates (CRA)

Mauricio Barrera, B.A., M.Sc. – environmental site assessments, remediation projects
Julia Charlton, Environmental Engineer – wastewater treatment engineering and operation, remedial alternatives
Lisa Clements, BSc., B.Eng., – investigations, remediation, chemical monitoring, monitoring plans
Jeff Daniel, B.A.Sc., P.Eng., Technical Advisor, Water Quality – water quality, surface water/sediment modeling

Steven M. Harris, M.A.Sc., P.Eng., P.E., Technical Advisor, Risk Assessment, Toxicology, and Groundwater Modeling Support - risk assessments, assessor/quantitative hydrogeologist, groundwater modeling

Gary R. Klepper, Technical Advisor, Regulatory Affairs – environmental regulations, environmental quality

Edward A. McBean, Ph.D., P.E., Technical Advisor, Waste Management – water supply security, risk assessments, economics, statistics

Al Meek, P.E., Project Advisor – environmental remediation, mining operational projects, Superfund and RCRA sites associated with mining, chemical plants and oil refineries

J. Richard Murphy, M.A.Sc., P.Eng., Technical Advisor, Groundwater Quality – hydrogeologic evaluation and design, groundwater flow and contaminant transport modeling

Gordon Reusing, M.A.Sc., P.E., P. Eng.- Technical Advisor on Air Quality – dispersion modeling, ambient air monitoring, stat testing, permitting, emergency release modeling and risk management plans

David Steele, Project Manager – site assessment and investigations, conceptual models, implementation of practical remedial response options

Glenn Turchan, M.A.Sc., P. Eng., Project Advisor – Brownfield redevelopment, environmental liability management

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Technical University of Crete (Greece)

Zacharias Agiotantis, Ph.D. - mining and metallurgical engineering

A. Anastasios Katsanos, Ph.D. - chemistry, low energy nuclear physics

Kostas Komnitsas, Ph.D. - metallurgy, hydro- and bio-hydrometallurgy, decontamination of effluents, soils and wastes derived from chemical, mining and metallurgical activities

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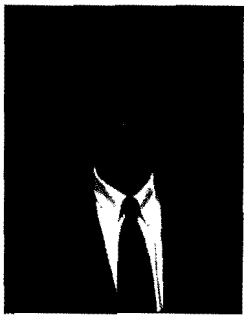
Virginia Tech (VT)

Gerald Harvey Luttrell, Ph.D. – mining engineering, mineral processing including particulate separations, process equipment design, modeling and optimization, and plant circuit engineering (has participated in the development of several patented processing technologies for mineral upgrading)



Joe B. Vance, C.P.G.

Senior Vice President

DEQ Uranium Study PROJECT MANAGER: *Joe is based in Ashland, Virginia, and is a principal project manager for a variety of VA DOH projects as well as international assignments. Joe is familiar with the Coles Hill uranium deposit as well as the overall geology, geography, and cultural history of the Commonwealth of Virginia. Joe's expertise as project manager is his ability to quickly assimilate the purpose and scope of a team composed of national and international members. In addition to his managerial skills, Joe is a practiced geologist and environmental sciences practitioner who understands the requirements and methods of the various agencies of the Commonwealth. Joe is familiar with the current body of federal regulations regarding the general practice of mining as well as air and water quality. Lastly, Joe is adept at writing reports that go to the point and facilitate the decision making process.*

EDUCATION

- M.S., Geology, Eastern Kentucky University, Richmond, Kentucky 1979
- B.S., Environmental Health, Eastern Kentucky University, Richmond, Kentucky, 1971

LICENSES

- American Institute of Professional Geologists, C.P.G., Certification No. 6918
- Virginia, P.G., Certification No. 402
- Tennessee, P.G., Certification No. 2534
- OSHA 40 Hour Health and Safety
- OSHA 20 Hour Supervisory Health & Safety
- OSHA 8 Hour Annual Refresher
- Roadway Worker Protection Training
- Hazardous Materials Training
- RCRA Regulations Review
- Virginia Certified Mold Inspector

EXPERIENCE

Joe Vance, C.P.G. serves as Senior Vice President/Division Manager, and has over 33 years of environmental and other related geologic experience. Areas of environmental and geologic studies/assessments cover many states including Virginia, Kentucky, Tennessee, West Virginia and Ohio. Environmental experience includes overseeing environmental site assessments, waste characterization and disposal options, groundwater assessments, assessment and closure of Class V injection wells, emergency response, underground storage tank removals and related site characterizations, risk assessments and corrective actions, underground storage tank installations including regulatory compliance and writing specifications and assessment of remediation alternatives and implementation. Mr. Vance has also developed superior experience with managing large government contracts and completing projects on a timely manner and under budget. Since 2003 Mr. Vance has been involved with air quality assessments related to water damage and intrusions into residential and commercial structures throughout Virginia, West Virginia and North Carolina.

Mr. Vance has developed particular expertise in evaluation of properties for environmental concerns relative to proposed right-of-way acquisitions for road construction. These assessments range from investigations of a few properties for upgrading of an intersection to evaluation of multiple properties for road widening or establishing new roadway alignments along project corridors,

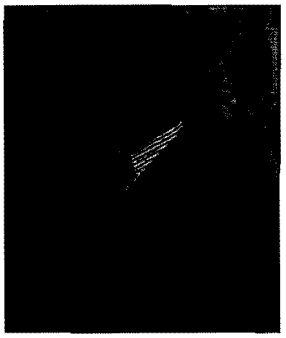
several miles in length. The scope of these projects includes a working knowledge of road construction design plans, evaluating potential risks to construction workers and determining potential liabilities to the purchaser for acquiring contaminated properties.

Mr. Vance has participated in numerous geological field exploration programs related to coal and oil/gas studies. These include exploration, evaluation, report preparation and presentation. His knowledge of the coal and oil/gas industry has also been beneficial in assisting with environmental property assessment throughout the Appalachian region.

Prior to Mr. Vance's appointment as a Division Manager, Mr. Vance held other positions within Marshall Miller & Associates over his thirty-three-year tenure with the company. He started his career as a field geologist and through promotions was appointed to project geologist, senior project geologist, Vice President, Branch Manager for our Ashland, Virginia office, Senior Vice President, and Division Manager for the Environmental group. From 2006 until 2011, Mr. Vance served as a board member for the Virginia Board of Geology.

Vincent Alaimo

Vice President



DEQ Uranium Study Role: Vince is based in Ashland, Virginia, and manages MM&A's Ashland office. Vince will play the role of MM&A's coordinator of the research activities and to facilitate the efforts of the international team members. Vince is also particularly well-practiced in air pollution rules, regulations, and impact mitigation methods. He will take an active role in the workgroup meetings and as such will assist in drafting portions of the proposed guidelines, rules, and regulations. As manager of the Ashland office, Vince has access to MM&A staff at the local level as well as throughout the other MM&A offices.

EDUCATION

- B.S., Chemistry, University of Western Ontario, 1990

SELECT LISTING OF PUBLICATIONS AND PRESENTATIONS

- "PM2.5 Can We Make the Grade," Technical Association of the Pulp and Paper Industry (TAPPI) March 1998.

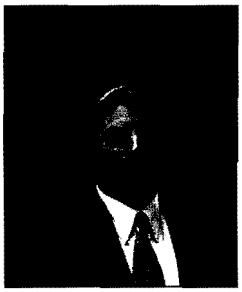
LICENSES AND CERTIFICATIONS

- OSHA 40 Hour Hazardous Waste Operations and Emergency Response Course
- OSHA 8 Hour Annual HAZWOPER Refresher
- U.S. Department of Transportation Medical Certificate
- Certified for EPA Method 9 — Opacity
- Certificate of Completion — Department of Transportation Regulations
- Certificate of Completion — Hazardous Waste Regulations
- Annual Roadway Worker Protection Training, 2011

EXPERIENCE

Over 20 years of national and international environmental consulting experience at all levels of government. Extensive experience in conducting air quality and compliance consulting including Title V, NPDES, SPCC, wetlands, underground injection, water withdrawals, rare threatened and endangered species. Significant experience with emergency response procedures, including initial abatement, health and safety coordination and addressing the media and public concerns. Mr. Alaimo is well versed in greenhouse gas (GHG) requirements for the coal, oil and gas and many other industry sectors.

Provided expert witness testimony for a 600 MW coal-fired power plant siting certificate. Conducted hundreds of Phase I Environmental Site Assessments to help protect real estate purchasers and lenders from CERCLA liability. Serve as the chief negotiator with regulatory officials on behalf of MM&A's environmental clients, and has extensive experience in negotiating consent orders with different regulating agencies. Experience in conducting risk assessments and calculating site-specific cleanup standards.



Gerard J. Enigk, P.E.

Manager of Engineering

DEQ Uranium Study Role: Gerry is a senior mining engineer based in Bluefield, Virginia. Gerry is an accomplished international miner as well as mine engineer who is familiar with computerized mine production models, ground stability simulators, mine water handling networks, and mine ventilation programs. His participation to this assignment is to assure a well-grounded and practicably achievable goal to the rules and regulations that are expected to evolve from this assignment. He is expected to play as significant role in assessing the impacts the proposed rules and regulations may have on the mine worker and to suggest corrective actions in order to mitigate such adverse circumstances.

EDUCATION

- M.S., Environmental Science, West Virginia Graduate College, 1994
- B.S., Mining Engineering, The Pennsylvania State University, 1976

AFFILIATIONS

- Society for Mining, Metallurgy, and Exploration

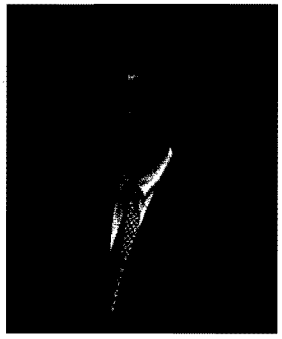
LICENSES AND CERTIFICATIONS

- West Virginia, Registered Professional Engineer, License No. 9171, 1983
- West Virginia Mine Foreman Certification
- OSHA 40-Hour Health & Safety Training, Certificate No. 007437, 1995
- MSHA Qualified Impoundment Inspector
- West Virginia Department of Environmental Protection (WVDEP) Approved Person for Quarrying and Reclamation

EXPERIENCE

Gerry Enigk's experience includes 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. Mr. Enigk is responsible for management of all engineering design, surveying, and permit preparation work for mine properties. He conducts Environmental Site Assessments and evaluates post-closure obligations for mining properties. Past projects have included evaluation and computer simulation of mine ventilation systems; industrial demolition and site reclamation of a coal preparation and base metals processing plant; design, permit preparation, field survey work, construction and reclamation supervision for breaching and excavation of coal refuse impoundments; design, permit preparation, and feasibility study for reprocessing and reclamation of coarse and fine coal refuse areas; weekly impoundment monitoring as required by MSHA; annual impoundment report preparation as required by MSHA.

Mr. Enigk has worked on international assignments in Venezuela, China, Turkey, Colombia, Peru, and Australia.



K. Scott Keim, C.P.G.

President

DEQ Uranium Study Role: Scott Keim is based in Bluefield, Virginia, and is the company president. Scott is a seasoned mining geologist with an outlook rendered pragmatic through years of making business decisions that are good for MM&A and thus for the Commonwealth. Scott has fostered a close yet professional association with Virginia Tech and the Virginia Center for Coal and Energy Research. He is familiar with the transparency requirements of modern government and integrates easily into open discussions on volatile subjects. Scott was one of the driving forces in scrutinizing the activities and auditing the results of the exploration and testing program at the Coles Hill uranium deposit. He is expected to play an intermittent yet important role in portions of the scheduled Workgroup sessions. Lastly, Scott has the ability to mobilize a substantial resource in staff (via associates and internal staff) with expertise in geology, hydrology, geotech, environmental sciences, social impact mitigation, and computer modeling.

EDUCATION

B.S., Geosciences, The Pennsylvania State University, 19811

LICENSES AND CERTIFICATIONS

- Certified Professional Geologist, American Institute of Professional Geologists, License No. 7504
- Licensed Professional Geologist, Kentucky, License No. 1241
- Licensed Professional Geologist, Virginia, License No.2801 001 352
- Licensed Professional Geologist, Kansas, Certificate No. 663

PROFESSIONAL EXPERIENCE

K. Scott Keim, *President* of Marshall Miller & Associates *(MM&A)*, has over 31 years experience in diverse geologic applications related to mining throughout the coal-bearing regions of the United States; eastern and western regions of Australia; China's Shanxi Province; the Guasare coal basin of Venezuela; Colombia, South America; Canada; Mexico; Turkey, and the Czech Republic. Mr. Keim has coordinated a multitude of major merger and acquisition studies involving the largest transactions in the coal industry and has conducted a variety of evaluations related to the prediction and impact of underground mining conditions and definition of surface mineable reserve potential. He has directed feasibility studies for international mining operations, several of which are now in production. Mr. Keim is responsible for managing multiple U.S. Securities and Exchange Commission independent reserve filings for publicly traded coal companies including Peabody Energy, Alpha Natural Resources, Penn Virginia Corporation, James River Coal Company, Natural Resource Partners, and International Coal Group. Additionally, he has coordinated filings in compliance with Australasian Joint Ore Reserve Committee (JORC) and Canadian 43-101 Standards.

Prior to his appointment as President, Mr. Keim held several other positions within Marshall Miller & Associates over his twenty-five-year tenure with the company. He started his career as a field geologist and through promotions was appointed project geologist, senior project geologist, Vice President, Senior Vice President, and President of Energy & Mineral Resources.

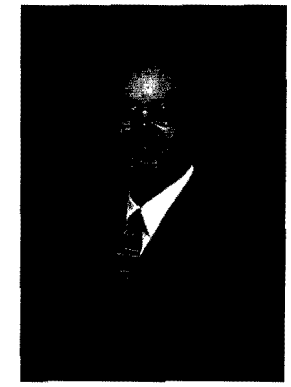
Mr. Keim's responsibilities include the coordination of all Energy and Mineral Resource Division activities including reserve evaluations, predictive geological mapping, merger and acquisition evaluations, geological and engineering applications, feasibility studies, coal quality assessments, and wire-line geophysical applications. The MM&A Energy and Mineral Resources Division is staffed by one of the largest groups of professional geologists and engineers in the coal consulting industry.

Mr. Keim is also responsible for MM&A's environmental and civil engineering groups, which include environmental science, civil engineering, emergency response, remedial design and oversight, and compliance management activities.

Mr. Keim is a recognized member of the Society of Mining, Metallurgy, and Exploration (SME) of AIME, the Central Appalachian Section of SME, and the American Institute of Professional Geologists. He is also a SME Committee Member (Exploration Committee). He serves on the Board of Directors of the Penn State Research Foundation and on the Advisory Board to the Virginia Center for Coal and Energy Research.

SELECT LISTING OF PUBLICATIONS AND PRESENTATIONS

- "The Future of Coal - A USA Perspective," presented to 2008 World Mining Congress, Krakow, Poland, September 2008.
- China Coal Overview and Summary of AACI Project," presented to West Virginia Coal Mining Institute, Stonewall Jackson Resort, West Virginia, May 2006.
- "China Coal Overview and Summary of AACI Project," presented to West Virginia Coal Mining Institute, Stonewall Jackson Resort, West Virginia, May 2006.
- "Digital Processing and Presentation of Complex Geological Data and Industry Trends," Keynote Speaker 2005 American Institute of Professional Geologists Annual Meeting, Lexington, Kentucky, October 2005.
- "Energy Venture in China," presented to the Virginia Economic Development Seminar," Virginia Beach, Virginia, September 2002.
- "CBM Review: China's Coalbed Methane Reserves," March 2002, World Coal, co-authors J.C. Tien and Marshall S. Miller.
- "Energy Venture in China," presented to the Virginia Chamber of Commerce, Williamsburg, Virginia, October 2001."
- Due Diligence: Reserve Assessment and Engineering Considerations," March 1999, St. Petersburg, Florida, presented at the Financial Times Energy/Coal Outlook Conference, co-presenter.
- "Case Study Evaluation of Geological Influences Impacting Mining Conditions at a West Virginia Longwall Mine," International Journal of Coal Geology, 1999, co-author M. Miller.
- "Modern Geological Applications and Predictive Techniques Applied to Coal Mining," June 1998, presented at the spring meeting of the Central Appalachian Section of SME, Abingdon, Virginia.
- "Evaluation of Geological Influences Impacting Longwall Mining," April 1998, presented at the spring meeting of the Geological Society of America, Charleston, West Virginia.
- "Geological and Geotechnical Methods for Evaluation of Longwall Mining Conditions," West Virginia Coal Mining Institute, May 1989, co-authors J. S. Nelson and C. Faria Santos.



Peter Lawson, M.B.A.

Executive Vice President

DEQ Uranium Study Role: Peter is based in Beckley, WV and is the company executive vice president. Among other things, Peter heads up a broad financial analysis service as well as a practiced environmental permit processing group. Underpinning that ability is his hands-on experience in mine operations, work force management, cost control, regulatory compliance and feasibility analyses. Peter is expected to advise on matters related to open cast mining, waste handling, and the assessment of the likely effects of proposed regulations on the safe management of men and machinery at a uranium mine site.

EDUCATION

- M.B.A., Ashland University, Ashland, Ohio, 1988
- B.S., Mining Engineering, New Mexico Tech, Socorro, New Mexico, 1978

SELECT LISTING OF PUBLICATIONS AND PRESENTATIONS

- **Coal Goes to Wall Street: Is Coal Still a Dirty Word?**, presented at the 2006 Annual Spring Meeting of the Society for Mining, Metallurgy and Exploration, Central Appalachian Section, Lexington, Kentucky, 2006.
- **Coal Reserve Evaluation and Reporting Under SEC Industry Guide 7**, presented at the joint meeting of the Society for Mining, Metallurgy and Exploration, Central Appalachian Section and the West Virginia Coal Mining Institute, White Sulphur Springs, West Virginia, 2005.
- **Aquatic Ecosystem Enhancement At A Mountaintop Mining Site**, presented at the Aquatic Ecosystem Enhancement at Mountaintop Mining Sites Symposium, US Department of Energy, National Energy Technical Laboratory, Charleston, West Virginia, 2000.
- **Surface Mining & Dragline Methods**, presented at the Mining and Reclamation Technology Symposium, US Department of Energy, Office of Fossil Energy, Federal Energy Technology Center, Morgantown, West Virginia, 1999.
- **Russian Coal: A Western Consultants Experience**, presented at the Society for Mining, Metallurgy and Exploration, Central Appalachian Section, 1994 Annual Spring Meeting, Abingdon, Virginia.
- **Processing Improvements At Empire Coal Company** presented at the International Coal Preparation Exhibition & Conference, Lexington, Kentucky, 1988, co-author William S. Kukura.
- ***Control Blasting – Innovations and Applications In Open-Pit Mining***, submitted as a directed study degree requirement, New Mexico Institute of Mining and Technology, December 1978.

MEMBERSHIPS AND ASSOCIATIONS

- Registered Member Society for Mining, Metallurgy and Exploration (SME) of AIME
- West Virginia Coal Association
- Illinois Mining Institute
- American Society of Mining and Reclamation

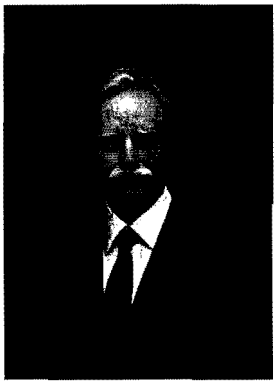
SELECT PROJECT EXPERIENCE

Peter Lawson, Executive Vice President, manages the Energy & Mineral Resources Group of Marshall Miller & Associates, Inc. He has over 38 years of industry experience and specializes in merger and acquisition due diligence, feasibility and valuation studies, surface mine engineering and operations management, independent engineering services, mine permitting and environmental performance, and workforce development and continuous improvement. His consulting experience includes domestic and

international projects in coal, base metals, industrial minerals and aggregates. He has provided litigation support services and expert witness testimony in a variety of matters relating to mining property valuation and environmental concerns.

As general manager of the largest surface coal mining operation in the eastern U.S., Mr. Lawson doubled production and led successful continuous improvement initiatives improving performance in the areas of safety, environmental compliance, productivity and cost. He installed state-of-the-art blending systems utilizing online nuclear analyzers to maximize profit margins; doubled capacity of coal preparation facilities; and expanded a CSX rail loadout facility to 8-million ton annual capacity. He developed a graduate fellowship program in co-operation with West Virginia University and the National Mined Lands Reclamation Center, in Morgantown, WV, for the development of a Manual of Best Practices for Successful Reforestation of Surface-Mined Lands.

Mr. Lawson was selected to participate in the Executive Management Program (1996) at the Indiana University Kelley School of Business and was the 1978 recipient of the Old Timer's Award presented to the outstanding mining engineering student entering the coal industry.



Ronal H. Mullennex, C.P.G., C.G.W.P.

Senior Vice President

DEQ Uranium Study Role: Ron is based in Bluefield, Virginia. Aside being an accomplished geologist familiar with the geology of the Commonwealth of Virginia, he also has a practiced hand in evaluating the impacts of mining on the local and regional ground water regime. In light of his extensive court testimony experience, Ron is expected to be one of the key advisors of the Workgroup sessions with respect to language that conforms to the science of geology and groundwater hydrology.

EDUCATION

- M.S., Geology, West Virginia University, Morgantown, West Virginia, 1975
- B.S., Geology, West Virginia University, Morgantown, West Virginia 1971

MEMBERSHIPS

- 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

LICENSES AND CERTIFICATIONS

- Certified Ground Water Professional, Certification No. 372
- Certified Professional Geologist, AIPG, Certification No. 4550
- Professional Geologist, Virginia, Certification No. 000275
- Professional Geologist, South Carolina, Certification No. 381
- Professional Geologist, Tennessee, Certification No. 2348
- Professional Geologist, Pennsylvania, Certification No. PG000802G
- Professional Geologist, Kentucky, Certification No. 1243
- Professional Geologist, North Carolina, Certification No. 1519
- Licensed Remediation Specialist, West Virginia, Certification No. 12

PROFESSIONAL EXPERIENCE (SELECTED)

Responsible for office management and administration; project management, coordination, and supervision; and project reporting and presentation. Projects involve all phases of geologic application to coal exploration, evaluation, and development; quarry stone resources and stone quality; construction and environmental site characterization; ground water and surface water investigations; 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.

Marshall Miller & Associates, Inc.
Staff Experience

Hans E. Naumann, Jr., P.E.

Senior Vice President

DEQ Uranium Study Role: Hans is stationed in Lexington, Kentucky, and is a senior vice president of MM&A with more than fifty years of troubleshooting open cut and underground mines. His international activities typically involve the transparent handling of social, economic, and environmental impacts. As to the latter, he has played an important role in conceptualizing post mining land uses and devising plans in support of their execution. Hans played a major role in the assembly of the response to this RFP, in particular with respect to the invitation of practiced national and international experts to serve as backdrop to this important phase of the Commonwealth's regulatory promulgation process. Mr. Naumann is expected to peer review the reports generated by the MM&A sponsored team and to advise on problem solving at all levels of this undertaking.

EDUCATION

- M.S., Mining Engineering, Virginia Polytechnic Institute, 1970
- B.S., Mining Engineering, Virginia Polytechnic Institute, 1969

LICENSES AND CERTIFICATIONS

- Kentucky, Professional Engineer, License No. 10669
- Virginia, Professional Engineer, License No. 011287
- West Virginia, Professional Engineer, License No. 7767
- State of Tennessee, Registered Professional Engineer, License No. 106686
- State of North Carolina, Registered Professional Engineer, License No. 027063
- State of Alabama, Registered Professional Engineer, License No. 24841
- State of Georgia, Registered Professional Engineer, No. 035303
- Commonwealth of Pennsylvania, Registered Professional Engineer, No. 078311
- State of Ohio, Registered Professional Engineer, No. 76092
- National Academy of Forensic Engineers, Senior Member, Certification No. 667
- Founding Registered Member, Society for Mining, Metallurgy & Exploration

PROFESSIONAL EXPERIENCE

Hans E. Naumann, Jr., P.E., Senior Vice President of the Energy & Resources Division in the Lexington, Kentucky, office, and is a Senior Consultant specializing in expert testimony. He has over 43 years of practical industry experience in assignments including, but not limited to, industrial engineering (time-motion-cost), surface and underground mine planning, roadway/portal/slope/shaft/embankment/impoundment construction, mine management, mining equipment evaluations and selection/acquisition, equipment maintainability, utilization and availability analyses, exploration, coal reserve evaluations, mine cost forecasting, capital cost estimation and justification, ground control investigations, reclamation permit processing, abandoned mined land reclamation, mine rehabilitation, water handling, mine ventilation, methane drainage, rail/conveyor haulage assessments, mining accident investigations, subsidence investigations, blasting damage investigations, foundation analyses, facilities construction design and construction management, land management, environmental site assessments, mine drainage treatment and disposal, and litigation relating to lost coal claims as well as inverse condemnations. He is responsible for projects related to mining, geotechnical, civil, environmental, and investigative engineering. His primary work involves providing expert testimony on issues relating to mining property valuation, environmental concerns, and structural damage investigations. In the latter capacity, he has testified numerous times in various venues.

SELECT LISTING OF PUBLICATIONS AND PRESENTATIONS

- Analyzing Excavation and Materials Handling Equipment, Research Division Bulletin 58, Virginia Polytechnic Institute, Blacksburg, Virginia, 1970, 264 pages, H. E. Naumann and L. Adler.
- A Systematic Approach For Conducting a Phase I Environmental Audit Utilizing Case History Examples, 1994, B. Hanlon, R. Pothini, and H. E. Naumann.
- Integration of Hydrogeologic and Geophysical Techniques for Identification of AMD Seepage and Remedial Design, 1995, R. H. Mullennex, V. P. Wiram, and H. E. Naumann.
- Locating Abandoned Underground Coal Mines, Faults, and Channels using Geophysical Methods, 15th Annual Professional Engineers in Mining Seminars, Lexington, Kentucky, 2002.
- Valuation of Minerals in Condemnation Proceedings. Hypothetic Application of Valuation Methods to an Operating Property Which Combines a Going-Concern With a Reserve Area, 24th Annual Institute, Energy and Mineral Law Foundation, North Myrtle Beach, South Carolina, 2003.
- Utilizing On-Site CBM to Power Mining Operations, 29th Mineral Law Conference, Energy and Mineral Law Foundation, Lexington, Kentucky, 2004.
- Mining Mitigation Reforestation & Remining, Presentation to The American Energy Security Summit, Alexandria, Virginia, 2007.

***CURRICULUM VITAE* - LISA CHANDLER**
PO Box 114, Bassendean WA 6934
Telephone: 08 9379 1202 Mobile: 0400 442 306 Email: lisa_aethos@ozemail.com.au

DEQ Uranium Study Role: Lisa Chandler is a principal owner of Æthos and is stationed in Bassendean, WA, Australia. Lisa brings to the table an unusual combination of regulatory authority, private business, and corporate engineering experience. This well-rounded engineering and environmental compliance background as well as her collaboration with her associate, Dr. Hondros, is expected to play an important role in guiding MM&A and the Workgroup through Australia's experiences with very large open cast copper/uranium mining activities. These experiences include the design, construction, and monitoring of mining-related facilities that are subject to periodic monsoonal rainfall events.

Recent Professional History

2010 – 2012 **SRK Consulting** **Perth, WA**

Principal Consultant, Geoenvironmental – Team leader (WA) and national coordinator for environmental services (geochemistry, due diligence, impact assessment, closure planning) for an international mining consultancy. Role involves team management, business development and principal level technical analysis for mining projects in Australia and overseas from pre-feasibility stages to closure.

2008 – 2012 **Æthos Consulting** **Perth, WA**

Director -Independent consultant providing advice on environmental assurance matters (due diligence, data and report verification, audits), environmental impact and risk assessment, and mine closure. Environmental impact assessment, risk assessment and closure planning for clients in the iron ore, base metals, gold and uranium sectors.

2007 – 2008 **Outback Ecology** **Perth, WA**

Principal, Environmental Approvals and Compliance – In charge of environmental impact assessment, auditing and other environmental management services for a wide range of mining and minerals processing projects. Role included strong client liaison and team leadership function, as well as technical and strategic emphasis.

2004 – 2007 **WA Department of Environment** **Perth, WA**

Manager, Environmental Audit – Responsible for strategic direction and delivery of compliance function. Led team that monitors regulatory compliance of major projects with environmental approval conditions imposed under Part IV of the *Environmental Protection Act, 1986*. Inspector under the *Environmental Protection Act, 1986*.

2003 – 2004 **Maunsell Australia Pty Ltd** **Perth, WA**

Principal Scientist -Project management, specialist technical advice and senior technical review for environmental impact assessments and strategic environmental studies, mainly for infrastructure, industrial and mining projects.

2002 -2003 **Department of Environmental Protection** **Perth, WA**

Project co-ordinator (licensing section) – Provided technical and strategic advice on the assessment and control of environmental impacts of airborne emissions from clay products industries in the Perth area. Responsible for the design and implementation of a communications strategy involving extensive community and industry liaison.

Previous Professional Roles

2000-2002 **University of Newcastle** **Newcastle, NSW**

Postgraduate researcher – Research into the design and assessment of stable engineered landforms for mine rehabilitation. Research focussed on use of readily available operational data and practical modelling approaches to define minimum design requirements for waste rock dumps. The study included a novel application of statistical process control techniques for the assessment of stability of natural dynamical systems.

1997 – 2000 **Golder Associates Pty Ltd** **Perth, WA**

Manager, Environmental Services -Accountable for business development, technical direction and review of environmental assessment and management projects. Project management and technical advice on a wide range of environment issues including soil and groundwater contamination; environmental incident investigation; design and auditing of landfills and other waste repositories; post-mining land rehabilitation; environmental aspects of industrial due diligence, closure and pre-feasibility studies.

1996 – 1997 **OTEK Australia Pty Ltd** **Sydney, NSW**

State Manager -Accountable for commercial and technical management of head office of environmental consulting firm. Consultancy mainly involved working with large petro-chemical companies and industrial/commercial users of petroleum products on environmental aspects of hydrocarbon use and management.

1993 -1996 **Comalco Minerals & Alumina** **Weipa, Qld**

Manager, Safety & Environment -Manager accountable for safety and environmental performance at one of the world's largest bauxite mines. Provided advice on legislative compliance (safety and environment), implementation of safety and environmental management systems, risk management and contingency planning; waste management, pollution prevention and control, and land regeneration at mine site and minerals processing plants.

1992 – 1993 and 1990-1991 **Victoria EPA** **Melbourne, Vic**

Senior Consultant – Technical advisor with the EPA's chemicals management and contaminated sites group.

1991 – 1992 **Maunsell Partners Pty Ltd** **Melbourne, Vic & Sydney, NSW**

Senior Consultant -Provided specialist advice for industrial waste audits; landfill design and management; contaminated land assessment.

1989 – 1990 **Rural Water Commission** **Melbourne, Vic**

Hydrogeologist -Project leader for regional groundwater recharge research project in the Victorian Wimmera-Mallee area.

1983 – 1989 **Golder Associates Pty Ltd** **Melbourne, Vic**

Senior Geotechnical Scientist -Accountable for field supervision, data interpretation and reporting on a wide range of geotechnical and environmental investigations. Extensive involvement in contaminated land and groundwater assessment.

Education

Postgraduate study (Geotechnical /Environmental Eng), University of Melbourne, 1986-1989. Research focus: Heavy metal occurrence in Victorian rocks and soils.

Postgraduate research (Agriculture), University of Melbourne, 1983-1985. Research focus: Behaviour of nitrogen fertilisers in irrigated cropping systems.

Postgraduate coursework in Soil Science, University of Hawaii, 1978-1980. Research focus: Sorption of phosphate by iron/aluminium sesquioxides.

BSc (Physical Geography), McGill University, Montreal Canada, 1978.

Additional skills and qualifications

RABQSA certified principal environmental auditor since 2006: Environmental Management Systems Auditor; Environmental Management Auditor; Contaminated Sites Auditor; Compliance Auditor. Member, National Environmental Law Association Member, Environment Institute of Australia and New Zealand Member, Australasian Institute of Mining and Metallurgy Adjunct senior lecturer (Environmental Management Systems, Environmental Audit) – Edith Cowan University

Jim Hondros

Email : jim@jrhc.com.au
Phone: 0439 348 922

PO Box 372,
Stirling, SA 5152

DEQ Uranium Study Role: Jim Hondros is an independent consultant for the mining industry who has agreed to collaborate with Lisa Chandler of Æthos for the common effort of educating MM&A and the Workgroup with respect to the evolving regulatory structure of Australia's uranium mining prospects. As his summary-styled CV below will reveal, Jim's direct involvement with the massive Olympic Dam project in Australia has material importance to the Workgroup in that this undertaking encompasses all of the interests of the Workgroup relative to a modern open cast mine and the handling of the vestiges of an abandoned underground mining complex.

PROFESSIONAL EXPERIENCE

27 years working in the mining industry, in operational, management and consulting roles.
Recent work has been with BHP Billiton, Rio Tinto and Toro Energy.
Predominant areas of work are;

- radiation protection advice,
- occupational health and safety,
- environmental management
- indigenous relations.

Since 2002 I have been consulting through my company JRHC Enterprises Pty Ltd. Major work includes:

- Developing and writing all aspects of the radiation protection, OH&S and risk management sections
- of the BHP Billiton Olympic Dam expansion EIS and the EIS supplement (ie; responding to all public
- comment), including public
- Developing and writing all aspects of the radiation protection, OH&S and risk management sections
- of the BHP Billiton BHP Billiton Yeelirrie Development ERMP.
- Developing and writing the radiation protection section for the Toro Energy Lake Way Development
- ERMP
- Provision of broad radiological advice to BHP Billiton.
- Provision of independent radiological protection advice to Indigenous communities in WA.
- Working with operations staff and Indigenous community groups on the development of engagement
- strategies for a number of Rio Tinto operations across Australia
- Contract community relations manager for Pasminco

Prior to consulting, I worked for 6 years in senior corporate and operational management roles for Pasminco and at its Century Mine. Duties included corporate policy (international), operational advisory and management roles in the areas of environmental management, OH&S and Indigenous affairs. Prior to this, I spent 12 years working for WMC at its Olympic Dam project in a number of operational and senior management roles. Duties ranged from monitoring, government liaison (State and Federal), statutory RSO & ERO and departmental management.

I have presented nationally and internationally on radiation protection at conferences and have a number of published papers. I have presented and run workshops for industry, regulators and the community on radiation protection and OH&S on a number of occasions and was an industry representative on the development of documentation on the implementation of the ICRP60 recommendations.

GOVERNANCE

I have held various board roles on not for profit boards and on advisory committees to the CEO of ARPANSA

QUALIFICATIONS & PROFESSIONAL AFFILIATIONS

BAppSci 1984 **GDipOHM** 1987 **MAppSci** 1991

Member - Australian Radiation Protection Society

Member – Environmental Institute of Australia & New Zealand

DEQ Uranium Study Role: Gregory Poremba is a senior member of Cardno ENTRIX who has agreed to work with MMA& and the Workgroup in evaluating proposed rules, regulations, and guidance documents with respect to social impacts. Gregory will be one of a number of Cardno employees who have the broad-based experience to advise on engineering, scientific, and social matters of importance to the proposed regulation development process.

Cardno ENTRIX
Shaping the Future

Gregory A. Poremba, Ph.D., Senior Consultant

Discipline/Specialty

- NEPA/SEPA
- Environmental Assessments
- Socioeconomics
- Environmental Justice/Subsistence
- Recreation
- Public Services/Utilities
- Land Use/Permitting
- Public Involvement
- Survey Design and Analysis

Education

- Ph.D., Sociology, Washington State University, 1990
- M.A., Sociology, University of North Dakota, 1982
- B.A., Sociology/Anthropology and English, University of Minnesota, 1979

SUMMARY OF QUALIFICATIONS

Over 28 years of experience in managing and conducting analyses for NEPA and SEPA environmental assessments throughout the United States for private energy development clients, the Bonneville Power Administration, U.S. Army Corps of Engineers, Federal Energy Regulatory Commission, Washington Energy Facility Site Evaluation Council, Fort Lewis, National Park Service, Bureau of Reclamation, U.S. Forest Service, Washington Department of Transportation, and other state and local agencies. Technical expertise include conducting socioeconomic, environmental justice, infrastructure/public services, subsistence, recreational, land use/permitting, and aesthetic analyses; designing, implementing, and analyzing the results of public surveys and program evaluations; and designing and conducting public involvement programs.

RELEVANT EXPERIENCE

Nuclear Energy and Waste Storage/Disposal Experience

Socioeconomics team leader – Bell Bend Nuclear Power Plant NRC Combined License Application Environmental Report, UniStar Nuclear Development, LLC and AREVA NP, Inc., Pennsylvania

Prepared the socioeconomic (including recreation, public infrastructure and services, fiscal/tax, and aesthetic analyses), environmental justice, and physical impacts environmental report (ER) sections for a Combined License Application (COLA) for a 1,600-MW nuclear power plant in Luzerne County, Pennsylvania. Also attended and represented the client during the NRC C-1 and C-3 meetings, discussing study methodologies, analyses, and findings for the project. Responded to NRC Requests for Additional Information (RAIs). Also prepared an estimate of the local, non-labor construction costs. The ER was prepared to meet the requirements of NRC NUREG 1555; NRC Regulatory Guide 4.2, Revision 2; NEPA; and other federal regulatory requirements.

Socioeconomics team leader – Nine Mile Point Nuclear Power Plant NRC Combined License Application Environmental Report, UniStar Nuclear Development, LLC and AREVA NP, Inc., New York

Prepared the socioeconomic (including recreation, public infrastructure and services, fiscal/tax, and aesthetic analyses), environmental justice, and physical impacts environmental report (ER) sections for a Combined License Application

(COLA) for a 1,600-MW nuclear power plant in Oswego County, New York. Also attended and represented the client during the NRC C-1 and C-3 meetings, discussing study methodologies, analyses, and findings for the project. Also assisted in preparing the New York SEQR Draft EIS. The ER was prepared to meet the requirements of NRC NUREG 1555; NRC Regulatory Guide 4.2, Revision 2; NEPA; and other federal regulatory requirements.

Socioeconomics consultant – Alternative Site Screening Criteria for Evaluating New Nuclear Power Plant Facilities, UniStar Nuclear Development, LLC and AREVA NP, Inc., throughout the US

Provided input about siting criteria and metrics for socioeconomic (including recreation, public infrastructure and services, fiscal/tax, and aesthetic analyses) and environmental justice issues in evaluating potential alternative sites nationwide for new nuclear power plant facilities.

Socioeconomics team leader – Uranium Enrichment Facility NRC Environmental Reports (AREVA NP, Inc.), Idaho

Prepared the socioeconomic (including public infrastructure and services and fiscal/taxes), environmental justice, and cost-benefit analyses and environmental report (ER) sections for NRC applications for an uranium enrichment facility. Evaluations were conducted for two applications, one for a 3.3-MSMU and another for a 6.6-MSMU facility. Also responded to NRC additional information need requests. Finally, provided similar analyses for an associated 10-mile long, 161-kV transmission line that would provide power to the facility.

Socioeconomics lead – Calvert Cliffs Nuclear Power Plant Unit 3 Combined License Application Environmental Report, UniStar Nuclear Development, LLC and AREVA NP, Inc., Maryland

Prepared the socioeconomic (including recreation, public infrastructure and services, fiscal/tax, and aesthetic analyses) and environmental justice environmental report (ER) sections for a Combined License Application (COLA) for a 1,600-MW nuclear power plant in Calvert County, Maryland. Also attended and represented the client during the NRC C-3 meeting, discussing study methodologies, analyses, and findings for the project. The ER was prepared for a power consortium and was the first to be submitted under the U.S. Nuclear Regulatory Commission's new integrated licensing requirements (for site approval and construction) and to meet the requirements of NRC NUREG 1555; NRC Regulatory Guide 4.2, Revision 2; NEPA; and other federal regulatory requirements. Also provided on-going support during the Maryland State CPCN permitting process.

Socioeconomics lead – Columbia Station Nuclear Power Plant Relicense Application, AREVA NP, Inc., Washington

Prepared the affected environment public services and facilities (Section 2.9) and housing sections (Section 2.10) for the relicense of a 1,200-MW nuclear power plant in the Tri-Cities, Washington. Descriptions were prepared for the 2-county study area's overall economy, employment, and income; educational resources; recreational opportunities; water systems; transportation networks and traffic levels; and housing availability. Also provided guidance and reviewed the 10-county demographics affected environment (Section 2.6) and other sections.

Public involvement – Washington State Hanford Leasehold for Low-Level Nuclear Waste Disposal, Washington State Joint Legislative Committee on

Science and Technology, Washington
Conducted preparatory tasks and facilitated public scoping meetings to evaluate current and potential future uses of the site at Hanford.

Public involvement – Hanford High-Level Nuclear Waste Repository, Washington State High-Level Nuclear Waste Office, Washington
Assisted task manager in implementing a statewide public involvement program for the repository siting study. Prepared written materials, facilitated small group meetings, and summarized issues and comments. Controversial meetings were held in Seattle, Spokane, and the Tri-Cities.

Socioeconomist – Licensing Project Manager Services, U.S. Department of Energy, Deaf Smith, Texas
Conducted socioeconomic impacts analysis for high-level nuclear waste site characterization studies of a site near Deaf Smith. Identified social, economic, demographic, and fiscal issues to be addressed in meeting 10 CFR 960 repository siting requirements. Linked issues to regulatory functional requirements, performance criteria, and constraints in helping to revise the programmatic requirements document.

Socioeconomist – Environmental Project Manager Services to the U.S. Department of Energy's Crystalline Repository Project, Battelle Memorial Institute - Seattle, Minnesota and Wisconsin
Developed a social impact sector model for areal reductions of proposed, potentially acceptable nuclear waste repository sites. Also studied population levels, calculated population projections, and prepared a white paper on issues related to transporting waste.

Senior reviewer – 20-MW Solar Energy Project, Confidential Client, California
Conducted an environmental and permitting siting study of potential sites in five California counties for a 20-MW solar energy project. This analysis included identification and assessment of the federal, state, and local permitting requirements; evaluation of the potential complexity and timelines for obtaining those permits; identification of the key land use and environmental issues; and the relative importance in each county. This project was completed under a fast-track (one week) schedule and helped the developer focus future efforts on the most viable sites. It is the first phase of ongoing support to the developer.

Senior reviewer – Sumas Energy 2 Generation Facility Application for Site Certification Review, Washington Energy Facility Site Evaluation Council, Washington
Conducted a fatal-flaw review of the application for a 720-MW, natural gas fired combined cycle electrical generation facility to be located on a 37-acre site in Sumas, northwestern Washington. Provided comments on the site description, public water supplies and rights, energy and natural resources, agricultural crops/animals, public services and utilities, socioeconomics, and recreational resources.

State liaison and socioeconomics leader –TransCanada Keystone XL Petroleum Pipeline NEPA Final EIS, U.S. Department of State, Canada and middle United States
Responded to comments about socioeconomic issues in the Draft EIS, and revised the Draft EIS to prepare the Final EIS for this 1,707-mile long, 36-inch diameter

petroleum pipeline from Alberta, Canada to Houston, Texas. Also worked with staff at the Montana Department of Environmental Quality (MDEQ) to revise an appendix focused upon issues related specifically to the State of Montana, and meeting the requirements of the Montana State Environmental Policy Act (MEPA).

Contract and project manager – NEPA EAs, Bonneville Power Administration, Washington, Oregon, and Idaho

A 3-year Category 2 Environmental Assessment Master Contract. Prepared an EA for the Cottrell hydroelectric project in Skamania County, Washington, and an EA for the Gull Industries/STS Hydropower Barclay Creek hydroelectric project in Snohomish County, Washington. Also prepared topical outlines for the City of Seattle South Fork Tolt hydroelectric project in King County, Washington; the Barclay Creek 7-MW hydroelectric project; the Olympic Energy Partners 233-MW cogeneration project in Bremerton, Washington; Washington Public Power Supply System SATSOP 178-MW combined cycle combustion turbine project in Satsop, Washington; the CARES/Flowind 25-MW windfarm project near Goldendale, Washington; the U.S. Generating 466-MW cogeneration facility in Hermiston, Oregon; and the Ida-West Energy Company 460-MW cogeneration facility in Hermiston.

Project manager and technical lead – Statewide Transportation Environmental Justice Evaluations, Recommendations, and Training, Washington State Department of Transportation, Washington

Evaluated the Washington State Department of Transportation's (WSDOT's) existing environmental justice (EJ) compliance activities and its program needs. Evaluated WSDOT's needs for complying with U.S. Department of Transportation and Federal Highway Administration orders, programs that had been implemented elsewhere in the United States, and to develop training materials. Tasks included preparing a white paper reviewing applicable regulations and guidelines; other state programs; EJ study methodologies and data sources; potential impact issues; public involvement activities; and WSDOT existing programs and policies; and recommending statewide policies, programs, staffing, training, and program evaluation needs. A 2-page EJ flyer was developed to inform state legislators about the funding implications to the State of Washington's transportation programs if the EO requirements were not met. Two PowerPoint presentations and supporting scripts were also developed to train WSDOT staff, including a 1-hour overview presentation to make staff aware of EJ issues and a 4-hour technical presentation about methods for complying with the requirements. An EJ survey was also developed to track statewide efforts to comply with EJ requirements for all transportation planning and project activities. Finally, a checklist of potential EJ issues was developed as a quick reference for project staff, project managers, and EA and EIS reviewers.

Project manager – Natural Gas Pipeline Extension FERC Prior Notice Applications Preparation, Northern Natural Gas, Minnesota, Iowa, and Nebraska

Supervised cultural resources field studies and prepared FERC Prior Notice permitting packages for four groups of natural gas pipeline extensions in three states, totaling 26 miles and up to 36 inches in diameter. These four groups of projects were conducted on a very fast-track schedule, including conducting cultural resources systematic shovel testing on 25 acres of high priority areas with heavy equipment during December and January.

Deputy program manager and EIS manager – Olympic Pipeline Company Cross-Cascade Petroleum Pipeline Application for Site Certification Review and NEPA EIS, Washington Energy Facility Site Evaluation Council, Washington

Evaluated construction of a highly controversial 231-mile long, 14-inch diameter underground petroleum product pipeline from Woodinville to Pasco, Washington. The project would traverse six counties, crossing the Cascade Mountains and the Columbia River. A truck distribution center was proposed for construction east of Ellensburg. The pipeline would transport motor gasoline, diesel fuel, and aviation jet fuel. Reviewed sections of the application to identify compliance with regulations, determine the completeness and accuracy of the information provided, and request additional information for each discipline. Application sections reviewed included the site description and the sections on socioeconomics; housing; public services and utilities; public water supply; recreation; agricultural crops and animals; energy and natural resources; initial site restoration plan; and federal, state, and local requirements. Also managed the preparation of the NEPA EIS meeting U.S. Forest Service requirements. Wrote the socioeconomics, environmental justice, public services and utilities, and energy sections of the EIS and supervised preparation of the recreation, agriculture, visual, and land use sections. Also held meetings with the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Bureau of Land Management. Attended statewide public scoping meetings, prepared a summary of the public scoping comments, and was a facilitator at statewide meetings, recording and responding to public comments on the Draft EIS.

Project manager – Bemidji-Grand Rapids 230-kV Transmission Line Project Joint PPSA/NEPA Draft EIS, Minnesota Department of Commerce - Office of Energy Security, Minnesota

Prepared a joint U.S. Department of Agriculture, Rural Development Utilities Program National Environmental Policy Act (NEPA) and Office of Energy Security Minnesota Power Plant Siting Act (PPSA) joint draft environmental impact statement evaluating potential impacts of up to five routes for a 68-mile long, 230-kV transmission line in northern Minnesota. Began by participating in five public scoping meetings, as well as inter-agency working group meetings, and preparing a public scoping summary report of the verbal and written comments received. Also collected desktop biological, land use, socioeconomic, and cultural resources information for three new alternative 1,000-foot wide corridors to conduct a GIS comparative screening analysis for all five routes. Prepared the Draft EIS meeting multiple cooperating agency needs (including the U.S. Army Corps of Engineers, U.S. Forest Service, and the Leech Lake Band of Ojibwe), and attended the public comment meetings.

Contract manager – Tacoma-Seattle Intertie Project SEPA Programmatic EIS, Seattle Public Utilities, King County, Washington

Prepared a SEPA Programmatic EIS evaluating 13 alternatives for supplying the City of Seattle and the surrounding metropolitan area (1.3 million people) with additional water resources needed to meet the projected supply shortfall in 2005. One alternative included evaluating four routes for locating an 8-mile long, 38-inch diameter pipeline in south King County. The pipeline would connect with the City of Tacoma's proposed pipeline #5 and allow Seattle to obtain water from Tacoma to supplement Seattle's water supply resources, at a rate of at least 22 million gallons of water per day to Seattle.

DEQ Uranium Study Role: Peter Thibodeau is a senior member of Cardno ENTRIX and is based in Raleigh North Carolina. He is strong associate of MM&A in the USA as well as Australia. His insights into the regulation development process as well as its subsequent application played an important role in the assembly of the response to the RFP. Peter's particular expertise in matters related to hydrogeology mesh perfectly with capabilities of his MM&A counterparts. Furthermore, his researching experience will play an important role in the initial three-week assignment outlined by the RFP. Finally, Peter will be the program manager for all things related to the work provided by Cardno.

Cardno ENTRIX
Shaping the Future

Peter M. Thibodeau, Ph.D., P.G., P.H., Senior Hydrogeologist, Water Resources — Raleigh, NC

SUMMARY OF QUALIFICATIONS

Dr. Thibodeau is a Senior Hydrogeologist with over 18 years of experience as a quantitative hydrogeologist and program manager. His primary focus is in providing technical direction and management on various multidisciplinary projects, including water resources, water supply, stream/wetland restoration, groundwater remediation, water resources and stormwater permitting, groundwater flow modeling, and contaminant transport modeling. Dr. Thibodeau has substantial experience managing large and technically diverse programs, and is recognized for his ability to coordinate and assemble and coordinate multi-disciplinary teams of geologists, engineers, aquatic and wildlife biologists and other environmental experts. During the last 15 years, Peter has managed multi-million dollar programs for mining projects, groundwater and surface water remediation programs, and Superfund remediation projects. Dr. Thibodeau has participated as an expert technical reviewer and modeler for projects at the local, state, and federal permitting levels, and has been invited to speak at national and international conferences on issues related to groundwater modeling, model development, and watershed management studies. He has also testified before a State Congressional committee on cyanide usage in mining operations.

RELEVANT EXPERIENCE

U.S. Army Corps of Engineers, Third Party EIS Development for Proposed Gold Mine, South Carolina
Cardno ENTRIX currently is providing environmental services to the U.S. Army Corps of Engineers Charleston, South Carolina District as a Third Party Contractor for the preparation of an Environmental Impact Statement (EIS) for the proposed Haile Gold Mine, which is owned by Romarco Minerals, Toronto, Canada. The Applicant proposes to reactivate the existing Haile Gold Mine near Kershaw, SC for the development of gold resources, to expand the area for open pit mining, and to construct associated processing facilities. The Haile Gold Mine Site encompasses approximately 4,231 acres. The phased mine plan includes eight open mining pits, ranging in depth from 110 to 840 feet, to be excavated over a twelve-year period. Peter is currently leading resource area analyses for geology and hydrogeology, as well as reclamation, financial assurances, safety, and contingency planning aspects to be included in the EIS.

Crandon Mine (Wisconsin), Proposed Underground Zinc and Copper Mine – 404 Application Review, Independent Physical Resources Evaluation
Dr. Thibodeau managed and directed a multiple-year study of the groundwater and surface water dynamics, contaminant transport phenomena, and potential impacts related to the proposed underground zinc and copper mine in northeastern Wisconsin. As part of this investigation, he provided expert technical review for the state and Federal permit review process. Using the existing and available borehole geologic and geophysical data, hydrogeologic information, and aquifer characterizations, he led the development of a revised conceptual site model to reflect the unique geologic conditions present at the mine site. This model was used to construct regional and focused inset groundwater flow and contaminant transport models of the proposed mine site and tailings management area. These models were used as predictive tools to evaluate potential impacts to groundwater and surface water resources in the area as a result of the proposed action's dewatering activities. Additional aspects of the investigation included analyses of tailings slope stability and loading, ore processing, landfill leachate management, and stream flows.

City of Raleigh (North Carolina), Regional Site Characterization and Remediation
Prior to Joining Cardno ENTRIX, Dr. Thibodeau was the program manager and senior hydrogeologist for a project involving site characterization, groundwater and surface water remediation for a 1,466 acre site impacted with nitrate-contaminated groundwater. Working with the client through the permit negotiation process with agencies and interested parties, Peter helped secure approval for a focused 29-well hydraulic containment system for the entire site, thereby saving the client approximately $60MM in project life costs by minimizing the extent of active remediation. Instead, Dr. Thibodeau also managed the permitting process, engineering design, and construction of 3 constructed wetland systems and 2 stream and wetland restoration projects at the site: these were included as part of the overall restoration of the expansive site.

*Numerous other examples of projects are available, most relevant have been included.

Conestoga-Rovers & Associates

Mauricio Barrera, B.A., M.Sc. - Research Project Team Member

DEQ Uranium Study Research Project Team Member: Member will be dedicated full time to the performance of regulatory program review for two to three weeks, as required to complete the assessment of state and national programs.

Mr. Barrera is an Environmental Scientist with CRA. Mr. Barrera has conducted and supported environmental site assessments and managed data and information on investigation and remediation projects for CRA at various sites in North and South America. Mr. Barrera supported engineering activities for solid waste disposal facilities and developed technical documents on landfill reconditioning. Mr. Barrera has also participated in research and development of advanced water treatment technologies, namely novel advanced oxidation processes (AOPs). This research was supported by the Natural Sciences and Engineering Research Council of Canada – NSERC.

Conestoga-Rovers & Associates
Julia Charlton, Research Project Team Member

DEQ Uranium Study Research Project Team Member: Member will be dedicated full time to the performance of regulatory program review for two to three weeks, as required to complete the assessment of state and national programs.

Ms. Charlton is an Environmental Engineer with CRA. Ms. Charlton has technical expertise in wastewater treatment engineering and operation. Ms. Charlton has also researched and evaluated remedial alternatives and wastewater treatment technologies and applications. Participated in research in non-point contaminant transport in subsurface environments, agricultural impacts on municipal water supplies and associated field investigations, conducted research on the application of anaerobic digestion for municipal wastewater treatment, and assisted in the operation and management of data for the entire global atmospheric watch program.

Conestoga-Rovers & Associates

Lisa Clements, BSc., B.Eng – Research Project Team Member

DEQ Uranium Study Research Project Team Member: Member will be dedicated full time to the performance of regulatory program review for two to three weeks, as required to complete the assessment of state and national programs.

Ms. Clements is an Environmental Engineer with CRA. Ms. Clements has conducted investigations, remediation and chemical monitoring for various sites. Ms. Clements has prepared assessment, remediation and monitoring plans for various stages of environmental action work and has conducted research and case preparation for litigation support cases.

Conestoga-Rovers & Associates

Jeff Daniel, B.A.Sc., P.Eng., Technical Advisor - Water Quality

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Daniel is a Principal and Senior Project Manager and manages CRA's surface water and environmental design groups and surface water/sediment modeling group. Mr. Daniel has over 20 years of experience in the surface water and environmental fields. During his career, Mr. Daniel has focused on the investigation and cost-effective remediation of sediment projects of varying sizes, including several of over 200,000 cubic yards of impacted sediment volume. Mr. Daniel has recently been managing work on the Port Hope facility remediation, which involves the management of closed uranium impacted waste disposal facilities, the engineering design of a consolidation disposal unit and of wastewater treatment works for contaminated waters at the facility under provincial and federal Canadian regulations.

Conestoga-Rovers & Associates

Steven M. Harris, M.A.Sc., P.Eng., P.E. - Technical Advisor - Risk Assessment, Toxicology, and Groundwater Modeling Support

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Harris is a senior engineer/risk assessor/quantitative hydrogeologist and Principal/Vice President of CRA and has over 17 years experience conducting risk assessments (RAs) and quantitative hydrogeologic/fate and transport assessments. Mr. Harris leads CRA's Risk Assessment Services Group, and is a senior member of CRA's Groundwater Modeling Group. RAs conducted by Mr. Harris have involved managing and leading teams of risk assessment professionals (e.g., environmental scientists, toxicologists, ecologists, hydrogeologists, statisticians, and engineers) to evaluate the potential for human health and ecological risks to be present above acceptable levels under both residential, recreational, and industrial/commercial land uses. Mr. Harris has conducted quantitative RAs throughout the United States and Canada. Many RAs have involved the development of risk management plans to mitigate identified risks to human health and the environment. In addition, risk communication has been an integral component of several RAs where the RA findings have been presented in plain language to the public, stakeholders, and local governments to facilitate their understanding to the RA process and conclusions. RAs have involved the development of risk-based site-specific cleanup criteria to support risk-based decision making. Mr. Harris is registered with the Ontario Ministry of the Environment as a Qualified Person - Risk Assessment under Ontario Regulation 153/04 (as amended by Ontario Regulation 511/09). Mr. Harris specializes in the application of analytical and numerical (i.e., simulation techniques to evaluate groundwater flow regimes and to evaluate single and multi-species solute transport phenomenon). Assessments conducted by Mr. Harris have involved the application of both numerical (e.g., MODFLOW-2000, SEAWATv_4, MODPATH, MT3DMS, RT3D, etc.) and analytical modeling approaches to evaluate the potential for future receptor impact, to conduct remedial design feasibility studies, and to assess long-term affects of natural attenuation processes. Assessments have often required the development and calibration of regional groundwater flow models followed by the application of these models to conduct single and multi-species solute transport predictions.

Conestoga-Rovers & Associates

Gary R. Klepper – Technical Advisor – Regulatory Affairs

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Klepper is a member of Conestoga-Rovers and Associates "Sustainable Solutions Group", and opened CRA's Lansing Michigan office in 2002. His twenty-seven-year public service career began with the collection of water resources data for the U. S. Geological Survey and extended to the development and administration of environmental regulations for the State of Michigan in positions ranging from water quality investigator to district supervisor. He participates on the Air Quality and Environmental Policy committees of the Michigan Manufacturers Association; the Governmental Affairs Committee of the Michigan Chemistry Council; the Environmental Quality Committee of the Michigan Chamber of Commerce; and the Executive Team for the Michigan Chapter of the National Brownfield Association (NBA) as chair of their Technical Committee. He experience includes service on a committee to develop remediation rules for Michigan under Part 201.

Conestoga-Rovers & Associates

Edward A. McBean, Ph.D., P.E., Technical Advisor - Waste Management

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Dr. McBean is a Professor of Engineering at the University of Guelph and Canada Research Chair in Water Supply Security. Dr. McBean's expertise includes more than 30 years of utilizing fate and transport as inputs to risk assessment concerns, and utilizing the resulting information as part of decision-making on prioritization of environmental problems. Dr. McBean has an extensive background in economics and statistics that assist in this type of decision-making environment. Dr. McBean was a Professor with the University of Waterloo Civil Engineering Department for almost 20 years while actively consulting for CRA, and joined CRA on a full-time basis in 1995.

Dr. McBean's experience is International in nature with a significant involvement in a large number of United States Superfund RI/FS's over the past 25 years in a project management or peer review role. Dr. McBean is a registered professional engineer in more than forty states. Dr. McBean has also had significant experience in solid waste management, including being the primary author for a 1995 Prentice Hall text book entitled "Solid Waste Landfill Engineering and Design" and lead author in "Statistical Procedures for Analysis of Environmental Monitoring Data and Risk Assessment" published by Prentice-Hall in 1998.

Conestoga-Rovers & Associates
Al Meek, P.E., Project Advisor

DEQ Uranium Study Project Advisor

Al Meek is a registered professional engineer (mining) with over 30 years of experience in the design and implementation of complex environmental remediation and mining operational projects with values over $200 million. He obtained his Bachelors of Science degree in Chemistry from Salem International University in 1977 and received his Professional Engineering license in 1991. The first 15 years of his career was spent with Island Creek Coal Corporation serving in varies environmental, engineering and management roles. The last 15 years he has worked on design and management of Superfund and RCRA sites associated Mining operations, Chemical Plants and Oil Refineries. Mr. Meek brings to the project team extensive experience in the area of Acidic Mine Prevention and Treatment (both passive and active). He served on the West Virginia Acid Mine Drainage Task Force and as Mining Engineer for the WV. AMD Technical Advisory Committee. These Government appointed groups were charged with the task of researching, developing and implementing acid mine drainage prevention technologies in both active mining and the reclamation of former (abandoned) acid producing mining areas. As a result of this effort, he has designed and implemented remediation plans involving, selective handling and placement of mine spoils, chemical treatment of mine spoils, impermeable and permeable caps, passive and active treatment technologies, on many large scale mining and reclamation operations.

Conestoga-Rovers & Associates

J. Richard Murphy, M.A.Sc., P.Eng., Technical Advisor - Groundwater Quality

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Murphy is a professional engineer specializing in hydrogeologic evaluation and design techniques. Mr. Murphy is a Principal of CRA and manages the Hydrogeologic Evaluation and Modeling Group that services all of CRA's projects. Mr. Murphy has technical expertise in hydrogeologic characterization and remedial design, groundwater flow and contaminant transport modeling, and natural attenuation evaluation. Mr. Murphy has been involved in a wide variety environmental characterization, contaminant fate and transport analyses, impact assessments, and remedial design/monitoring projects throughout North America (including CERCLA Sites). He has extensive experience dealing with government agencies and has served as an expert witness on a number of occasions. Mr. Murphy is the leader of CRA's aggregate resources work. He is project manager of the two leading dolostone quarry licensing projects in Ontario and has successfully completed the Ontario Joint Board Hearing for one of these projects. Various other aggregate and cement industry projects are underway. Mr. Murphy is an Associate Member of the Ontario Stone, Sand & Gravel Association (OSSGA), and sits on the Water and Environment Committees.

Conestoga-Rovers & Associates

Gordon Reusing, M.A.Sc., P.E., P. Eng.- Technical Advisor on Air Quality

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Reusing is a Principal of CRA and manages CRA's corporate Air Quality assessment services. Mr. Reusing has over 21 years of experience in air emission assessments. His experience in air assessments includes dispersion modeling, ambient air monitoring, stack testing, permitting, emergency release modeling and risk management plans. Mr. Reusing has completed air compliance work at more than 250 manufacturing facilities and waste management sites in the US, Canada, Brazil, and the UK. Examples of facilities include petroleum, chemical, primary and secondary metals, food products, wood products, automotive, glass, and waste management industries. Mr. Reusing has conducted air emissions modeling, air dispersion modeling, permitting, risk assessments, noise assessments and ambient air monitoring programs for quarries, mines, aggregate processing equipment, cement manufacturing, landfills and site remediation facilities. Mr. Reusing has provided consulting and expert witness services for many litigation projects and hearings, including landfills, petroleum, train derailments, waste incineration, and secondary metals processing. Mr. Reusing also conducted air modeling and assessment on a former uranium processing facility in Ohio to identify the potential for off site impact from former operations on surrounding residents and workers. Expert for quantification of emissions reductions as part of CRA's role as an Applicant Entity (AE) for Clean Development Mechanism (CDM) projects in the United Nations Framework Convention on Climate Change and for Alberta Environment offset project emissions. Mr. Reusing has performed air emissions inventories, dispersion modeling and permitting for over 200 manufacturing facilities. Mr. Reusing has managed the air emissions and noise assessments for numerous environmental impact statement (EIS) and environmental assessment (EA) projects in the United States and Canada. This work includes advanced emissions and dispersion modeling, ambient air monitoring, noise monitoring programs, advanced acoustic modeling and presentations for agency and public meetings for the following EIS, EA and high-profile air assessment projects. Mr. Reusing has completed numerous air and noise assessments, ambient air monitoring and regulatory reporting projects for quarry and mining sites.

Conestoga-Rovers & Associates
David Steele, Project Manager

DEQ Uranium Study CRA Team Project Manager

Mr. Steele is an environmental scientist at Conestoga-Rovers & Associates in the Lexington, Kentucky office. He has 30 years of experience in general environmental practice, including over nine years as a director of environmental projects for a U.S. petroleum and chemical manufacturing company. Mr. Steele's experience includes site assessment and investigations with a focus on use of site conceptual models to identify, select and implement practical remedial response options. Specific project experience encompasses site characterization and remedial design for contaminated industrial and hazardous waste sites, construction of remedial systems, development of remedial strategies and negotiations with regulatory agencies, and the assessment of long-term remediation systems for efficacy and efficiency. In his role in industry, he worked with legal and accounting resources to develop remedial reserves for various active and inactive industrial facilities and participated in quarterly and annual reviews with senior management. Mr. Steele also developed a probabilistic approach to estimate costs for deactivating and demolishing a set of operating manufacturing sites that was used to inform business models for deciding on the location of manufacturing capacity.

Conestoga-Rovers & Associates

Glenn Turchan, M.A.Sc., P. Eng., Project Advisor

DEQ Uranium Study Project Advisor

Mr. Turchan is a Principal and Executive Vice President of CRA and has 28 years of experience in all facets of environmental site assessment and remediation. Mr. Turchan has been a leading professional within CRA in the development of a significant Brownfield redevelopment business for the firm, and has gained valuable experience negotiating a variety of Brownfield type remedial programs at numerous contaminated sites in the United States and Canada. Mr. Turchan has worked closely with General Motors Corporation (GM) on the successful re-development of over 1,000 acres of industrial property at two different Michigan properties. Mr. Turchan has championed environmental liability management over the last 10 years as a means of assisting CRA's clients to resolve environmental liabilities and focus on their core businesses. One particular case was the Libbey Glass Plant project in Wallaceburg, Ontario which won CRA a National Brownie Award from the Canadian Urban Institute in 2004. Mr. Turchan spearheaded CRA's effort, which resulted in CRA becoming both the Owner and the Property Manager of the former glass manufacturing facility with full responsibility for residual groundwater and soil environmental issues. Incorporating environmental excellence and strategic understanding of regulatory, financial, insurance, and business issues, Mr. Turchan was able to make this project a tremendous success for both CRA and our client. The Brownfield redevelopment of the Libbey Site has lead to over 200 new manufacturing jobs in Wallaceburg.

Conestoga-Rovers & Associates

Mauricio Barrera, B.A., M.Sc. - Research Project Team Member

DEQ Uranium Study Research Project Team Member: Member will be dedicated full time to the performance of regulatory program review for two to three weeks, as required to complete the assessment of state and national programs.

Mr. Barrera is an Environmental Scientist with CRA. Mr. Barrera has conducted and supported environmental site assessments and managed data and information on investigation and remediation projects for CRA at various sites in North and South America. Mr. Barrera supported engineering activities for solid waste disposal facilities and developed technical documents on landfill reconditioning. Mr. Barrera has also participated in research and development of advanced water treatment technologies, namely novel advanced oxidation processes (AOPs). This research was supported by the Natural Sciences and Engineering Research Council of Canada – NSERC.

Conestoga-Rovers & Associates

Julia Charlton, Research Project Team Member

DEQ Uranium Study Research Project Team Member: Member will be dedicated full time to the performance of regulatory program review for two to three weeks, as required to complete the assessment of state and national programs.

Ms. Charlton is an Environmental Engineer with CRA. Ms. Charlton has technical expertise in wastewater treatment engineering and operation. Ms. Charlton has also researched and evaluated remedial alternatives and wastewater treatment technologies and applications. Participated in research in non-point contaminant transport in subsurface environments, agricultural impacts on municipal water supplies and associated field investigations, conducted research on the application of anaerobic digestion for municipal wastewater treatment, and assisted in the operation and management of data for the entire global atmospheric watch program.

Conestoga-Rovers & Associates

Lisa Clements, BSc., B.Eng – Research Project Team Member

DEQ Uranium Study Research Project Team Member: Member will be dedicated full time to the performance of regulatory program review for two to three weeks, as required to complete the assessment of state and national programs.

Ms. Clements is an Environmental Engineer with CRA. Ms. Clements has conducted investigations, remediation and chemical monitoring for various sites. Ms. Clements has prepared assessment, remediation and monitoring plans for various stages of environmental action work and has conducted research and case preparation for litigation support cases.

Conestoga-Rovers & Associates

Jeff Daniel, B.A.Sc., P.Eng., Technical Advisor - Water Quality

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Daniel is a Principal and Senior Project Manager and manages CRA's surface water and environmental design groups and surface water/sediment modeling group. Mr. Daniel has over 20 years of experience in the surface water and environmental fields. During his career, Mr. Daniel has focused on the investigation and cost-effective remediation of sediment projects of varying sizes, including several of over 200,000 cubic yards of impacted sediment volume. Mr. Daniel has recently been managing work on the Port Hope facility remediation, which involves the management of closed uranium impacted waste disposal facilities, the engineering design of a consolidation disposal unit and of wastewater treatment works for contaminated waters at the facility under provincial and federal Canadian regulations.

Conestoga-Rovers & Associates

Steven M. Harris, M.A.Sc., P.Eng., P.E. - Technical Advisor – Risk Assessment, Toxicology, and Groundwater Modeling Support

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Harris is a senior engineer/risk assessor/quantitative hydrogeologist and Principal/Vice President of CRA and has over 17 years experience conducting risk assessments (RAs) and quantitative hydrogeologic/fate and transport assessments. Mr. Harris leads CRA's Risk Assessment Services Group, and is a senior member of CRA's Groundwater Modeling Group. RAs conducted by Mr. Harris have involved managing and leading teams of risk assessment professionals (e.g., environmental scientists, toxicologists, ecologists, hydrogeologists, statisticians, and engineers) to evaluate the potential for human health and ecological risks to be present above acceptable levels under both residential, recreational, and industrial/commercial land uses. Mr. Harris has conducted quantitative RAs throughout the United States and Canada. Many RAs have involved the development of risk management plans to mitigate identified risks to human health and the environment. In addition, risk communication has been an integral component of several RAs where the RA findings have been presented in plain language to the public, stakeholders, and local governments to facilitate their understanding to the RA process and conclusions. RAs have involved the development of risk-based site-specific cleanup criteria to support risk-based decision making. Mr. Harris is registered with the Ontario Ministry of the Environment as a Qualified Person – Risk Assessment under Ontario Regulation 153/04 (as amended by Ontario Regulation 511/09). Mr. Harris specializes in the application of analytical and numerical (i.e., simulation techniques to evaluate groundwater flow regimes and to evaluate single and multi-species solute transport phenomenon). Assessments conducted by Mr. Harris have involved the application of both numerical (e.g., MODFLOW-2000, SEAWATv_4, MODPATH, MT3DMS, RT3D, etc.) and analytical modeling approaches to evaluate the potential for future receptor impact, to conduct remedial design feasibility studies, and to assess long-term affects of natural attenuation processes. Assessments have often required the development and calibration of regional groundwater flow models followed by the application of these models to conduct single and multi-species solute transport predictions.

Conestoga-Rovers & Associates

Gary R. Klepper – Technical Advisor – Regulatory Affairs

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Klepper is a member of Conestoga-Rovers and Associates "Sustainable Solutions Group", and opened CRA's Lansing Michigan office in 2002. His twenty-seven-year public service career began with the collection of water resources data for the U. S. Geological Survey and extended to the development and administration of environmental regulations for the State of Michigan in positions ranging from water quality investigator to district supervisor. He participates on the Air Quality and Environmental Policy committees of the Michigan Manufacturers Association; the Governmental Affairs Committee of the Michigan Chemistry Council; the Environmental Quality Committee of the Michigan Chamber of Commerce; and the Executive Team for the Michigan Chapter of the National Brownfield Association (NBA) as chair of their Technical Committee. He experience includes service on a committee to develop remediation rules for Michigan under Part 201.

Conestoga-Rovers & Associates

Edward A. McBean, Ph.D., P.E., Technical Advisor – Waste Management

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Dr. McBean is a Professor of Engineering at the University of Guelph and Canada Research Chair in Water Supply Security. Dr. McBean's expertise includes more than 30 years of utilizing fate and transport as inputs to risk assessment concerns, and utilizing the resulting information as part of decision-making on prioritization of environmental problems. Dr. McBean has an extensive background in economics and statistics that assist in this type of decision-making environment. Dr. McBean was a Professor with the University of Waterloo Civil Engineering Department for almost 20 years while actively consulting for CRA, and joined CRA on a full-time basis in 1995.

Dr. McBean's experience is International in nature with a significant involvement in a large number of United States Superfund RI/FS's over the past 25 years in a project management or peer review role. Dr. McBean is a registered professional engineer in more than forty states. Dr. McBean has also had significant experience in solid waste management, including being the primary author for a 1995 Prentice Hall text book entitled "Solid Waste Landfill Engineering and Design" and lead author in "Statistical Procedures for Analysis of Environmental Monitoring Data and Risk Assessment" published by Prentice-Hall in 1998.

Conestoga-Rovers & Associates
Al Meek, P.E., Project Advisor

DEQ Uranium Study Project Advisor

Al Meek is a registered professional engineer (mining) with over 30 years of experience in the design and implementation of complex environmental remediation and mining operational projects with values over $200 million. He obtained his Bachelors of Science degree in Chemistry from Salem International University in 1977 and received his Professional Engineering license in 1991. The first 15 years of his career was spent with Island Creek Coal Corporation serving in varies environmental, engineering and management roles. The last 15 years he has worked on design and management of Superfund and RCRA sites associated Mining operations, Chemical Plants and Oil Refineries. Mr. Meek brings to the project team extensive experience in the area of Acidic Mine Prevention and Treatment (both passive and active). He served on the West Virginia Acid Mine Drainage Task Force and as Mining Engineer for the WV. AMD Technical Advisory Committee. These Government appointed groups were charged with the task of researching, developing and implementing acid mine drainage prevention technologies in both active mining and the reclamation of former (abandoned) acid producing mining areas. As a result of this effort, he has designed and implemented remediation plans involving, selective handling and placement of mine spoils, chemical treatment of mine spoils, impermeable and permeable caps, passive and active treatment technologies, on many large scale mining and reclamation operations.

Conestoga-Rovers & Associates

J. Richard Murphy, M.A.Sc., P.Eng., Technical Advisor – Groundwater Quality

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Murphy is a professional engineer specializing in hydrogeologic evaluation and design techniques. Mr. Murphy is a Principal of CRA and manages the Hydrogeologic Evaluation and Modeling Group that services all of CRA's projects. Mr. Murphy has technical expertise in hydrogeologic characterization and remedial design, groundwater flow and contaminant transport modeling, and natural attenuation evaluation. Mr. Murphy has been involved in a wide variety environmental characterization, contaminant fate and transport analyses, impact assessments, and remedial design/monitoring projects throughout North America (including CERCLA Sites). He has extensive experience dealing with government agencies and has served as an expert witness on a number of occasions. Mr. Murphy is the leader of CRA's aggregate resources work. He is project manager of the two leading dolostone quarry licensing projects in Ontario and has successfully completed the Ontario Joint Board Hearing for one of these projects. Various other aggregate and cement industry projects are underway. Mr. Murphy is an Associate Member of the Ontario Stone, Sand & Gravel Association (OSSGA), and sits on the Water and Environment Committees.

Conestoga-Rovers & Associates

Gordon Reusing, M.A.Sc., P.E., P. Eng.- Technical Advisor on Air Quality

DEQ Uranium Study Media and Technical Area Expert Advisor: Will advise the Project Management team on specific areas of concern relative to means and measures to protect the relevant media and assessment areas identified for Advise to the Commonwealth of Virginia Uranium Work Group.

Mr. Reusing is a Principal of CRA and manages CRA's corporate Air Quality assessment services. Mr. Reusing has over 21 years of experience in air emission assessments. His experience in air assessments includes dispersion modeling, ambient air monitoring, stack testing, permitting, emergency release modeling and risk management plans. Mr. Reusing has completed air compliance work at more than 250 manufacturing facilities and waste management sites in the US, Canada, Brazil, and the UK. Examples of facilities include petroleum, chemical, primary and secondary metals, food products, wood products, automotive, glass, and waste management industries. Mr. Reusing has conducted air emissions modeling, air dispersion modeling, permitting, risk assessments, noise assessments and ambient air monitoring programs for quarries, mines, aggregate processing equipment, cement manufacturing, landfills and site remediation facilities. Mr. Reusing has provided consulting and expert witness services for many litigation projects and hearings, including landfills, petroleum, train derailments, waste incineration, and secondary metals processing. Mr. Reusing also conducted air modeling and assessment on a former uranium processing facility in Ohio to identify the potential for off site impact from former operations on surrounding residents and workers. Expert for quantification of emissions reductions as part of CRA's role as an Applicant Entity (AE) for Clean Development Mechanism (CDM) projects in the United Nations Framework Convention on Climate Change and for Alberta Environment offset project emissions. Mr. Reusing has performed air emissions inventories, dispersion modeling and permitting for over 200 manufacturing facilities. Mr. Reusing has managed the air emissions and noise assessments for numerous environmental impact statement (EIS) and environmental assessment (EA) projects in the United States and Canada. This work includes advanced emissions and dispersion modeling, ambient air monitoring, noise monitoring programs, advanced acoustic modeling and presentations for agency and public meetings for the following EIS, EA and high-profile air assessment projects. Mr. Reusing has completed numerous air and noise assessments, ambient air monitoring and regulatory reporting projects for quarry and mining sites.

Conestoga-Rovers & Associates
David Steele, Project Manager

DEQ Uranium Study CRA Team Project Manager

Mr. Steele is an environmental scientist at Conestoga-Rovers & Associates in the Lexington, Kentucky office. He has 30 years of experience in general environmental practice, including over nine years as a director of environmental projects for a U.S. petroleum and chemical manufacturing company. Mr. Steele's experience includes site assessment and investigations with a focus on use of site conceptual models to identify, select and implement practical remedial response options. Specific project experience encompasses site characterization and remedial design for contaminated industrial and hazardous waste sites, construction of remedial systems, development of remedial strategies and negotiations with regulatory agencies, and the assessment of long-term remediation systems for efficacy and efficiency. In his role in industry, he worked with legal and accounting resources to develop remedial reserves for various active and inactive industrial facilities and participated in quarterly and annual reviews with senior management. Mr. Steele also developed a probabilistic approach to estimate costs for deactivating and demolishing a set of operating manufacturing sites that was used to inform business models for deciding on the location of manufacturing capacity.

Conestoga-Rovers & Associates

Glenn Turchan, M.A.Sc., P. Eng., Project Advisor

DEQ Uranium Study Project Advisor

Mr. Turchan is a Principal and Executive Vice President of CRA and has 28 years of experience in all facets of environmental site assessment and remediation. Mr. Turchan has been a leading professional within CRA in the development of a significant Brownfield redevelopment business for the firm, and has gained valuable experience negotiating a variety of Brownfield type remedial programs at numerous contaminated sites in the United States and Canada. Mr. Turchan has worked closely with General Motors Corporation (GM) on the successful re-development of over 1,000 acres of industrial property at two different Michigan properties. Mr. Turchan has championed environmental liability management over the last 10 years as a means of assisting CRA's clients to resolve environmental liabilities and focus on their core businesses. One particular case was the Libbey Glass Plant project in Wallaceburg, Ontario which won CRA a National Brownie Award from the Canadian Urban Institute in 2004. Mr. Turchan spearheaded CRA's effort, which resulted in CRA becoming both the Owner and the Property Manager of the former glass manufacturing facility with full responsibility for residual groundwater and soil environmental issues. Incorporating environmental excellence and strategic understanding of regulatory, financial, insurance, and business issues, Mr. Turchan was able to make this project a tremendous success for both CRA and our client. The Brownfield redevelopment of the Libbey Site has lead to over 200 new manufacturing jobs in Wallaceburg.

Technical University of Crete (Greece)
Zacharias (Zach) Agioutantis, Ph.D.

DEQ Uranium Study Role: Zacharia (Zach) Agioutantis is a professor at the Technical University of Crete (Greece) and has a strong relationship with the United States through ongoing business with Virginia Tech. Zach is particularly skilled in rock mechanic's matters and has maintained an awareness of the development of uranium mines in the CIS and neighboring countries. As such, he is familiar with most of the pending regulations and is certainly in tune with the present regulatory environment. Of special note is Zach's ability to harness the knowledge and expertise of Katsanos Anastasios with respect to the Greek Atomic Energy Commission and Kostas Komnitsas on matter related to hydrometallurgy and mine/mill waste disposal. Zach's team will play a major role in summarizing the emerging Eastern Europe, Africa, and Asian regulatory process with respect to uranium mining, milling and waste disposal.

Professor Zacharias (Zach) Agioutantis has a diploma degree in Mining and Metallurgical Engineering from the National Technical University of Athens where he graduated first in a class of about 50. He obtained an MSc and a PhD degree from Virginia Tech in USA. He is a full professor at the Technical University of Crete and he currently serves as Head of the Department of Mineral Resources Engineering. He has taught Rock Mechanics and Drilling and Blasting for over 20 years. He also teaches Numerical Methods in Geomechanics as well as a number of graduate courses. He is the Director of the Rock Mechanics and Engineering Geology Labs. He has participated in numerous research projects in Greece and abroad either as principal investigator or as member of the core group. Selected funded projects are shown below

Sponsored Research & Development
Participated as principal or co-principal investigator or investigator in the following research projects funded by various agencies and organizations:

- M. Karmis, Z. Agioutantis, Principal Investigators, "Software Enhancement 'Surface Deformation Prediction System' (SDPS)", OSMRE, September 1992 - December 1993, contract no EF 68-CT92-12156.
- Z. Agioutantis, Principal Investigator, "Computerization of delay and operation parameter logging at the LKP-A surface mines", Public Power Corporation, June 1993 - May 1994, contract no 1993.323/LKPA.
- M. Karmis, Z. Agioutantis, Principal Investigators, "Development of an Interactive and User-Friendly Pre-Processor for the LAMODEL Program", USBM, July - October 1996. http://www.cdc.gov/niosh/mining/groundcontrol/
- M. Karmis, Z. Agioutantis, Principal Investigators, "Development of Windows based analysis of longwall pillar stability (ALPS) Computer Software", NIOSH, July - October 1998.
- Z. Agioutantis, Principal Investigator, "An investigation of homogenization techniques in stockpiling of lignite", Project "YPER", funded by the General Secretariat of Research and Technology, Greece, 1998-2001.
- Z. Agioutantis, Principal Investigator, "Verification of the final design of the Plakiotissa water dam, Crete", funded by OADYK (Organization for the development of Western Crete), 2005-2006.
- Z. Agioutantis, Investigator, Risk assessment study at the Somika plant, Katanga province, Kongo, Contrat No 48/Copirep/SE/03/2006, funded by COPIREP, Apr. '06 - Dec. '06.
- Z. Agioutantis, Principal Investigator, "Design of a water reservoir in Inahorio, Western Crete", funded by OADYK (Organization for the development of Western Crete), 2008.
- Z. Agioutantis, Principal Investigator, "Design of a water reservoir in Zoniana, Central Crete", funded by OADYK (Organization for the development of Western Crete), 2009.
- Z. Agioutantis, Leader of TUC Partner, "Sustainable Aggregate Management", SEE Interreg Project, funded by the EU, May 2009 - October 2011.
- Z. Agioutantis, Principal Investigator, "Development of a geotechnical database for tunnel monitoring", funded by Istria, Dec 2009 – Dec 2010
- Z. Agioutantis, Principal Investigator, "Development of on-line data acquisition system for SCADA, South Field Mine, PPC", funded by PPC (Public Power Corporation), Nov 2009-April 2011
- Z. Agioutantis, Principal Investigator, "Design of support measures for the steep cliffs at Topolia", Western Crete, June 2010-May 2011.

- Z. Agioutantis, Principal Investigator, "Geological, Geophysical and Geotechnical Evaluation of limestone/schist slopes at the Mauropigi Mine, PPC", funded by PPC, July 2011-February 2012.
- Z. Agioutantis, Principal Investigator, Evaluation of the ventilation system of underground mixed sulphides mine, funded by Hellas Gold, May 2011-Sept 2012.

He has organized 8 international conferences related to mining and sustainable development. He has written three books (in Greek) and he has authored over 170 papers in journals and conference proceedings. He is a member of the editorial board of several scientific journals and has served as external examiner and evaluator in numerous occasions. His research interests focus in Rock Mechanics, Ground Control, Computer Applications in Mining, Sustainable development in Mining and related fields.

Selected publications are shown below:

1. Agioutantis, Z. and M. Karmis, "Developing Improved Methods of Predicting Surface Displacements due to Underground Mining Through the Integration of Empirical Indices into Numerical Modeling", Mining Science and Geotechnology, 7, 1988, pp. 133-148.
2. Karmis, M., Z. Agioutantis and A. Jarosz, "Recent Developments in the Application of the Influence Function Method for Ground Movement Predictions in the U.S.", Mining Science and Geotechnology, 1990, Vol. 10, pp. 233-245.
3. Karmis, M., Z. Agioutantis and A. Jarosz, "Subsidence Prediction Techniques in the United States: A State-of-the-Art Review", Mineral Resources Engineering, 1990, Vol. 3, No 3, pp. 197-210.
4. Agioutantis, Z. "Automated Downtime Recording and Processing for Continuous Surface Mining Systems", *International Journal of Surface Mining, Reclamation and Environment*, 1994, Vol. 8, 159-162.
5. Karmis, M., J. Mastoris, and Z. Agioutantis, "Potential of the 'Damage Angle' Concept for Assessing Surface Impacts of Underground Mining", *Transactions*, Society for Mining, Metallurgy and Exploration, Inc., 1994, Vol. 296, pp. 1883-1886.
6. Agioutantis, Z. "Using Numerical Procedures for Geomechanical Modeling", Mineral Wealth, 1995, Mineral Wealth, Vol 96, pp. 23-34 (in Greek).
7. Duvris, D. and Z. Agioutantis, "Air quality improvement of underground bauxite mines through a controlled maintenance program of the diesel-powered equipment", *Transactions*, Society for Mining, Metallurgy and Exploration, Inc., Vol 306, 1999.
8. Agioutantis, Z. and A. Bekas, "The potential of district heating using geothermal energy. A case study", *Geothermics*, Vol. 29, No. 1, 2000, pp. 51-64.
9. Heasley, K. and Z. Agioutantis, "LAMODEL - A boundary element program for coal mine design", Proceedings, 10th International Conference on Computer Methods and Advances in Geomechanics, Arizona, January 9-12, 2001.
10. Agioutantis Z. and K. Komnitsas, "Life cycle of a tailings facility with emphasis on impoundment stability", Proceedings, International Workshop, New Frontiers In Reclamation: Facts & Procedures In Extractive Industry, 19-21 September 2001, Milos, Greece.
11. Komnitsas, K. and Z. Agioutantis, "Risk calculation as a key tool for the rehabilitation of mixed sulphide disposal sites", Proceedings, International Workshop, New Frontiers In Reclamation: Facts & Procedures In Extractive Industry, 19-21 September 2001, Milos, Greece.
12. Schafrik, S., M. Karmis, Z. Agioutantis and T. Chewing, "Sustainable development of mineral resources: Improving communications using visualization techniques", Proceedings, International Conference on Sustainable Development Indicators in the Mineral Industry, 21-23 May 2003, Milos, Greece, pp. 353-358.
13. Komnitsas, K. and Z. Agioutantis, "Risk assessment and sustainable development framework in the mining industry", Proceedings, International Conference on Sustainable Development Indicators in the Mineral Industry, 21-23 May 2003, Milos, Greece, pp. 53-58.
14. Agioutantis, Z., K. Komnitsas, and K. Bounou, Risk quantification in the mineral sector, Sustainable Development Indicators in the Minerals Industry (SDIMI) 2005, May 18-20, Aachen, Germany.

15. Konialis, A., K. Komnitsas, and Z. Agioutantis, Rethinking Capacity Building, Proceedings, 3rd International Conference on Sustainable Development Indicators in the Minerals Industry (SDIMI 2007), 17-20 June 2007, Milos, Greece pp. 389-396.

16. Konialis, A., K. Komnitsas, and Z. Agioutantis, Rethinking Capacity Building, *Bulletin Resurse Minerale, editorial*, June 2007, Vol 4, No 2, pp. 3-13.

17. Blengini G.A, E. Garbarino, S. Solar, D. Shields, T. Hámor, R. Vinai and Z. Agioutantis, The EU SARMa Project: Life Cycle Assessment guidelines to boost sustainable production and recycling of aggregates, Journal of Cleaner Production, Volume 27, May 2012, pp. 177–181.

18. Steiakakis, C. and Z. Agioutantis, Innovative reinforced soil slope for the stabilization, of stiff – fissured clay high cut, State of the Art and Practice in Geotechnical Engineering, GeoCongress 2012, California USA, March 25-29, 2012.

CURRICULUM VITAE

KATSANOS A. Anastasios
Professor Emeritus
Technical University of Crete (Greece)
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Email: katsanos@mred.tuc.gr

DEQ Uranium Study Role: Katsanos Anastasios is a professor emeritus of the Technical University of Crete (Greece). He has agreed to collaborate with Professor Agioutantis, also of the Technical University, to undertake as well as guide the research on the regulatory environment for uranium mining in Eastern Europe, Africa, and Asia. He is well-qualified to do that through his former association with nuclear research and control matters.

EDUCATION

1. University of Thessaloniki, 1953-1958, B.S. in chemistry
2. The University of Chicago, 1962-1967, Ph.D. in low energy nuclear physics

POSITIONS HELD

Apr.1989 to Sep. 2002	Professor of the Technical University of Crete, Dept. of Sciences
Feb.1994 to Jan 1999	President of the Greek Atomic Energy Commission
Sep. 1969 to Apr. 1989	DEMOKRITOS NRC, Aghia Paraskevi, Attiki, Greece, Head of Physics Division, Director of the Inst. of Nuclear Physics.
Sep.1968 to Aug. 1969	Centre d'Edute Nuclaire de Saclais, Paris, France. Collaborateur etranger.
Jan. 1967 to Jul. 1968	University of Washington, Phys. Dept., Seattle, Wash., USA. Research associate.
Oct. 1963 to Dec. 1966	Argonne National Laboratory, Chem. Division, Argonne, Ill., USA. Research associate.
Jul. 1963 to Sep. 1963	Enrico Fermi Research Inst., Chicago, Ill., USA.. Research assistant.
Oct. 1962 to Jun 1963	The University of Chicago, Chemistry Dept.,Chicago, Ill., USA. Teaching assistant.
Jan. 1961 to Aug. 1962	DEMOKRITOS NRC, Chem. Dept., Aghia Paraskevi, Attiki, Greece. Associate.
1959-1960	Compulsory military service in Greece.

OTHER ACTIVITIES

- ✓ Greek High Level Representative to EUREKA 1986-1991
- ✓ Member of the JET Council (the EU fusion laboratory) 1982-1999
- ✓ President of the European Atomic Energy Society 1996-1997
- ✓ Member of the Scientific and Technical Committee of EU
- ✓ Participation in several international advisory committees, IAEA expert missions to other countries (Portugal, Hungary, Singapore, Viet Nam, Bangladesh, etc.), Received grants from EEC, IAEA, UNESCO, Greek ministries, etc.

RESEARCH INTERESTS

Nuclear Physics and applications of nuclear techniques, advanced analytical methods with emphasis on XRF and Ion Beam Analysis, applications on environmental problems.

PUBLICATIONS

63 Publication in journals (about 500 citations), 20 reports and 30 contributions to conferences

LANGUAGES: Greek (mother tongue), English (good), French (poor).

Kostas Komnitsas, Ph.D.

Technical University of Crete, Chania, Greece

DEQ Uranium Study Role: Kostas Komnitsas is a professor at the Technical University of Crete (Greece). He is experienced in a broad variety of mining and waste handling methods and has agreed to apply this experience through Zach Agioutantis in support of MM&A and the Workgroup. In addition to his specialty skills in designing, constructing, and monitoring waste facilities, he has agreed to join in the research of the evolving regulatory climate in Eastern Europe, Africa, and Asia on behalf of MM&A and the Workgroup.

Professor Kostas Komnitsas, born in 1961, PhD, is the director of the research unit "Waste Management and Soil Rehabilitation", http://www.mred.tuc.gr/p013215_UK.htm, of the Technical University Crete, Chania, Greece. He is expert in the fields of metallurgy, hydro- and bio-hydrometallurgy, decontamination of effluents, soils and wastes derived from chemical, mining and metallurgical activities. He is also involved in environmental and risk assessment exercises as well as in waste valorisation studies. His research unit is equipped with sophisticated laboratory instruments to carry out all kinds of analysis and assessment.

Prof. Komnitsas has been appointed as national representative of the Framework Programme 6 (FP6) of the European Union "Integrating the European Research Area" (2002-2004), and the FP7 International Cooperation (INCO) programme (2006-2009). In addition he is a member of the editorial board of two international journals (Minerals Engineering published by Elsevier, and Environmental Forensics, published by Taylor and Francis). He frequently evaluates research proposals in the fields of environment and materials as well as education and training for the European Commission (EC), the Greek Ministry of Research and Technology, the Greek Ministry of Education, the Cyprus Ministry of Technology, the US NSF as well as the Russian, Czech, Georgian, Romanian and Serbian Science Foundations (he has participated in more than 50 evaluation exercises, also remote). He frequently reviews papers for more than ten international journals (more than 400 reviews).

Professor Komnitsas is actively involved in research, has participated in more than 40 research projects (in most of them as co-ordinator) and has published more than 50 research papers in peer reviewed international journals that have received over 700 citations. He has also written chapters in 7 books (in English and in Greek) for Waste Management. He has organized several international conferences and has been appointed as external examiner for PhD theses in various countries. He has established research links with several institutions in Europe, China, Russia, US and Australia.

Participation in selected projects

(some of them involved management of wastes and industrial effluents containing **radioactive** elements)

1. Sep. 2011 – Aug. 2015. Best practices for agricultural WASTEs (AW) treatment and REUSE in the Mediterranean countries, LIFE+ Environment Policy and Governance 2010, funded by EC, www.wastereuse.eu
2. Jan. 2011 - Dec. 2012. Treatment of Acid Mine Drainage Using Permeable Reactive Barriers (In-Situ Treatment) and Anaerobic Baffled Reactors (Ex-Situ Treatment), Greece-Turkey bilateral cooperation project, funded by GSRT and Tubitak, http://www.tuc.gr/treatamd.html
3. Jan. 2009 – Dec. 2012. Strategies to improve and protect soil quality from the disposal of olive oil mills' wastes in the Mediterranean region, Life+ project (PROSODOL), LIFE07ENV/GR/000280, funded by the EC, http://www.prosodol.gr/
4. June 2006 – May 2008. Optimization of the permeable reactive barriers performance for the decontamination of leachates and groundwater, bilateral Greek-Canada cooperation project, funded by the Greek General Secretariat of Research and Technology, http://www.mred.tuc.gr/p042.htm
5. Jan. 2006 – Dec. 2007. Strategic plan for prevention of regional water resources contamination from mining and metallurgical activities in Western Balkan Area (Prewarc), INCO C.1 Environment, SSA, funded by the EC, http://www.labmet.ntua.gr/prewarc/index.htm
6. Jan. 2006 – Dec. 2007. Integrated system for the rehabilitation of contaminated areas in waste disposal sites with the use of innovative technologies, bilateral Sino-Greek cooperation project, funded by the Greek General Secretariat of Research and Technology, http://www.mred.tuc.gr/projects/GR-China/index.htm

7. Apr. 2006 – Dec. 2006. Risk assessment study at the Somika plant, Katanga province, Kongo, Contrat No 48/Copirep/SE/03/2006, funded by COPIREP.
8. Sep. 2005 – Aug. 2007. Management and remediation of hazardous industrial wastes in the Western Balkan Countries (INDUWASTE). INCO C.1 Environment, SSA, funded by the EC, http://www.ibes.be/induwaste/
9. Aug. 2004 – July 2007. Integrated treatment of industrial wastes towards prevention of regional water resources contamination (INTREAT), INCO C.1 Environment STREP, funded by the EC, http://www.labmet.ntua.gr/intreat/
10. Sep. 2004 – Aug. 2006. Integrated industrial solid waste management in Albania (INSWAM – AL), INCO C.1 Environment, SSA, funded by the EC, http://www.mred.tuc.gr/projects/inswab/index.htm
11. Sep. 2000 - Dec. 2003: Environmental management of hazardous mining wastes and effluents, funded by the EC, Copernicus II project, Contract No ICA2-CT-2000-10010.
12. Sep.1998 - Aug. 2000: Study and application of remediation technologies for mitigation of pollution emanating from uranium wastes in Romania, funded by GSRT, Greek-Romania bilateral cooperation project.
13. Feb. 1997 – July 1999: Pollution at Black Sea coastal areas due to mining activities. Pilot scale rehabilitation actions, funded by EC, Contract No IC15-CT96-0114.
14. Aug. 1993 - Jan. 1996: Bioremediation of sites affected by acid mine drainage by accelerated bioleaching of mine wastes, funded by EC, Contract No EV5V-CT93-0248.

Selected publications in peer reviewed journals

1. Komnitsas, K., F.D. Pooley (1991). Optimization of the bacterial oxidation of an arsenical gold sulphide concentrate from Olympias, Greece. *Minerals Engineering* 4(12), 1297-1303, http://dx.doi.org/10.1016/0892-6875(91)90173-S
2. Kontopoulos, A., K. Komnitsas, A. Xenidis, N. Papassiopi (1995). Environmental characterisation of the sulphidic tailings in Lavrion, *Minerals Engineering* 8(10), 1209-1219, http://dx.doi.org/10.1016/0892-6875(95)00085-5
3. Komnitsas, K., A. Kontopoulos, I. Lazar, M. Cambridge (1998). **Risk assessment and proposed remedial actions in coastal tailings disposal sites in Romania**, *Minerals Engineering* 11(12), 1179-1190, http://dx.doi.org/10.1016/S0892-6875(98)00104-6
4. Komnitsas, K., I. Lazar, I.G. Petrisor (1999). **Application of a vegetative cover on phosphogypsum stacks**, *Minerals Engineering* 12(2), 175-185, http://dx.doi.org/10.1016/S0892-6875(98)00130-7
5. Groudev S., S.G. Batkova, K. Komnitsas (1999). **Treatment of waters polluted with radioactive elements and heavy metals by means of a laboratory passive system**, *Minerals Engineering* 12(3), 261-270, http://dx.doi.org/10.1016/S0892-6875(99)00004-7
6. Peppas A., K. Komnitsas, I. Chalikia (2000). Use of organic covers for acid mine drainage control, *Minerals Engineering* 13(5), 563-574, http://dx.doi.org/10.1016/S0892-6875(00)00036-4
7. Groudev S.N., I.I. Spasova, P.S. Georgiev, K. Komnitsas (2001). **Bioremediation of soil contaminated with radioactive elements**, *Hydrometallurgy* 59, 311-318, http://dx.doi.org/10.1016/S0304-386X(00)00187-0
8. Xenidis, A., Papassiopi, N., K. Komnitsas (2003). Carbonate rich mine tailings in Lavrion: Risk assessment and proposed rehabilitation schemes, *Advances in Environmental Research* 7(2), 207-222, http://dx.doi.org/10.1016/S1093-0191(02)00017-5
9. Zilberchmidt M., M. Shpirt, K. Komnitsas, I. Paspaliaris (2004). **Thermal processing of sulfur containing coal wastes**, *Minerals Engineering* 17, 175-182, http://dx.doi.org/10.1016/j.mineng.2003.10.026
10. Petrisor I., S. Dobrota, K. Komnitsas, I. Lazar, C. M. Kuperberg, M. Serban (2004). **Artificial inoculation - Perspectives in tailings phytostabilization**, *International Journal of Phytoremediation* 6(1), 1-15, http://dx.doi.org/10.1080/16226510490439918
11. Komnitsas, K., G. Bartzas, I. Paspaliaris (2006). Inorganic contaminant fate assessment in zero-valent iron treatment walls, *Environmental Forensics* 7, 207-217, http://dx.doi.org/10.1080/15275920600840479
12. Komnitsas, K., K. Modis (2006). Soil risk assessment of As and Zn contamination in a coal mining region using geostatistics, *Science of the Total Environment* 371, 190-196, http://dx.doi.org/10.1016/j.scitotenv.2006.08.047
13. Komnitsas, K., G. Bartzas, K. Fytas, I. Paspaliaris (2007). Long-term efficiency and kinetic evaluation of ZVI barriers during clean up of copper containing solutions, *Minerals Engineering* 20, 1200-1209, http://dx.doi.org/10.1016/j.mineng.2007.05.002
14. Komnitsas, K., Zaharaki D. (2007). Geopolymerisation. A review, *Minerals Engineering* 20, 1261-1277, http://dx.doi.org/10.1016/j.mineng.2007.07.011

15. Komnitsas, K., Zaharaki, D., V. Perdikatsis, (2009). Effect of synthesis parameters on the compressive strength of low-calcium ferronickel slag inorganic polymers, *Journal of Hazardous Materials* 161, 760-768, http://dx.doi.org/10.1016/j.jhazmat.2008.04.055

16. Komnitsas, K. , K. Modis (2009). Geostatistical risk assessment at waste disposal sites in the presence of hot spots, *Journal of Hazardous Materials* 164(2-3), 1185-1190, http://dx.doi.org/10.1016/j.jhazmat.2008.09.027

17. Komnitsas, K., Guo, X., Li, D., (2010). Mapping of soil nutrients in an abandoned Chinese coal mine and waste disposal site, *Minerals Engineering* 23, 627-635, http://dx.doi.org/10.1016/j.mineng.2010.02.009

18. Kavvadias, V., M.K. Doula, K. Komnitsas, N. Liakopoulou (2010). Disposal of olive oil mills wastes in evaporation ponds: Effects on soil properties, *Journal of Hazardous Materials* 182, 144-155, http://dx.doi.org/10.1016/j.jhazmat.2010.06.007

19. Komnitsas, K., Zaharaki, D., Doula, M., Kavvadias, V. (2011). Origin of recalcitrant heavy metals present in olive mill wastewater evaporation ponds and nearby agricultural soils, *Environmental Forensics* 12, 319-326, http://dx.doi.org/10.1080/15275922.2011.622349

20. Altun, M., Sahinkaya, E., Bektas, S., Komnitsas, K. (2012). Bioreduction of Cr(VI) from acidic wastewaters in a sulfidogenic ABR, *Minerals Engineering*, in press

Titles in bold denote management of wastes containing radioactive elements

Gerald Harvey Luttrell

DEQ Uranium Study Role: Gerald Luttrell is a professor at Virginia Tech, in Blacksburg, Virginia. He is well regarding in the mineral milling and processing fields of mining engineering. He has an especially strong standing in the Commonwealth of Virginia. Gerald has agreed to join MM&A in evaluating the development of regulations specific to the milling and storage of uranium ore. His participation will have the authority developed over many years of working in and around milling plants of various kinds and sizes. He will be particularly helpful in guiding regulations that affect the worker's health in milling plants and the associated handling of raw material (on the input side of the plant), product (on the output side of the plant) and waste.

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Education

1986	*Doctor of Philosophy*, Mining and Minerals Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
1982	*Master of Science*, Mining and Minerals Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
1980	*Bachelor of Science*, Mining and Minerals Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
1978	*Associate of Science*, Engineering, Southwest Virginia Community College, Richlands, Richlands, Virginia.

Professional Experience

2004-	*Massey Professor*, Department of Mining and Minerals Engineering, Virginia Polytechnic Institute and State University.
1997-2004	*Professor*, Department of Mining and Minerals Engineering, Virginia Polytechnic Institute and State University.
1991-1997	*Associate Professor*, Department of Mining and Minerals Engineering, Virginia Polytechnic Institute and State University.
1986-1991	*Assistant Professor*, Department of Mining and Minerals Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
1980-1986	*Graduate Research Assistant*, Department of Mining and Minerals Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.
1980	*Process Engineer*, Amax Extractive Research & Development, Golden, Colorado.
1976-1979	*General Laborer*, Island Creek Coal Company, Mine #1 and #3, Vansant, Virginia.

Area of Specialization

Dr. Luttrell's areas of specialization in mineral processing include particulate separations, process equipment design, modeling and optimization, and plant circuit engineering. He has participated in the development of several patented processing technologies for mineral upgrading including the Microcel™ column, CrossFlow™ classifier, HydroFloat™ separator and StackCell™ flotation technology. He is actively involved in the application of particulate processing technologies for pollution prevention and environmental restoration. These include the removal of air pollutant precursors from coal, clean up of radioactive soils/sites, hydrocarbon soil remediation, and recycling of plastics. He participates in a variety of extension activities including field services for industrial organizations, federal/state agencies, engineering firms, equipment manufacturers, and chemical suppliers. He actively promotes technology transfer and has presented nearly 200 short courses and workshops for industry. Since 1986, he has participated in sponsored research projects exceeding $14 million. His scholarly works in include 18 patents, 10 book chapters, 120 referred journal and proceedings papers, 129 conference proceeding articles, as well as more than 200 technical reports. and authored numerous technical articles including 6 book chapters, 96 refereed journal and conference publications, 118 conference proceedings/communications, more than 200 technical reports.

Recent Honors and Awards

Robert H. Richards Award, AIME/SEM, 2012.
Frank Aplan Award, AIME Award, 2007.
Certificate of Teaching Excellence, VPI&SU, 2005-2006.
Percy Nicholls Award, SME Award, 2005.
Outstanding Alumnus Award, Mining & Minerals Engineering, VPI&SU, 2005.
Outstanding Faculty Award, Student Chapter of AIME, VPI&SU, 2004-2005.
Henry Krumb Lecturer, SME Speaker Award, 2000-2001.
Dean's Award for Excellence in Public Service, VPI&SU, 1998.
Stephen McCann Educational Excellence Award, PCMIA Award, 1995.
Outstanding Alumnus Award, Southwest Virginia Community College, 1987.

Professional Service

Treasurer, Coal Preparation Society of America, 2006-present.
Committee Member, Executive Board, International Coal Preparation Exhibition and Conference, 2000-present.
Editor-in-Chief, Coal Preparation: A Multi-National Journal, 2005-2006.
Secretary/Treasurer, SME/Central Appalachia Section, 1999-2004.
Committee Member, Editorial Board, Coal Preparation: A Multi-National Journal, 1997-present.

Selected Publications

1. Richardson, W.S., Phillips, C.R., Luttrell, G.H., Hicks, R., and Clinton, C., 1999. "Application of Remedy Studies to the Development of a Soil Washing Pilot-Plant that uses Mineral Processing Technology: A Practical Experience," *Journal of Hazardous Materials*, Vol. 66, No. 1-2, pp. 47-65.
2. Luttrell, G.H., Venkatraman, P. and Yoon, R.-H., 1998. "Removal of Hazardous Air Pollutant Precursors by Advanced Coal Preparation," *Coal Preparation: A Multi-National Journal* (Special Issue), Vol. 19, pp. 243-255.
3. Honaker R.Q. and Luttrell, G.H., 2006. "Innovative Gravity-Based Technologies and Circuits for Fine Coal Cleaning," Proceedings, XV International Coal Preparation Conference and Exhibition, Beijing, China, October 17-20, 2006, 502-508.
4. Mankosa, M.J. and Luttrell, G.H., 2006. "The PolyMag Process: A Novel Approach to Plastic Recycling," SME Annual Meeting, St. Louis, Missouri, March 26-29, 2006.

5. Luttrell, G.H. and Honaker, R.Q., 2005. "Practical Optimization of Coal Preparation Plants," Innovations in Natural Resource Processing (C.A. Young, J.J. Kellar, M.L. Free, J. Drelich, and R.P., King, Eds), Symposium Honoring Jan Miller, Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, 444 pp.
6. Luttrell, G.H., and Mankosa, M.J., 2003. "Strategies for the Instrumentation and Control of Solid-Solid Separation Processes," in Mineral Processing Plant Design, Control, and Operating Practices, (A. Mular, D. Halbe, and D. Barratt, Eds.), Vol. 2, Chapter F-7, Mineral Processing Plant Design, Practice, and Control Symposium, October 20-24, 2002, Vancouver, BC, Canada, Society for Mining, Metallurgy, and Exploration, Littleton, Colorado, ISBN 0-87335-223-8, pp. 2152-2163.
7. Luttrell, G.H., Kohmuench, J.N., and Yoon, R.-H., 2001. "HAPPs Reduction by Coal Preparation," *Proceedings*, 11th International Conference on Coal Science, San Francisco, California, September 30-October 5, 2001, Preprint 397, 4 pp.
8. Luttrell, G.H., Yoon, R.-H., Adel, G.T., 1997. "Precombustion Removal of Hazardous Air Pollutant Precursors," *Proceedings*, Coal Liquefaction and solid Fuels Contractors Review Conference, Pittsburgh, Pennsylvania, September 3-4, 1997, 6 pp.
9. Richardson, W.S., Phillips, C.R., Luttrell, G.H. and Cox, C., 1997. "The Design and Conduct of Meaningful Soil Characterization and Treatability Studies Based on a Knowledge of Mineral Processing Technology," in *Waste Management '97, Proceedings*, Waste Management '97 Symposium, Tucson, Arizona, February 1997, CD-ROM Article 46-02, 11 pp.
10. Luttrell, G.H., Venkatraman, P., Yoon, R.-H., Novak, J.T. and Hill, D., 1995. "Control of Hazardous Air Pollutant Precursors by Advanced Coal Preparation," *Proceedings*, Technical Solutions for Pollution Prevention in the Mining and Minerals Processing Industries, Engineering Foundation Conference, January 22-27, 1995, Palm Coast, Florida, pp. 111-120.
11. Honaker, R.Q., Saracoglu, M., Thompson, E., Bratton, R., Luttrell, G.H., and Richardson, V., 2007. "Dry Coal Cleaning Using the FGX Separator," Proceedings, 24th Annual International Coal, Aggregate and Mineral Processing Exhibition and Conference, Penton Media, Lexington, Kentucky, April 30 – May 3, 2007, pp. 61-75.
12. Lin, C.L., Miller, J.D., Luttrell, G.H., and Adel, G.T., 2000. "Development of an On-Line Coal Washability Analysis System Using X-Ray Computed Tomography," *Coal Preparation*, Vol. 21, pp. 383-409.
13. Yoon, R.-H., Asmatulu, R., Yildirim, I., Eryadin, M.K., and Luttrell, G.H., 2003. "Pilot-Scale Testing of Novel Fine-Particle Dewatering Aids," *Minerals & Metallurgical Processing*, Vol. 20, No. 4, November 2004, pp. 206-210.
14. Tao, D.P., Richardson, P.E., Luttrell, G.H., and Yoon, R.-H., "Electrochemical Studies of Pyrite Oxidation and Reduction Using Freshly Fractured Electrodes and Rotating Ring-Disc Electrodes," *Electrochimica Acta*, Vol. 48, No. 24, October 30, 2003, pp. 3615-3623.
15. Palmer, C.A., Luppens, J.A., Finkelman, R.B., Luttrell, G.H., and Bullock, J.H., Jr., 2004. "The Use of Washability Studies to Predict Trace-Element Reductions During Coal Cleaning," Proceedings, 29th International Technical Conference on Coal Utilization and Fuel Systems, Sheraton Sand Key, Clearwater, Florida, April 18-22, 2004, Preprint 141, 12 pp.
16. Luttrell, G.H., Kohmuench, J.N., and Mankosa, M.J., 2004. "Optimization of Magnetic Separator Circuit Configurations," *Minerals & Metallurgical Processing*, Vol. 21, No. 3, pp. 153-157.
17. Luttrell, G.H., Westerfield, T.C., Kohmuench, J.N., Mankosa, M.J., Mikkola, K.A. and Oswald, G., 2006. "Development of High-Efficiency Hydraulic Separators," *Minerals and Metallurgical Processing*, Vol. 23, No. 1, pp. 33-40.
18. Burchett, R.T., McGough, K.M., Luttrell, G.H., 2006. "Improved Screen-Bowl Centrifuge Recovery Using Polymer Injection Technology," *Coal Age*, Vol. 111, No. 8, August, 2006, pp. 22-26.
19. Kohmuench, J.N., Mankosa, M.J., Kennedy*, D.G., Yasalonis, J.L., Taylor, G.B. and Luttrell, G.H., 2007. "Implementation of the HydroFloat Technology at the South Fort Meade Mine," Minerals and Metallurgical Processing, Vol. 24, No. 4, pp. 264-270.
20. Schultz, W., Jahnig, R., Bratton, R.C. and Luttrell, G.H., 2009. "Operating and Maintenance Guidelines for Screenbowl Centrifuges," Coal Age, Vol. 114, No. 1, pp. 38-43.
21. Kohmuench, J.N., Yan, E.S, Mankosa, M.J., Luttrell, G.H. and Bratton, R.C., 2010. "Design, Operation and Control of a Teeter-Bed Hydroseparator for Classification," Minerals and Metallurgical Processing, Vol. 27, No. 3, pp. 166-172.

22. 49. Keles, S., Luttrell, G.H., Yoon, R.-H., Estes, T., Schultz, W. and Bethell, P.J., 2010. "Development of the Centribaric™ Dewatering Technology," International Journal of Coal Preparation and Utilization, Vol. 30, No. 2-5, pp. 204-216.
23. Kohmuench, J., Mankosa, M.J., Wyslouzil, H., Furey, J., Liberato, R. and Luttrell, G.H., 2010. "Phosphate Flotation - From Boulders to Bug-Dust," Chapter 21, in Beneficiation of Phosphates - Technology Advanced and Adoption," P. Zhang, Ed., Society for Mining, Metallurgy and Exploration, Inc. (SME), Littleton, Colorado, pp. 213-220.
24. Luttrell, G.H., 2009. "Chapter 4 - Coal Preparation," Meeting Projected Coal Production Demands in the USA - Upstream Issues, Challenges and Strategies, National Commission on Energy Policy (NCEP), Washington, D.C., pp. 106-143.
25. Luttrell, G.H. and Honaker, R.Q., 2011. "Coal Preparation," Encyclopedia of Sustainability Science and Technology, Springer, New York, N.Y., 57 pp.

Statements of Qualifications

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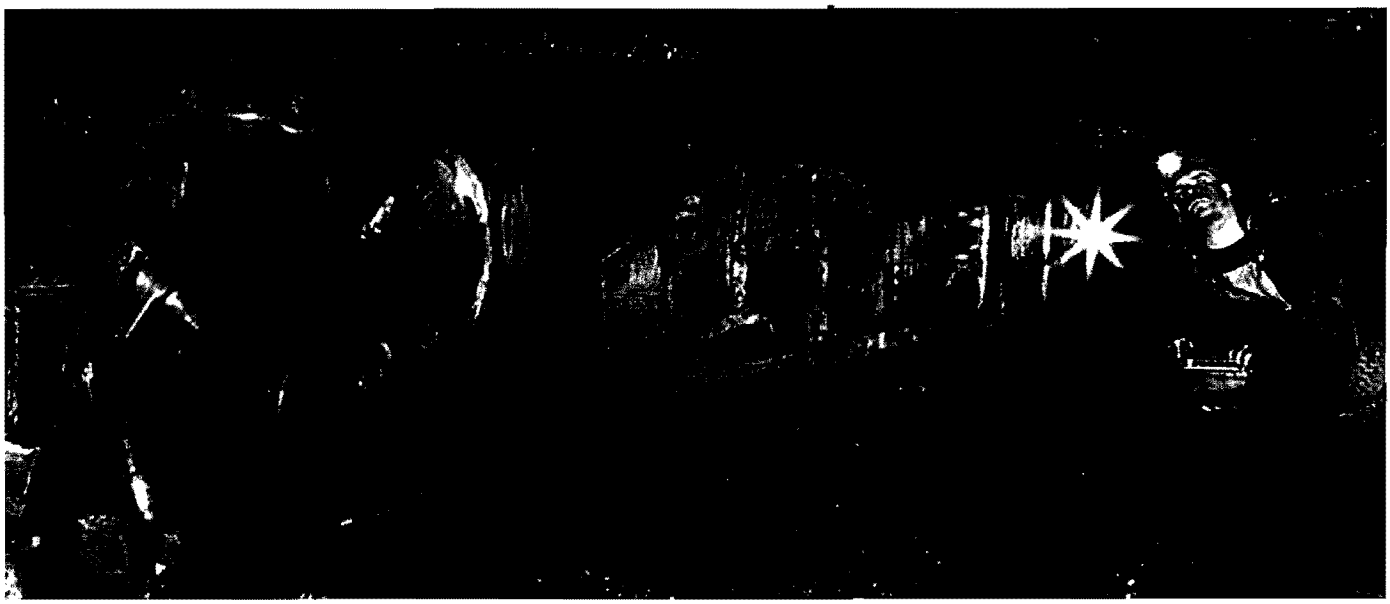
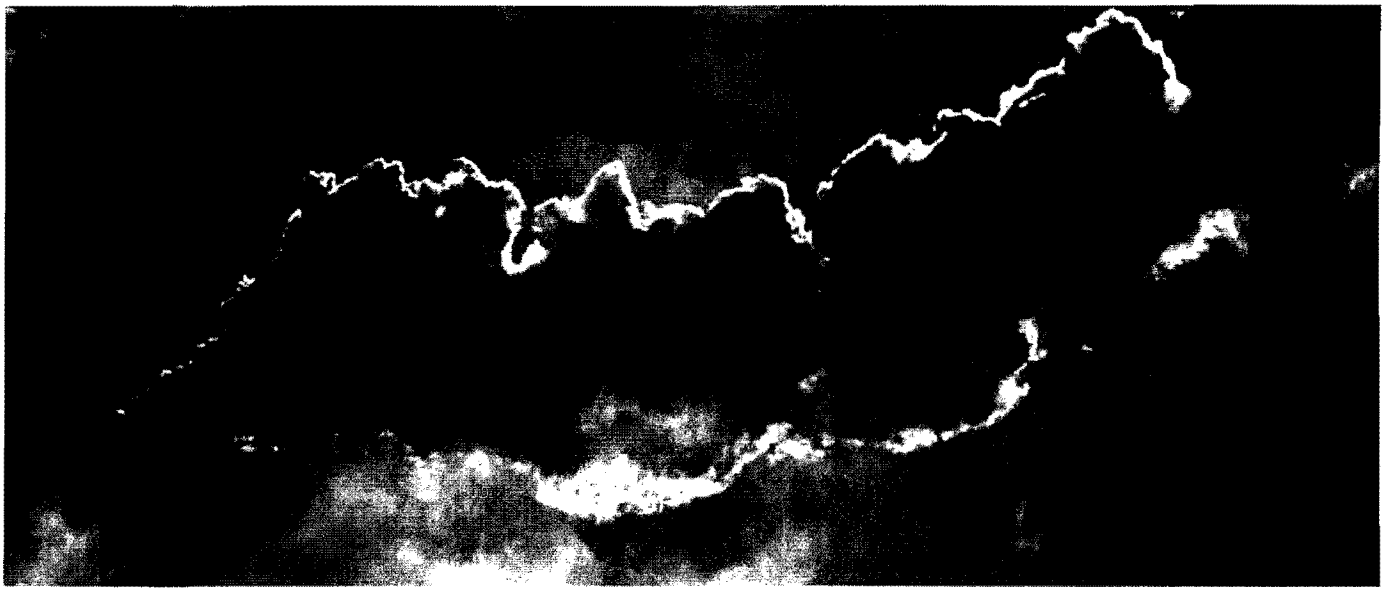
2012

STATEMENT OF QUALIFICATIONS

ENERGY / ENVIRONMENTAL / ENGINEERING / CARBON MANAGEMENT





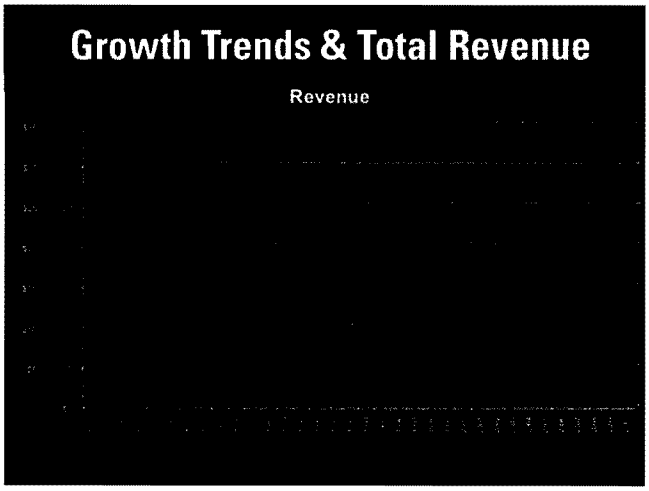
MARSHALL MILLER & ASSOCIATES

INTRODUCTION

Marshall Miller & Associates (*MM&A*), a diverse consulting and engineering firm headquartered in Bluefield, Virginia, U.S.A., offers a wide spectrum of services to clients in North America, South America, Asia, and Europe. Over its 36-year history, MM&A has evolved into a leader in the mineral resource, environmental, and carbon management industries. The company's growth is based on a commitment to applying and developing advanced engineering and scientific technologies and maintaining our talented staff of geologists; hydrologists; earth scientists; and mining, petroleum, environmental, and civil engineers.

The roots of MM&A originated with professional services provided to the coal, aggregate, industrial minerals, unconventional gas, financial, and insurance industries. Professional services include mining engineering, coal and petroleum geology, petroleum engineering, mining-related environmental services, expert witness and litigation support, valuation and appraisals, financial and operations assessment, advisory services, permitting/regulatory services, and wireline geophysics. As the leading consulting firm in the United States working in the coal and coalbed methane industries, our energy-related client base consists of over 250 companies. Since 2005 MM&A has been an active participant in a Department of Energy-sponsored Carbon Capture and Storage (CCS) project related to storage in thin, unmineable coal seams and other deep formations.

In the early 1990s MM&A added environmental services to diversify and to insulate the company from the cyclic nature of the energy business. Professional services include environmental risk assessment, remediation, environmental site assessments and impact studies, hazardous waste evaluation, compliance monitoring and reporting, permitting and emergency response. MM&A offers these services to the mining 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. MM&A has actively participated in multiple scenarios, including the injection of 1,000 tons of CO_2 into a coalbed methane reservoir and various carbon footprint evaluations. Our staff is currently involved with helping clients with their the mandatory reporting rules (MRR) related to greenhouse gases (GHG) as proposed by the US Environmental Protection Agency. MM&A engineering, geological, and environmental professionals are leaders in this newly developing field. This is a natural extension of MM&A services to business sectors where we have an excellent reputation and strong client contacts.

MM&A is well positioned to continue our growth in the challenging economic climate of 2012 and beyond. The strength and diversification of the 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.

Marshall S. Miller
Founder & Chairman Emeritus

K. Scott Keim
President

SUMMARY OF SERVICES

GEOLOGICAL SERVICES

- Reserve Evaluation
- Geotechnical Evaluation of Roof & Floor Conditions
- Evaluation & Prediction of Underground Mining Hazards
- Coalbed Methane Evaluation
- Coalbed Methane Resource Evaluation
- Field Exploration/Core Description

MINING ENGINEERING

- Mine Operations Evaluation
- Valuations of Reserves, Property, Plant & Equipment
- Mine Cost/Cash Flow Analysis
- Mine Planning/Feasibility Studies
- Geotechnical Engineering (Subsidence Prediction, Pillar Design, and Roof Support Design)
- Impoundment and Embankment Design, Permitting, Inspection, Operations & Monitoring Capabilities

OIL & GAS SERVICES

- Geologic Assessment
- Development Planning
- Economics & Reserves
- Recent Projects

HYDROGEOLOGY

- Monitoring
- Water Supply Development
- Mine Inflow and Control
- Monitoring of Mine, Quarry or Construction Impact
- Mitigation of Hydrogeologic Impact
- Acid or Metal-Rich Drainage Prevention
- Mine Stream and Wetland Mitigation/Restoration

ENVIRONMENTAL

- Site Investigation and Remediation
- Environmental Compliance
- Voluntary Remediation/Brownfield Redevelopment
- Real Estate Services
- Emergency Response
- Asbestos, Lead, Radon & Mold
- Mining Property Acquisitions - Phase I ESA
- Reclamation Liability Determination
- Mining & Reclamation Permitting
- Management of Idle Mine Sites

CARBON MANAGEMENT

- Carbon Credit Verifier
- Greenhouse Gas Inventories and Reduction
- US EPA Methane-to-Markets Program
- Carbon Capture and Storage

EXPERT WITNESS

GEOLOGICAL LOGGING SYSTEMS

GEOLOGICAL SERVICES

RESERVE EVALUATION

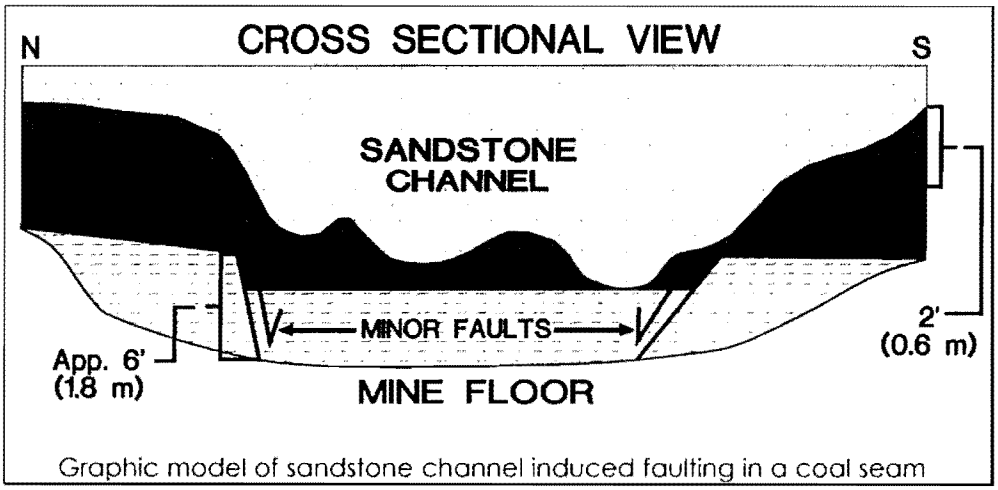
Marshall Miller & Associates (MM&A) performs reserve evaluations, geophysical logging, interpretation and engineering studies for land and mining companies and for insurance, banking, and investment firms. The reserve evaluations, prepared by professional geologists, are highly regarded in the industry for presenting complex geological data in a concise and understandable format. MM&A utilizes state-of-the-art computer software that is written solely for geologic applications and aids geologists in efficiently preparing coal, coalbed methane, mineral, ore, and oil and gas reserve evaluations.

Differential compaction induced faulting observed in a mine

Geological evaluations by MM&A go beyond determining basic volumes or tonnage assessments of mineral deposits. The evaluations address the geological factors that control seam quality and mining conditions. By establishing scientific cause-and-effect relationships, our geologists reliably predict the potential productivity of a mining venture and classify reserves based on their economic viability.

MM&A geologists are recognized leaders in fields such as traditional coal and mineral evaluation and exploration, assessment of geologically-controlled mine productivity factors, evaluation of coal quality characteristics, coalbed methane exploration, and reserve analysis. Their geological expertise is fully integrated into reserve and engineering services including operations analysis, economic modeling, and environmental assessments. The largest mining companies and financial institutions in the United States and abroad use these composite services.

Since 1975, MM&A has been involved with coal reserve evaluations throughout the United States. Although the company had its beginnings primarily in the eastern U.S., the quality of our services allowed rapid expansion into the Midwestern (Illinois and Indiana) and Western (Wyoming, Colorado, Utah, Arizona, and New Mexico) coalfields. Additionally, MM&A works on an international basis in South America, Asia, Africa, and Europe.



Graphic model of sandstone channel induced faulting in a coal seam

GEOTECHNICAL EVALUATION OF ROOF & FLOOR CONDITIONS

The delineation of geotechnical factors controlling mining conditions is an integral part of a comprehensive reserve evaluation. Geological and geotechnical complexities are analyzed and mapped to determine roof and floor strata impacts on mining conditions and to predict preferred areas for mine development. MM&A geologists assess the geotechnical properties of the critical roof and floor strata and then map the occurrence of these strata using their comprehensive knowledge of depositional environments and geological settings. This provides understanding and prediction of the geological impacts on mining.

Rock core is geotechnically logged and photographed by a certified professional geologist. Specific empirical analyses of each stratum are performed and include: Rock Mass Rating (RMR) based on uniaxial compressive strength and other critical rock mass properties; Rock Quality Designation (RQD); and fracture analyses (including average fracture spacing and fracture condition) calculated directly from the fracture log. The results of the empirical analyses are displayed on a computer-generated geotechnical log. These logs graphically represent the following data: strata lithology and thickness; visible strata defects; visual rock mass quality assessment; spacing of discontinuities; RQD percentage; weathering; and location of all strength test samples.

EVALUATION & PREDICTION OF UNDERGROUND MINING HAZARDS

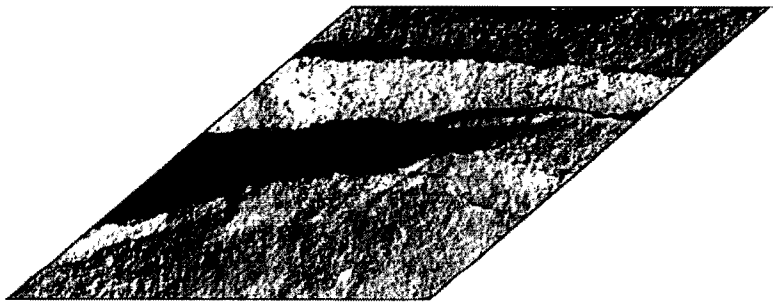
HAZARDS ENCOUNTERED

MM&A geologists are industry leaders in assisting mine operations impacted by unexpected geologic hazards. From the initial underground mapping of the impacted area by MSHA-certified mine geologists, through development of a predictive geologic model, MM&A provides rapid response to critical productivity interruptions.

Severe roof conditions

HAZARDS UNDERSTOOD, PREDICTED AND MAPPED

A wealth of experience, teamed with strong computer capabilities for evaluation of complex geologic data, allow MM&A geologists to reliably predict the cause and occurrence of hazardous geologic anomalies resulting in interruption of mineral deposits, unstable roof and floor strata, high stress areas, faulted or fractured areas, and excessive ground water inflow. Graphics and 3-D computer simulation modeling are used as a tool for defining and presenting these complexities.



Geologic factors that could create hazardous conditions are used to create predictive maps, identifying potential problems for the total reserve area. These maps are an essential tool for optimizing mine plans and developing reliable mine cost forecasting.

COALBED METHANE EVALUATION

MM&A geologists have extensive experience in the determination of coalbed methane quantity, quality, reservoir characteristics, and recovery technology. Services provided include drill hole site selection and supervision, on-site sampling, laboratory analysis of coal seam samples for desorption characteristics, residual gas determinations, coal seam mapping, and reserve evaluation. Because these reserves are often found in areas of concentrated stratigraphic fracturing, the ability to locate and analyze these features is important not only in delineating reserves, but also in coal mine roof control and support. Professional petroleum mining and civil engineering personnel are available to assist with mine planning and production design and all phases of coalbed methane work, including commercial production of coalbed

methane and degasification of coal seams in advance of mining. All processing and procedures are fully computerized. MM&A has been active in both domestic and international coalbed methane projects.

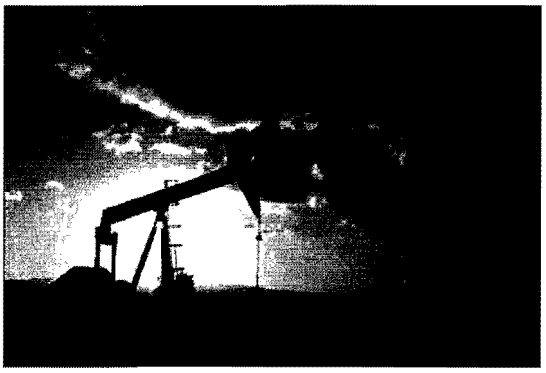
COALBED METHANE DESORPTION LABORATORY

Located in our Bluefield, Virginia office, MM&A maintains a coalbed gas desorption laboratory that employs U.S. Bureau of Mines methodology for determining the gas content of coal samples. Field geologists are available to collect core or cutting samples at the drill site to be transported in a temperature-controlled environment during the entire desorption phase, which lasts from a few weeks to several months, as dictated by project requirements.

The gas content of coal samples from the eastern United States have been analyzed by our laboratory for more than two decades.

COALBED METHANE RESOURCE EVALUATION

In addition to facilities for analyzing gas content, MM&A has conducted extensive coalbed methane (CBM) resource evaluations for hundreds of thousands of acres in the United States and abroad.



Areas of expertise within the United States include:

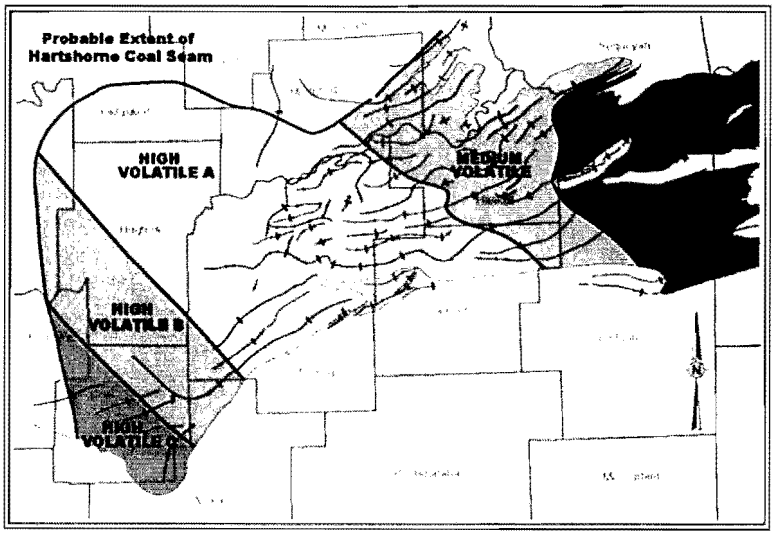
- Black Warrior Basin (Alabama)
- Central and Northern Appalachian Basins (Tennessee, Virginia, Kentucky, West Virginia, Ohio, and Pennsylvania)
- Illinois Basin (Indiana, Western Kentucky, and Illinois)
- Forest City and Arkoma Basins (Oklahoma, Kansas, and Arkansas)
- San Juan Basin (New Mexico and Colorado)
- Greater Green River Basin (Colorado and Wyoming)
- Powder River Basin (Wyoming and Montana)

MM&A has been involved in an assessment of CBM potential in specific basins located within mainland China and has participated as a minority partner in CBM development projects there.

Experience in the development of geologic models for coal-bearing regions across the United States in conjunction with geophysical logging capabilities and laboratory facilities provides MM&A staff with a strong basis for identifying and quantifying CBM resource potential. Coal mining and CBM production companies have relied upon our high-resolution geophysical logs for over 20 years to precisely measure coal thickness for purposes of identifying the size and distribution of CBM reservoirs.

MM&A personnel have worked directly with companies in the development of both stand-alone "conventional" CBM wells and "degasification" wells which produce pipeline-quality coal mine methane (CMM) from either active or abandoned mining operations.

The staff has provided in-depth geologic assessments of mature, emerging, and frontier CBM regions to the energy industry for more than a decade. As interest in CBM production has accelerated in recent years, MM&A has been at the forefront of resource assessment from small-scale to regionally extensive properties.



FIELD EXPLORATION/CORE DESCRIPTION

MM&A geologists are experts in planning, permitting, and managing field exploration projects. The exploration phase of a reserve evaluation can be one of the most important factors in determining the areal extent of a potential reserve and in defining its quality and mining characteristics. The data generated by field exploration generally serve as the basis for subsequent reserve evaluations and mining assessments. Field exploration can provide additional information, supplementing existing data in order to predict mining trends, define roof and floor problem areas, and provide samples for mining permits.

MINING ENGINEERING

INTRODUCTION

A majority of MM&A mining engineers are seasoned professionals with broad-based experience in mine management, operations and in meeting client needs. A majority of our senior mining engineers have the following qualifications: master's degrees from major universities, technical proficiency, and years of experience in coal and associated industries. In addition, all are registered professionals in major coal-producing states. They specialize in the following areas:

- Mining Engineering
- Rock Mechanics
- Mineral Economics
- Environmental Reclamation

MM&A ENGINEERS HAVE EXPERIENCE IN THE FOLLOWING:

- Mine Operations Evaluations
- Valuation of Reserves, Property, Plant, and Equipment
- Mine Cost and Cash Flow Analysis
- Mine Planning, Construction Studies and Related Services
- Geotechnical Engineering (Subsidence, Slope Stability, Pillar Design, and Roof Support Design)
- Expert Witness

MINE OPERATIONS EVALUATION

The recent economic climate in the coal industry has been one of merger, acquisition, consolidation, and re-engineering. It is within this environment that banks, financial institutions, capital management groups, insurance companies, financial brokers, and mining companies seek assistance in evaluating the probable success of active mining operations and proposed mining ventures. In meeting this need, MM&A engineers and geologists evaluate those parameters critical to the success of a mining venture. Analysis of this information provides an overall audit of the operation, allowing any existing strengths and weaknesses to be identified.

Multiple factors and contingencies are considered when evaluating a mining operation, each of which can be examined singularly or collectively as needed. Areas of concern include reserves, quality parameters, mining methods, management and manpower, mine plan assessment, operating costs, and supply contracts.

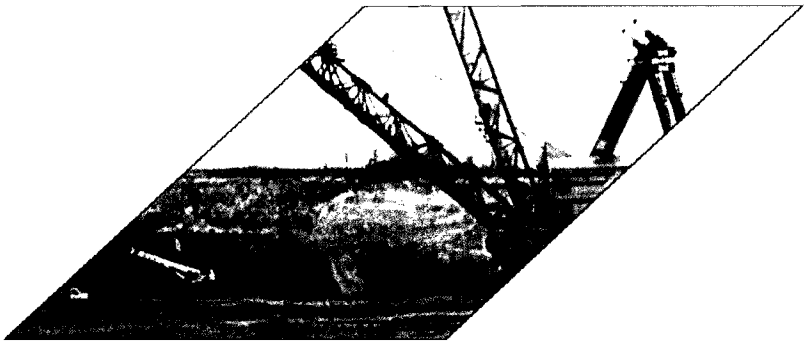
VALUATIONS OF RESERVES, PROPERTY, PLANT, & EQUIPMENT

Valuations are performed in accordance with the Uniform Standards of Professional Appraisal Practice and the Uniform Appraisal Standards for Federal Land Acquisition, where applicable. Valuations are prepared for banks, financial groups, mining companies, and insurance companies, and conform to the standards and requirements of the Financial Accounting Standards Board, where required.

Mineral reserve and resource valuations are prepared for coal and other minerals recoverable by different mining methods. The objective of the valuation is to estimate the fair value of the mineral ownership, with consideration given to the type of mineral control. Mineral valuations are based upon classifications consistent with the U.S. Geological Survey, U.S. Securities and Exchange Commission, Canada's National Instrument 43-101, Australasia's JORC, and other accepted industry practices as performed during reserve evaluations.

Property valuations determine the value of a mineral property through the appropriate geological and financial investigations. Comparable sales, royalty, and operational income (discounted cash flow) methods are considered to determine the value of mineral holdings, infrastructure, coal supply contracts, and other tangible and intangible assets. Valuation studies of active and proposed operations are prepared in support of acquisitions and for financing.

Plant valuations determine the value of coal preparation and mineral processing plants and other material-handling facilities and related infrastructure. Through on-site investigation, the fair value is presented for the plant facility as a whole, on individual circuits, and on specific individual pieces of equipment as required by the appraisal. Parameters considered include the plant's capacity, replacement cost, age, amount of usage, type of material handled, proximity to markets, and other operating factors.



Equipment appraisals are prepared for all types of mining equipment at both surface and underground mines. When possible, comparable sales values are used. During on-site investigations, the equipment is inspected for its general condition, age, the amount of usage, maintenance history, and mechanical availability. MM&A maintains an extensive database of new and used equipment values for both surface and underground equipment to support the valuation process.

MINE COST/CASH FLOW ANALYSIS

In addition to providing mine operations evaluation services, MM&A prepares economic analysis of coal, aggregates, industrial minerals, and other types of minerals to determine the net present value of projected after-tax cash flows and the rate of return on the invested capital. Based upon the physical parameters of the mineral reserve, estimates are prepared of the productivity, production, manpower, capital requirements, and operating cost for the proposed mining venture or the ongoing mining operations. Included in the economic analysis are the evaluation of manpower costs, royalty, depreciation, depletion, and interest charges (cash flows are calculated on a pre- or post-tax basis). These evaluations are prepared in accordance with the criteria for scoping-level, preliminary feasibility and bankable feasibility studies.

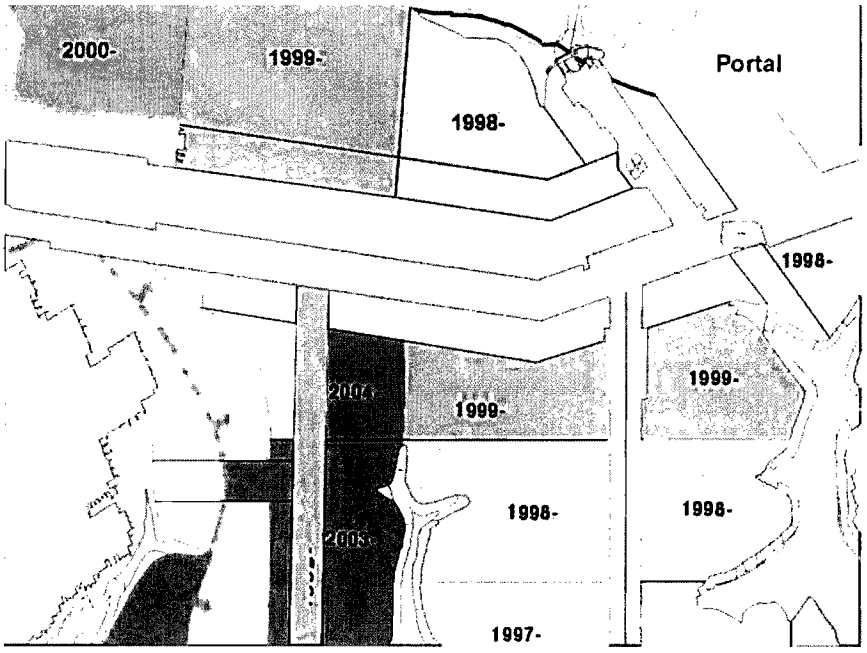
A proprietary financial model incorporates productivity parameters with manpower, equipment, and supply costs to generate a comprehensive cost analysis. Analyses routinely include forecasts of revenue, direct cash mining cost, total mining cost, EBITDA, depreciation, depletion and amortization, and projections of corporate income tax.

MINE PLANNING/FEASIBILITY STUDIES

Consistent mine productivity depends on how thoroughly a mine plan adapts to the variations in geologic conditions and mineral deposition. MM&A engineers and geologists combine skills and experience to develop a mine plan that considers all relevant geologic and mining factors. Using the physical factors identified during geologic and geotechnical evaluations, MM&A engineers design a mine plan to take advantage of favorable mining conditions, and to minimize the impact of any adverse mining conditions.

MINE PLANNING CRITERIA ESSENTIAL FOR DETERMINING THE PRODUCTIVITY AND PRODUCTION OF A MINE INCLUDE:

- Geologic Factors
- Consistent Approach
- Productivity
- Access
- Manpower
- Equipment Selection
- Operating Constraints
- Material Handling
- Electrical Power Distribution
- Ventilation
- Drainage Control
- Market Forecasting



Underground mine plan detail

GEOTECHNICAL ENGINEERING

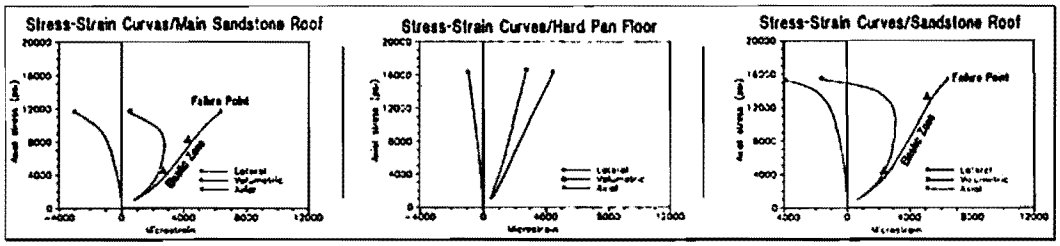
(SUBSIDENCE PREDICTION, PILLAR DESIGN, AND ROOF SUPPORT DESIGN)

LONGWALL MINE AND SUBSIDENCE PLANNING

Longwall and mine subsidence evaluations are specialized services analyzing the impacts of mining operations on surface lands and on man-made structures, perennial streams, aquifers, large impoundments, and public facilities. With the increasing use of longwall mining in the United States, mine subsidence prediction, planning, and investigation have become important aspects of MM&A's consultancy. Development of mitigation measures to reduce the effects of subsidence initially relies on subsidence prediction. MM&A provides support to mining companies, landowners, pipeline companies, and many others. These services include:

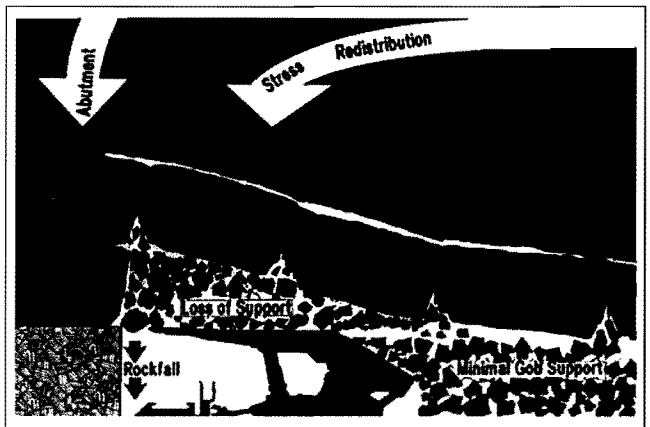
LONGWALL MINE AND SUBSIDENCE PLANNING

- Design of subsidence remediation includes backfilling of surface depressions and underground voids, surface drainage diversion and de-watering, and stream channel restoration.
- Reclamation of the subsidence site includes, but is not limited to, drainage restoration, topsoil placement, revegetation, wetland construction, and erosion control.



GROUND CONTROL AND ROCK MECHANICS

- MM&A has considerable experience in advising the mining and construction industries in ground control issues, particularly on the location of geologic hazard zones, feasibility studies, and field monitoring. Mining design capabilities include: slope stability; mine portal slope and shaft construction; mine roof support; pillar stability; mine planning and layout; multi-seam mining interaction; and bearing capacity of floor plans. The interaction and consequence of these aspects can be monitored by sophisticated instrumentation packages installed and operated by qualified engineers.
- Stability issues addressed by our professional staff include roof, rib, pillar, and highwall. Stability techniques are developed to maximize personal safety and recovery of mineral reserves. Professional engineers and geologists evaluate strata control relative to subsidence potential, roof stability, support design, floor heave, longwall panel design, conventional and continuous mining, room and pillar design, and surface mining.
- Roof support requirements are analytically evaluated for the range of strata types, overburden depths, and horizontal stress fields prevalent at the mine site. This information can then be used by MM&A mining engineers to optimize the design of pillars and entries, roof support systems, and the overall mine plan.



Cross-section of roof collapse behind a longwall face

IMPOUNDMENT AND EMBANKMENT DESIGN, PERMITTING, INSPECTION, OPERATIONS & MONITORING CAPABILITIES

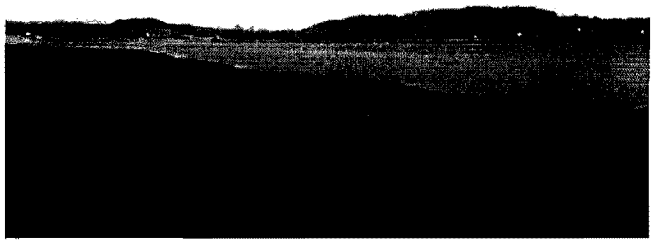
MM&A's senior staff of qualified professionals has more than 34 years of experience with the design, permitting, inspection, operations, testing and monitoring of coal fly ash and bottom ash disposal facilities located in the Appalachian coalfields and the eastern United States. At some sites, we have designed impoundments for containment of the coal ash slurry behind soil and rock fill dams, while others have involved dewatering of the coal ash for combined disposal with the bottom ash and/or co-mingled with fine and coarse coal refuse from mine-mouth coal operations.

The basic engineering principals and practices associated with the design and operation of coal refuse impoundments, embankments and earthen dams are nearly identical to fly ash and bottom ash disposal facilities. The primary exception is

an understanding of the unique physical and chemical characteristics of the waste materials. Because of our extensive experience with the testing, materials placement, and construction monitoring of these waste operations, we are in a unique position to assist Owners and Operators in evaluating the suitability of their disposal operations to ensure adherence to sound engineering practices consistent with appropriate local, state, and federal regulations.

Clearly, as a result of the recent failure of the coal ash dredge cell at the TVA Kinston Fossil Plant located near Harriman, Tennessee, there is increased concern for the integrity of similar structures located at many other power stations throughout the U.S. MM&A is in a unique position to evaluate such facilities because of our extensive experience and hands-on knowledge of the design and construction procedures required to ensure long-term stability while satisfying the disposal requirements for the plant facilities.

We have developed detailed checklists for site inspection of disposal operations to identify potential stability problems related to excessive slope movements, large or changed seepage flows, possible uncontrolled contamination of surface and ground water, changes to the flood routing structures, improper placement practices of the waste materials, and more. These checklists provide the responsible operations and engineering personnel with a tool for identifying impending problems that must be addressed to minimize risk of future releases of waste materials into downstream watercourses.



The following key service areas summarize our capabilities and expertise in design, operational support and construction monitoring. These are specifically related to fly ash and bottom ash disposal:

- Geotechnical evaluations including slope stability analyses under both static and earthquake loading conditions; the potential of mine subsidence; breaching of mine seals related to abandoned or active mines in proximity to the disposal facility; excessive settlement of the waste materials; and the impact on surface structures, pipelines, decant systems and internal drain systems.
- Hydrologic and hydraulic analyses pertaining to storm water diversion and flood routing and the discharge of slurried waste, and the return of clarified water to the plant facilities.
- Erosion and sedimentation control systems to prevent or minimize uncontrolled discharges from the disturbed areas associated with the disposal facility.
- Reclamation and abandonment considerations throughout the life of the facility and after closure.
- Installation of instrumentation systems for monitoring slope movements, groundwater pressures, seepage flow quality and quantity, and settlement (i.e., slope inclinometers, piezometers, settlement plates, etc.).
- Laboratory testing of the waste materials to determine its physical and chemical characteristics and sensitivity to water content, varying compaction procedures, or use of additives or amendments to mitigate problems with placement and compaction of the waste materials.
- Evaluation of the optimal materials handling and placement procedures of the waste materials.

OIL & GAS

It is noteworthy that our senior staff has been intimately involved with the development of the two engineering design manuals prepared by the Mine Safety and Health Administration (MSHA) which specifically address procedures to be followed in designing and operating coal refuse impoundments and embankments. The first manual was published in 1975 and an updated version was released in 2009. These documents are extremely useful to designers and operators responsible for siting, design, permitting, and operation of coal ash disposal facilities.

Our staff has also been involved with forensic studies of major waste impoundments that have experienced uncontrolled releases of fine slurry and slope instability within the embankment portions of both fly ash embankments and impoundments and coarse coal refuse dams.

The Oil & Gas Division provides an array of services to related industries. Our staff has years of experience with both large multi-national and independent petroleum companies in geologic basins worldwide. They have served in key technical and operations positions with E&P companies, and have been instrumental in exploring for and developing both conventional and unconventional oil and gas resources. Few consulting firms can match our expertise regarding coalbed methane (CBM), coal mine methane (CMM), and organic shales. Additionally, we provide comprehensive technical support on many other types of projects. A summary of our services is presented below:

GEOLOGIC EVALUATIONS

- Regional Prospect Generation
- Detailed Property Assessment
- Structural and Stratigraphic Analysis
- Depositional Models
- Cross Section Analysis
- Geologic Mapping

CONVENTIONAL OIL & GAS

- Basin Analysis
- Clastic & Carbonate Sedimentology
- Structural Interpretation
- Log Analysis
- Porosity and Isopach Mapping
- Production Forecasts
- Economic Analysis

COALBED METHANE

- Detailed Coal Correlations
- Coal Isopach Mapping
- Gas Content Determination
- Permeability Determination
- Gas-In-Place Calculation
- Horizontal vs. Vertical Drilling
- Reserve Estimation
- Economic Analysis

COAL MINE METHANE

- Coal Isopach Maps
- Mine Development Review
- Mine Emissions Review
- Production Models
- Economic Analysis
- Carbon Offset Verification

ORGANIC SHALES

- Isopach Maps
- Gas Content Determination
- Fracture Trend Analysis
- Gas-In-Place Determination
- Horizontal vs. Vertical Development
- Well Spacing
- Production Forecasts
- Economic Analysis

DUE DILIGENCE REVIEWS

- Geologic Assessment
- Development Model
- Production Forecast
- Reserve Analysis
- Project Economics
- Sensitivity Analysis

RESERVOIR ENGINEERING

- Gas Storage Studies
- Unitization Studies
- Development Well Spacing
- Well Test Design
- Volumetric Assessment
- Production Type Curves
- Decline Curve Analysis

PRODUCTION ENGINEERING

- Well Scheduling
- Capital Cost Estimation
- Operating Expense Estimation
- Well and Completion Design
- Gathering System Design
- Produced Water Systems

TECHNICAL SUPPORT

- Project Optimization
- Gathering System Review
- Expert Witness
- Production Well Permitting
- SWD Well Permitting
- Spill Plan & Certification

ECONOMICS AND RESERVES

- Property Valuations
- Production Forecasts
- Discounted Present Value
- Internal Rate of Return
- Risk Assessment
- Reserve Reports

FIELD SERVICES

- Drilling & Operations Supervision
- Well-Site Geology
- Desorption Testing
- Geophysical Logging
- Downhole Camera

GEOLOGIC ASSESSMENT

Drawing on the combined experience of our geologists and engineers, many clients seek our assistance in evaluating potential oil and gas investments. We provide comprehensive due diligence assessments that include geologic evaluation, reserve analysis, production forecasting and net present value determination. As required, we also provide on-site reviews of facilities, surface development considerations, and potential environmental issues.

We frequently perform regional geologic studies to identify high-potential prospect areas or trends. With our detailed geologic mapping, we can refine and expand upon the regional interpretation to identify the most prospective exploitation targets. In addition, we can assist in locating and evaluating specific properties.

Our geologists are able to unravel complex geology with detailed structural and stratigraphic analysis, combined with integrated core, drilling and petrophysical datasets. Standard mapping suites include formation isopachs, cross-section analyses and facies maps that define depositional environments, structural interpretations and production trends. MM&A geologists utilize a network-based computer system throughout the investigative process to assist with database management, reserve mapping and tabulations, graphic displays and computer-aided drafting/design.

DEVELOPMENT PLANNING

Our technical staff routinely assists oil and gas operators with initial field development planning and implementation. We also become involved during later developmental phases when operators need to optimize project performance. When developing unconventional resources such as CBM, tight sands and organic shales, our professionals can efficiently determine optimum well spacing, preparing wellbore, completion and gathering system designs, and developing produced-water systems. By conducting field inspections, including discussions with operations personnel and service providers, recommendations can often lead to improved production, reduced costs, or both.

ECONOMICS AND RESERVES

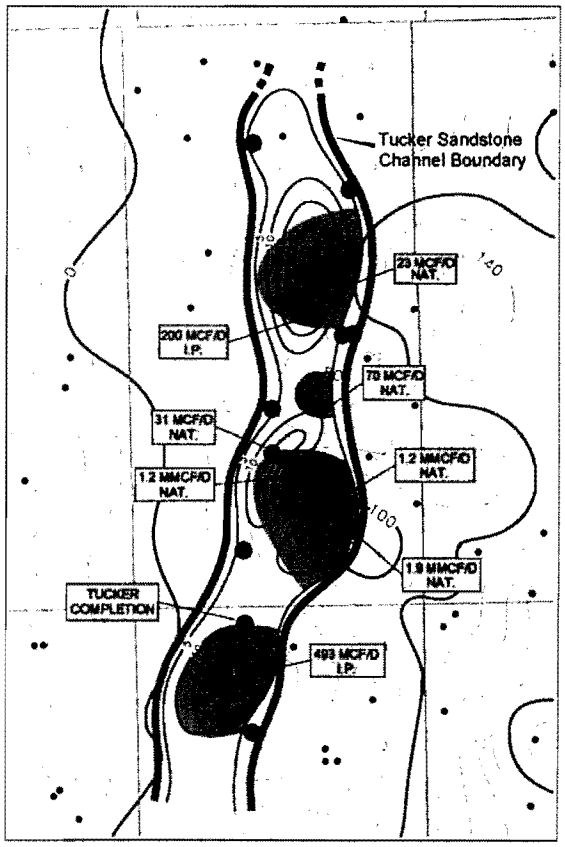
For due diligence reviews and other property assessments, our petroleum engineers are able to project future production levels. By incorporating all available geologic, reservoir and production data, we can develop production-decline type curves based on actual production data or from analogous development projects.

MM&A works closely with the operator to assess development scheduling and capital and operating costs. Cash flow forecasts and internal rate-of-return and net present value determinations can then be generated. Clients often request sensitivity analyses, allowing assessment of the economic impact of alternate development schedules, varied production rates, and changes in oil and gas prices. Risk-adjusted economic presentations can be prepared that allow a composite view of various scenarios. Reserve reports can be prepared per SEC guidelines and company financial reporting requirements.

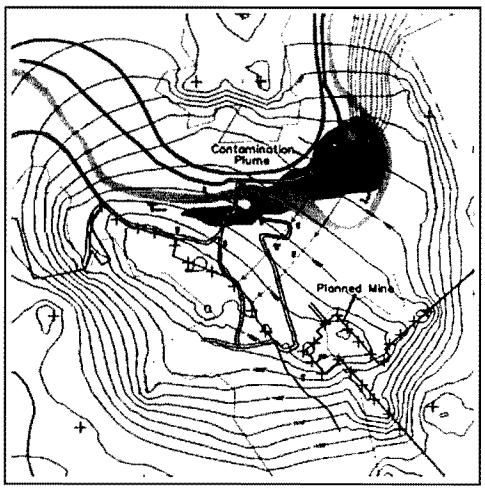
RECENT PROJECTS

Some of the recent projects undertaken by MM&A demonstrate the diversity of the evaluations we perform. These include regional geologic studies, due diligence assessments, CBM and CMM evaluations, reserve reports, gas storage projects and conventional oil and gas appraisals. A sampling of our recent projects is provided below.

- Oil and Gas Property Due Diligence
- Horizontal CBM Reserve Study, China
- Tight Sand and Shale Gas Evaluations
- Marcellus Shale Geologic Studies
- Gas Storage Field Review
- CBM and CMM Property Assessment
- Carbon Offset Verification - CMM Projects
- Expert Witness Reports and Testimony
- Carbon Sequestration Studies and Testing
- Oil & Gas Reserve Studies
- CBM Studies - U.S., Canada, China
- Production Optimization
- Geophysical Logging Services
- Coal Core Desorption Testing



HYDROGEOLOGY



INTRODUCTION

MM&A has a wealth of experience in evaluating the interactions between both underground and surface mining and the hydrogeologic regime. Understanding the hydrogeologic framework not only provides the basis for assessment of probable hydrogeologic consequences of mining, but also allows anticipation of mining conditions. MM&A hydrogeologists investigate the stratigraphic, structural, and geotechnical controls influencing the subsurface hydrogeologic system to determine the nature and degree of interaction between that system and mining. Applications of these investigations have included: pre-mining assessment of hydrogeologic impact for permitting and hydrogeologic reclamation planning purposes; assessment of probable mining conditions beneath stream valleys, and impact of mining upon the stream; post-mining evaluation of stream-crossing impacts; assessment of impact to domestic water supplies; evaluation of conditions to be encountered in shaft and slope construction; and remediation of drainage impacts from flooded underground workings and/or surface disturbed areas.

Hydrogeologic evaluation begins with detailed geologic evaluation of the subsurface from cores and geophysical logs to identify fractures, evidence of weathering, and aquifer or aquitard potential of the various strata. MM&A maintains comprehensive geophysical logging capabilities, including acoustic televiewer, borehole video camera, and fluid conductivity/temperature probes to assist in hydrogeologic investigations. Hydrogeologically important strata are delineated in maps and cross-sections, and structural influences are identified. Photolineament analysis is employed to identify potential fracture traces that may enhance hydrogeologic interactions with the mine.

Subsurface hydrogeologic conditions are assessed using monitoring wells and piezometers to confirm ground water flow paths, horizontal and vertical gradients, and degree of intercommunication between horizons. Aquifer conductivity is evaluated by means of in-situ pressure tests ("packer tests"), aquifer pumping tests, and slug tests. From these data, flow nets and hydrogeologic models are constructed to define the hydrogeologic regime, and the effects of mining upon the regime are evaluated. MM&A maintains in-house aquifer testing and well installation capabilities.

MONITORING

Monitoring provides early detection of impacts resulting from mining and quarrying so that corrective action can be taken if needed. Monitoring also provides evidence of whether impact has occurred. A prerequisite for a meaningful, defendable monitoring program is an understanding and delineation of hydrogeologic controls, flow paths, and flow rates, and interactions between the subsurface and surface components of the hydrogeologic regime. MM&A hydrogeologists are experts in monitoring system design and installation, employing scientific understanding and modeling of the hydrogeologic system as the basis for monitoring system development.

WATER SUPPLY DEVELOPMENT

MM&A assists industry in the selection and development of ground water supplies for industrial and domestic use. Evaluation of potential ground water sources involves understanding of ground water movement and flow paths, and the controls on both quantity and quality imposed by geologic factors such as rock type, structural attitude, occurrence of fractures, and recharge/discharge relationships within the hydrogeologic system. MM&A employs sound geological, geophysical, and hydrogeological techniques to develop such understanding.

MINE INFLOW AND CONTROL

Our hydrogeology staff is proficient in predicting, identifying causative factors, and developing mitigation, control, or handling means for waters encountered in surface mining and quarrying operations, underground mines, and slope and shaft facilities for mine access. We have developed many pregrouting and grouting plans that have proven effective in preventing unmanageable water inflow to mines in shallow overburden settings beneath streams, while affording continuing function of aquifers and stream underflow zones. We have assisted numerous clients in the application of water control measures in slopes and shafts, and in predicting where such measures will be needed prior to construction.

MONITORING OF MINE, QUARRY OR CONSTRUCTION IMPACT

MM&A hydrogeologists are industry leaders in monitoring applications, from initial conceptual modeling to system design to statistical and other analysis of monitoring results. Our monitoring designs are based on understanding water movement controls at each site, and typically meet with ready approval of regulatory reviewers. Evaluations of results consider not only the hydrogeologic and operational factors, but also entail sound statistical and/or trend analysis approaches.

MITIGATION OF HYDROGEOLOGIC IMPACT

Any significant ground disturbance could exert some influence on hydrologic conditions at or near the point of disturbance. MM&A can evaluate which influences may occur from a proposed operation, and which impacts have or have not resulted from previous or existing operations, through sound application of scientific principles.

ACID MINE OR METAL-RICH DRAINAGE PREVENTION

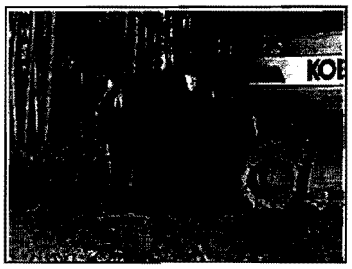
MM&A assists clients in delineating acid-producing materials that may be encountered in mining, and in designing handling and disposal approaches to prevent acid drainage. We also assist clients in determining appropriate treatment techniques to mitigate poor-quality drainage. Our understanding of hydrogeologic controls on drainage degradation and migration has led to effective alternative mitigations, preventing water quality impacts and removing the need for ongoing treatment.

STREAM AND WETLAND MITIGATION/RESTORATION

MM&A's hydrogeologists, hydrologists, civil engineers, and biologists work as a team to determine stream mitigation requirements and design restoration programs.

ENVIRONMENTAL

SITE INVESTIGATION AND REMEDIATION



MM&A's scientists and engineers use cost-effective, focused investigations to design remedial programs that consistently meet our clients' needs. These projects often involve regulatory compliance, site closure, redevelopment and litigation support. We offer the following services:

- Negotiating Site Enrollment in Applicable Local, State or Federal Regulatory Programs
- Environmental Site Assessments and Environmental Impact Assessments
- Remedial Investigations and Feasibility Studies
- Multimedia Sampling, Analysis and Monitoring
- Light Non-Aqueous Phase Liquid (LNAPL - Fuels and Fuel Mixtures) Mobility Studies
- LNAPL Recoverability Modeling and Assessments
- Contaminant Fate and Transport Modeling
- Ecological and Human Health Risk Assessments
- Development of Risk-Based Cleanup Goals
- Geographic Information Systems (GIS)
- Litigation Support and Expert Witness

MM&A routinely employs innovative investigative technologies and successfully navigates local, state and federal regulatory frameworks to bring sites into compliance. In many cases, we have obtained site closures. Specific investigative technologies include:

- Light-induced Fluorescence (LIF) Spectroscopy
- Membrane Interface Probe (MIP) Investigations
- Soil Conductivity and Hydraulic Profiling Studies
- Non-Aqueous Phase Liquids (NAPL) Fluid Mobility Investigations
- Portable X-Ray Fluorescence (XRF) Spectroscopy
- Immunoassay Analyses
- Surface and Downhole Geophysical Investigations

In the last decade, a systematic shift towards risk-based cleanup standards has altered the regulatory framework at the local, state and federal levels. The ability to develop site-specific remedial goals provides standards protective of human health and the environment while greatly diminishing the burden on business and industry. Using the latest toxicological data, MM&A's scientists have prepared site-specific risk assessments and have developed site-specific remedial goals using Risk Assessment Guidance for Superfund (RAGS) as well as state-mandated risk assessment protocols, thereby matching the intended property use with future exposure scenarios.

Because site closure is not always attainable through human health and ecological risk analysis, MM&A engineers can design the appropriate cost-effective remedy to address virtually any contaminant in a variety of environmental media. Our geologists and hydrogeologists provide crucial information to the engineering team regarding free-phase and dissolved-phase contaminant mobility to affect an appropriate design, facilitating closure within a reasonable time frame. Our expertise in remediation design includes the following technologies:

- Practicable LNAPL and DNAPL Recovery
- Excavation and Off-site Disposal
- In-situ and Ex-situ Bioremediation and Phytoremediation
- Chemical Destruction (in-situ chemical oxidation/reduction)
- On-Site Thermal Treatment
- Capping in Place
- Pump and Treat
- Vapor and Fluid Extraction
- Encapsulation
- On-Site Landfilling/Management
- Monitoring of Natural Attenuation (MNA)
- Use of Institution Controls

ENVIRONMENTAL COMPLIANCE

MM&A's strength in environmental compliance lies in helping our clients foresee regulatory requirements before they become management issues.

Our success in serving energy, transportation, and government sector clients gives MM&A the ability to assist in managing environmental requirements for any large corporation with numerous facilities throughout a broad geographic area. MM&A's staff researches and anticipates the regulatory requirements that arise from facility operation, property acquisition or transfer, building, repair and renovation of structures. If an emergency arises, we quickly respond to our clients with the appropriate support.

Each action our clients take potentially triggers another environmental challenge. Accordingly, we deliver comprehensive solutions. Our track record proves it. Since 1998, MM&A has prepared and updated over 5,000 plans and permits for our clients. Our extensive history of handling compliance-related issues includes:

- Storm Water Pollution Prevention Planning and Permitting
- Spill Prevention Control & Countermeasures (SPCC) Assessments and Plans
- Oil Discharge and Contingency Assessments and Plans
- Facility Response Planning
- Waste Management and Reduction
- Sediment & Erosion Control Planning & Permitting
- National Environmental Policy Act Compliance
- National Pollution Discharge Elimination System
- Environmental Compliance Audits
- Reclamation Liability
- Environmental Site Assessments
- Wetland Delineation
- Noise Assessments

VOLUNTARY REMEDIATION/BROWNFIELD REDEVELOPMENT

Over the last decade and a half, state Voluntary Remediation Programs (VRP) have directed industry toward site closures with minimal regulatory oversight. MM&A has hands-on experience guiding companies through VRP programs in numerous states and acquiring certificates of completion. MM&A maintains the necessary licenses and credentials to perform work under a variety of state programs. VRP services routinely offered include:

- Negotiation of Consent Agreements
- Selection or Creation of Remediation Goals Based on Intended Property Use
- Preparation of Program-Specific Plans and Documents
- Preparing Public Notices and Conducting Public Meetings
- Obtaining Covenants or Certificates of Completion

REAL ESTATE SERVICES

MM&A has a proven track record working directly with real estate interests and real estate transactions. Whether a client is acquiring or selling property, or simply managing real estate assets already in possession, we can provide support. Our experience ranges from environmental due diligence for properties the size of one acre or less to those upwards of 100,000 acres (timber and mining properties). Over the last decade, MM&A has assisted clients with real estate management at hundreds of facilities. These services have included:

- Performing Due Diligence Assessments in Accordance with ASTM Standards
- Performing Environmental Audits of Leased Property
- Assisting Lessees in Becoming Compliant with Environmental Regulations
- Reviewing Due Diligence Audits and Investigations Performed by Other Consultants to Confirm or Refute Findings
- Performing Corrective Actions to Facilitate Property Transactions
- Supporting Redevelopment and Sale of Property under Brownfield and State Voluntary Remediation Programs
- Evaluating Potential Impact to Natural Resources

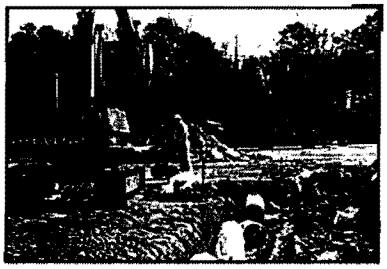
EMERGENCY RESPONSE

MM&A's Bluefield and Ashland, Virginia offices provide emergency response services for petroleum or hazardous materials releases. From these offices, we can respond to emergency calls anywhere in Virginia and much of Appalachia within one to three hours. MM&A's emergency response team not only performs first response and cleanup, but also provides incident managers who act as the clients' liaison with on-scene agencies. In many instances, aggressive short-term remedial actions guided by these environmental professionals can minimize long-term liability and eliminate the regulatory "red tape" commonly associated with environmental remediation. MM&A emergency responders have experience in the following service areas:

- HAZMAT Spill Response and Incident Management
- Emergency Response and Containment
- Site Cleanup and Restoration
- Hazardous Materials Testing, Management and Disposal
- Level A and B Personal Protective Equipment (PPE)
- Regulatory Negotiations and Site Closure
- Litigation Support for Insurance Claims
- Post ER Site Characterization and Restoration

MM&A's environmental professionals are HAZWOPER trained. Those involved in emergency response have received additional Haz-Mat response training.

ASBESTOS, LEAD, RADON & MOLD



ASBESTOS

MM&A maintains licensed asbestos inspectors, management planners, and project designers in Virginia, West Virginia, North Carolina, and South Carolina. MM&A performs all asbestos work in accordance with NESHAP and AHERA regulations. All asbestos personnel attend routine refresher courses and training seminars to stay current on new regulations and technologies. MM&A provides turnkey asbestos project management using our network of certified and licensed abatement contractors.

LEAD

MM&A provides lead-based paint (LBP) services for inspections, risk assessments, abatement and training. Our experience with LBP includes inspection of residential and commercial buildings, water tanks, bridges, and superstructures; we provide turnkey LBP work from inspection to abatement, including the repainting or demolition of a structure. We also offer lead ballistic material remediation from firing range media, including both indoor and outdoor ranges. MM&A provides cost-effective controls and environmentally sound practices to recycle and dispose of lead-impacted materials.

RADON

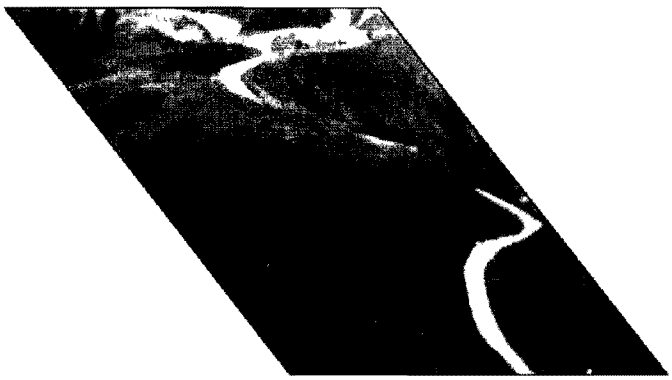
MM&A has on staff Radon Measurement Specialists and Radon Mitagators certified by the National Radon Safety Board (NRSB). Since the EPA stopped the Radon Management Proficiency (RMP) program, the accreditation process was transferred to two national trade organizations, NRSB and National Environmental Health Association (NEHA). NRSB certification is recognized by most State Radiological Health Boards. MM&A personnel attend 16 hours of

biannual recertification training for each discipline. MM&A mitigation personnel are adept at creating aesthetic solutions to any radon problem in a home or commercial structure.

MOLD INVESTIGATIONS

MM&A develops and implements successful strategies for evaluating residential and commercial structures to determine the origin, cause, effect, and extent of mold growth. Our success lies in relating mold conditions to specific water damage incidents. These investigations combine detailed data accumulation, sampling of indoor contaminant when necessary, and thorough analysis of all information obtained. Following the evaluation, recommendations for remediation can be provided. Regarding analytical services, MM&A contracts only with third party laboratories and works solely with those considered leaders in the microbiology field. Our staff includes members of the Indoor Air Quality Council who continuously review new developments in IAQ investigations. MM&A's goal is to provide our clients the technical support to assess and properly address environmentally sensitive issues, while minimizing the potential for costly exposures and/or litigation.

MINING PROPERTY ACQUISITIONS - PHASE I ESA



MM&A prepares Phase I Environmental Site Assessments (ESA) for mining properties and related facilities, modified specifically to address those unique mining-related issues of surface reclamation and surface and ground water. The purpose of a modified Phase I ESA is to review previous and current practices at the mining site, material handling facility, coal preparation or mineral processing plant. The Phase I ESA helps to determine if any operations or activities have created a recognized environmental concern on the property that would not meet federal, state, and local regulations, and/or be a potential threat to the environment or the surrounding population in years to come.

The assessment is one of several tasks MM&A addresses in its "due diligence" activities prior to an intended joint venture or acquisition. A reserve audit and an operations overview are usually but not always conducted concurrently with the ESA, and are reported under separate cover. MM&A is generally asked to complete the ESA in less than one month, except for very large properties involving multi-state activities.

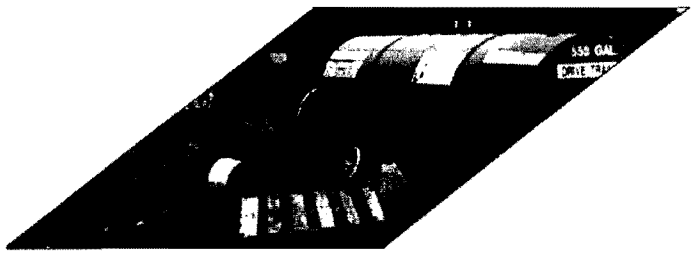
To meet the pressing schedule associated with the entire due diligence process, MM&A typically partitions its assignment into the following three areas for coal mining properties:

- Surface Coal Mining and Reclamation Act (SCMRA)-Related Issues
- Environmental Protection Agency (EPA)-Related Issues
- Water Treatment and NPDES Issues

The investigation typically addresses the results of an expedited field reconnaissance of operations, conducted to identify any readily discernible and reasonably ascertainable environmental conditions. The mining and reclamation area accommodates a review of regulatory compliance issues relating to state- or federal-sanctioned (via approved permits and licenses) activities conducted by the operating company, its agents, or its contractors. In the EPA arena, particular emphasis is directed to a preliminary assessment of the property, and to the identification of chemical usage, petroleum spills, contamination, and/or storage issues that may require cleanup under regulatory authority. The final area deals with ground and surface water treatment, and whether water treatment activities impact the cost and viability of future mining operations. The hydrology of the ground water and surface water regimes is evaluated during field reconnaissance.

The ESA report prepared by MM&A addresses SCMRA-related issues, EPA-related issues, water treatment, and NPDES issues. Potential environmental issues including hazardous chemicals such as perchlorethylene and waste oil (usually found at the laboratory and shop facilities, respectively) are identified. The status of any contractor's environmental practices is compared to industry practice.

RECLAMATION LIABILITY DETERMINATION



The Federal Surface Mining Control and Reclamation Act of 1977 (SMCRA) requires that land disturbed by surface mining or by the surface effects and facilities of underground mining be restored to its pre-mining condition or an "equal or better economic or public use." MM&A identifies outstanding reclamation liabilities for mining operations based upon site reconnaissance, permit evaluations, analysis of aerial photographs, and performance reviews. The reclamation liability determination is prepared in accordance with Federal Accounting Standards Board (FAS 143) and includes costs associated with restoration of the land to the approximate original contour, unless waived, and the successful establishment of the approved vegetative cover. Each reclamation assessment performed by MM&A is unique and site specific, taking into account structures, permit variances (where applicable), drainage, and sediment control systems. The site is evaluated with respect to the mine plan, the local geography and geology, and the approved post-mining land use. Financial considerations such as abatement of violations, water supply replacement, surface damage repair, and perpetual water treatment are identified. Issues specific to each state, permit, and operator are examined.

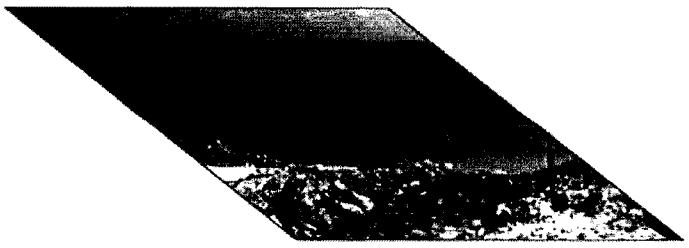
MM&A assembles a team of experienced engineers, geologists, and scientists to complete the reclamation liability determination. Representatives of regulatory agencies with knowledge of or authority over the subject site are routinely interviewed. Pending enforcement issues and appropriate corrective measures are identified.

The reclamation liability determination will provide an estimate of present and future financial responsibilities, which are suitable for the following:

- Determination of the Market Value of a Property
- Preparation of Mine Plans and Cash Flow Projections
- Inclusion on the Corporate Balance Sheet as an Asset Retirement Obligation

The reclamation liability determination may be performed as an independent analysis or may be included as part of a Mine Environmental Site Assessment.

MINING & RECLAMATION PERMITTING



Changing regulations and increasing environmental laws and constraints are challenging the mining industry. This is occurring even though the mining industry has an exceptional record of diligently protecting the environment while extracting the resources necessary to sustain the economy of our country.

MM&A's staff of geologists, hydrogeologists, mining and civil engineers, environmental scientists, biologists, chemists, and wetlands specialists possess the requisite skills and knowledge to assist the mining industry during this time of changing laws and increasingly complex environmental regulations. The collective expertise of these professional disciplines has been combined into a mine-permitting unit within MM&A.

MM&A offers complete surface and deep mine permitting services to the coal, aggregates, and mineral mining industries. Our qualified professionals have significant experience in the permitting of surface mines, refuse disposal facilities, deep mines, and associated mining-related facilities.

PERMITTING AND RELATED SERVICES

- Surface and Deep Mine Permitting
- NPDES Permitting
- U.S. Army Corps of Engineers Permitting
- Hydrologic Reclamation Plans (HRP)
- Slope Stability Analysis
- Blasting Designs and Surveys

- Coal Refuse Disposal Design and Permitting
- Mine Siting and Development Studies
- Mine Planning and Design
- Surface Water Runoff Analysis (SWROA)
- Stream Mitigation Restoration Design
- Geologic and Hydrogeologic Investigations
- Probable Hydrologic Consequences (PHC) Evaluations
- Mine Subsidence Evaluations and Control Plans
- Valley and Hollow Fill Design
- Erosion and Sediment Control Design
- Mine Drainage Control and Treatment Design
- Wetland Delineation and Stream Determination
- End-of-Mine Closing Cost Estimates
- Expert Witness/Litigation Support Services

MANAGEMENT OF IDLE MINE SITES

A trend in the industry indicates many mining interests are focused on both active operations and developing new projects, while facing the challenges associated with idle mine property management. MM&A is uniquely suited to offer environmental and engineering services to assist clients with these responsibilities in a cost-effective manner, optimizing the use of the mine operators' internal professional resources on higher priority objectives.

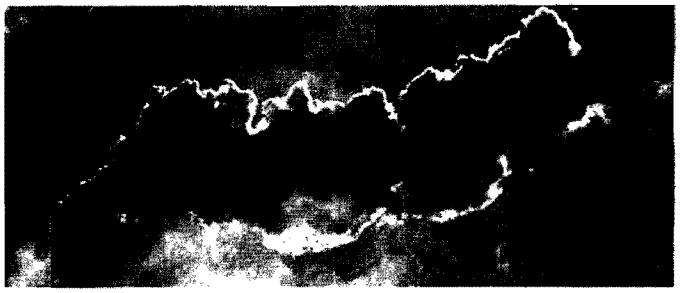
With a skilled staff of environmental scientists, biologists, hydrologists, wetlands specialists, foresters, engineers and geologists experienced from both regulatory and operational perspectives, MM&A has created a team that can handle post-mining management needs to efficiently expedite SMCRA bond release.

MM&A's staff is always available to assist coal operators with active mine design, permitting, and reclamation services. Our personnel can also assist clients with the identification and placement of spoil material, grading techniques, and approved ground cover applications necessary to achieve optimum site conditions. This includes the successful establishment of trees and shrubs required for final bond release in accordance with the approved post-mining land use.

ENVIRONMENTAL MANAGEMENT SERVICES OF BONDED MINE PROPERTIES SERVICES INCLUDE:

- Submitting Phase I, II, and III Bond Release Packages to state regulatory agencies
- Performing field inspections on a routine basis to monitor ground cover along with tree-shrub survival and development
- Providing supplemental seeding or planting as needed to comply with post-mine and use criteria of forest, land, or fish and wildlife habitat
- Evaluating and identifying any problems associated with a mine site
- Maintaining and repairing any sub-standard erosion control structures, and regrading slopes or roads during the bond maintenance period
- Meeting with inspectors and other regulatory personnel on behalf of the client regarding any post mining issues
- Managing post-mining water quality treatment facilities
- Compiling and submitting NPDES monitoring reports
- Providing sediment control structure and valley fill certifications, as required
- Seeking approval from state regulatory authorities for minor revisions to existing permits on behalf of the client

CARBON MANAGEMENT



MM&A's Carbon Management Division (CM) provides a wide range of consulting, engineering and environmental services. Committed to achieving the highest standards in carbon-related projects, MM&A's staff of 200 professional geologists, hydrogeologists, engineers and scientists work in tandem with clients to identify needs, analyze opportunities, prevent problems and respond to the constantly evolving carbon market.

In an increasingly "carbon-conscious" society, our awareness, management and growth will be measured by our carbon footprint or output. As power producers and their fuel suppliers, manufacturers and government agencies fight the battle of carbon reduction, one of the essential tools will be capture and storage (e.g. sequestration) of carbon. From business and engineering managers to legislators and end users, understanding GHG emissions and strategies will encourage open dialogue and better understanding of the implications of carbon management.

By providing a comprehensive set of services, MM&A makes it possible for its clients to minimize costs associated with permitting and regulatory compliance issues, reduce environmental risks, and maximize investments in new or existing operations or ventures.

The Carbon Management division of MM&A is a national leader and a significant international participant in areas including GHG inventorying, reporting and reduction, carbon capture & storage (carbon sequestration) and carbon off-set credit verification. Our talented and experienced staff, combined with the pool of support services at MM&A strive to deliver accurate and relevant analysis, consultation and recommendations to our clientele.

CARBON CREDIT VERIFIER

MM&A is approved by the Chicago Climate Exchange (CCX) as a qualified, independent verifier for carbon credits for a variety of markets including coal mine methane (CMM) and abandoned mine methane (AMM) projects. CCX is the world's first legally binding rules-based greenhouse gas emissions trading system. Carbon credits can be earned (and traded on the exchange) for documented reductions in methane emissions occurring during the mining process if the gas that would have otherwise been emitted to the atmosphere is rather (1) sold as high quality gas on a natural gas pipeline system, or (2) used as mid-quality gas in electricity generation.

In order to qualify for the carbon credits, the methane extraction technique must first be approved for use by the Mine Safety and Health Administration (MSHA) and meet the following eligibility requirements:

PRE-MINING ACTIVITIES

- CMM collected from wells drilled after January 1, 1999, and mined around or through after January 1, 2003, can be registered and traded on the CCX up to the sales limits sets for years 2003-2006 (Phase I reporting).
- CMM collected from wells drilled after January 1, 1999, and mined around or through after January 1, 2007 can be registered and traded on the CCX (Phase II reporting).

POST-MINING ACTIVITIES

- CMM from any well drilled at any time, collected after January 1, 2003, which is processed/refined through a low quality gas facility, constructed after January 1, 1999, or utilized in a low quality combustion process, constructed after January 1, 1999, can be registered and traded on the CCX up to the sales limits set for years 2003-2006 (Phase I reporting).
- CMM from any well drilled at any time, collected after January 1, 2007, which is processed/refined through a low quality gas facility, constructed after January 1, 1999, or utilized in a low quality combustion process, constructed after January 1, 1999, can be registered and traded on the CCX (Phase II reporting).

MM&A is currently in the process of verifying CMM carbon credits for mining operations located in the Appalachian Basin and the Black Warrior Basin for a U.S.-based mining company. MM&A has also been approached by a number of other firms to potentially verify CMM carbon credits from mining operations located in the U.S. and Europe. MM&A is well positioned to assist in these types of projects due to our extensive experience in mining engineering,

coalbed methane (CBM) production, and carbon sequestration technologies. We look forward to assisting mining and CBM owners and producers to verify the carbon credits eligible through the CCX trading system.

GREENHOUSE GAS INVENTORIES AND REDUCTION

MM&A's staff has considerable experience in the accounting, collection, assembly and reporting of GHG emissions. This experience is translated from the reporting to Reduction Plans for our clients allowing goals to be set, met and exceeded, affording carbon off-set trading options. MM&A has worked with a wide variety of protocols including WRI, WBCSD, or CA General Reporting Protocol. With the impending regulation from the USEPA's Mandatory GHG Reporting Rule (MRR), the option to participate in the collection and reporting of GHG emissions is soon to be a thing of the past. The new rules require some two dozen industries to provide specific reporting of GHG emissions to the government on a yearly basis. MM&A's staff has reviewed and evaluated the impact of this new rule and we have the cutting-edge experience to offer compliance services to all of MM&A's clients

MM&A, through our Carbon Management Division, offers categorized GHG services in the following areas:

- Carbon Footprint Analysis
- Greenhouse Gas (GHG) or Emission Inventories (1605b Format)
- Inventory Reduction Plans (IRP) and Inventory Management Plans (IMP)
- Project Off-Set and Aggregation Services

US EPA METHANE-TO-MARKETS PROGRAM

MM&A participates in the USEPA's Methane-to-Markets Program providing Coal Mine Methane (CMM) reduction and guidance documentation for the coal mining market in China. MM&A is assessing multiple drilling techniques to produce methane in advance of mining. The purpose of the project is to define improved methods for recovery of CBM and CMM in regions previously thought to hold little promise for methane production.

CARBON CAPTURE & STORAGE

The Carbon Management Division is also a prime contractor and lead researcher for the Southern States Energy Board's (SSEB) management of the United States Department of Energy's (USDOE) Southeastern Regional Carbon Sequestration (SECARB) Central Appalachian coal seam project. The objective of this program is to assess and verify the sequestration capacity and performance of mature CBM and enhanced CBM reservoirs in the region.

Currently, 1,000 tons of CO_2 has been injected into a CBM production well. This test site is being monitored at depth and on the surface for gas migration. Additionally, MM&A is assessing the feasibility for a large scale injection project involving stacked reservoirs (unmineable coalbeds, depleted gas producing formations, and saline aquifers).

The carbon capture and storage project is receiving industry support from coal and gas producing companies, and large land- holding companies.

OVERVIEW OF CARBON CONSULTING SERVICES

- Greenhouse Gas Inventory & Reduction
- Carbon Credit Verification
- Off-Sets and Aggregation Services
- US EPA Methane-to-Markets Program
- Carbon Capture & Storage (Sequestration)
- Geologic Evaluations
- Conventional Oil and Gas
- Coalbed Methane
- Organic Shales
- Coal Mine Methane
- Due Diligence
- Reservoir Engineering
- Economics and Reserves
- Production Engineering
- Field Services

EXPERT WITNESS

MM&A is a member of the Eastern Mineral Law Foundation, and our professional geologists and engineers routinely provide expert witness services for private industry and state and federal government agencies. MM&A professionals have provided depositions, court exhibits, and testimony to assist with case presentations in the areas of hydrogeology; mineral property evaluations; mining; mineral condemnation; insurance and lost coal cases; geotechnical engineering; and in subsidence, construction, and accidents requiring engineering expertise. MM&A can develop court exhibits, create video productions, and perform still frame photo editing. Expanding the field of visual presentations, MM&A offers sophisticated 3-D graphics and animation. Using cutting-edge technology in software and hardware, MM&A can produce broadcast-quality video and photo-realistic computer-generated animation and still frames. Supported by strong in-house graphics capabilities, our professionals deal with complex scientific and engineering issues in a manner that aids the layman in understanding the factors involved and the basis for the conclusions. MM&A engineers have provided expert witness testimony in cases involving:

- Lost Coal Claims
- Fatalities/Serious Injuries
- Blasting Damage
- Water Loss Damage
- Subsidence Damage
- Mine Fires and Explosions
- Equipment Loss
- Roof Collapse
- Reserve Estimation
- Longwall Entrapment
- Business Interruption
- Mine Property Damage
- Legal Suits and Labor Costs
- Mineral Condemnation

We have a proven track record as expert witnesses in both state and federal courts.

GEOLOGICAL LOGGING SYSTEMS

Geological Logging Systems (GLS), a division of MM&A, began providing borehole geophysical logging services in 1975. GLS senior staff have nearly 100 years of combined logging experience and adhere to the safety regulations required by the Nuclear Regulatory Commission. A large fleet of Logging Units serves the Appalachian and Midwestern coal fields as well as other regions. Safety classes are attended on a regular basis and a radiation safety officer oversees activities that require use of licensed materials in the logging process. Our safety record and OSHA ratings are well above industry standards and we value customer service as one of our major assets. We continually expand our services to meet the requirements of a large client base.

GLS personnel can assist in determining which log responses are best suited for various applications. below are types of logs that GLS can provide:

- Density (High Resolution)
- Density (Bulk or dual spaced)
- Natural Gamma
- Electromagnetic Flowmeter
- Acoustic Televiewer
- Borehole Deviation /Orientation, Magnetic and Gyroscopic Orientations
- Borehole Video Camera
- Fluid Conductivity
- Neutron
- Various Resistivity Logs
- Temperature
- Spontaneous Potential
- Caliper
- Induction
- Resistance (Single Point)

Æthos Consulting – Company Profile

Æthos Consulting is a small, specialist consultancy providing environmental assurance services and social impact assessments. The company can also provide general environmental management advice, to the extent that that advice does not prejudice its provision of independent advice on environmental assurance matters. Ken Redwood (BA, B Soc Sci (Hons)) and Lisa Chandler (BSc, MEng) are the directors and principals of Æthos Consulting. Ken has a background in social sciences, media and community development. He formerly held senior roles in the Northern Territory Department of Community Development. Lisa has over twenty years experience as an environmental advisor in both the public and private sectors. She holds formal qualifications in both science and engineering and is a principal level environmental auditor under the RABQSA certification scheme.

Æthos aims to provide ethical, objective and evidence-based advice on the management of environmental and social impacts of development. The company is committed to the effective use of information to guide practical management decisions and action.

Æthos Consulting – staff profiles:

Lisa Chandler

M Eng (University of Newcastle)

BSc (McGill University)

Diplôme de Linguistique (Sorbonne)

Lisa Chandler has over twenty years experience as an environmental advisor to government and the private sector. Her diverse professional experience and formal qualifications in both engineering and science enable her to work effectively in multi-disciplinary teams. Lisa has a particular interest in environmental assurance activities, including compliance and performance assessment and a range of other due diligence activities. She was formerly head of the Department of Environment and Conservation audit section. For the past twelve years, Lisa has worked predominantly in environmental impact assessment, and senior technical / management roles for mining, industrial and infrastructure projects in Western Australia. Lisa is certified as a principal auditor for assessment of environmental management, environmental management systems, environmental compliance and contaminated sites assessment.

Ken Redwood

BSc (Hons – Social Science) (Southern Cross University);

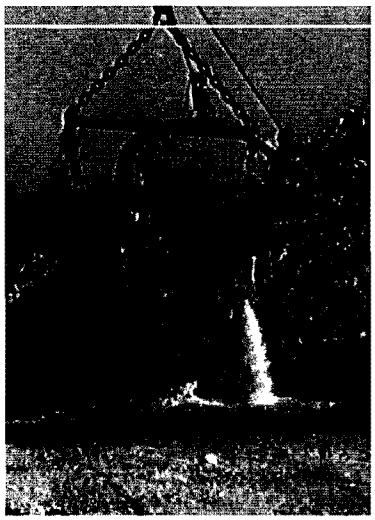
BA (Media Communications) (University of New England);

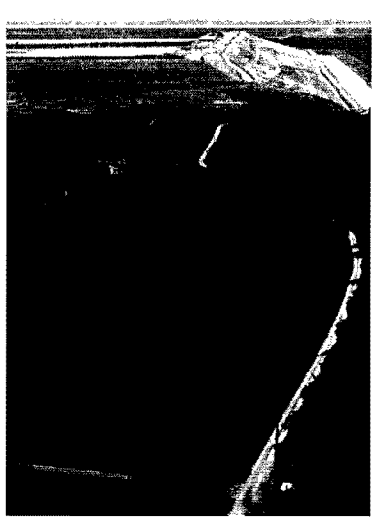
Dip Mech Eng (Sydney TAFE).

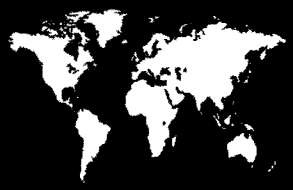
Ken Redwood holds formal qualifications in social science, media communications and engineering. Ken specialises in community liaison, communication and change management. He worked for over 15 years as a senior public servant in the Northern Territory government, where he was involved in community development and social services projects. Ken has a particular interest in the social impacts of development in rural and remote regions and has extensive experience conducting community consultations. He has worked throughout Australia in indigenous and non-indigenous communities in both government and private sector roles. His experience includes writing a Community Development Plan for the town of Katherine (view to the establishment of the Tindal RAAF Base) and consulting on law and order issues in remote indigenous communities. Currently, Ken is working on a range of resource development projects in the Northern Territory and Western Australia. His work on these projects includes Aboriginal Community liaison, local area enterprise development and the provision of advice on Aboriginal Heritage matters.

Cardno ENTRIX

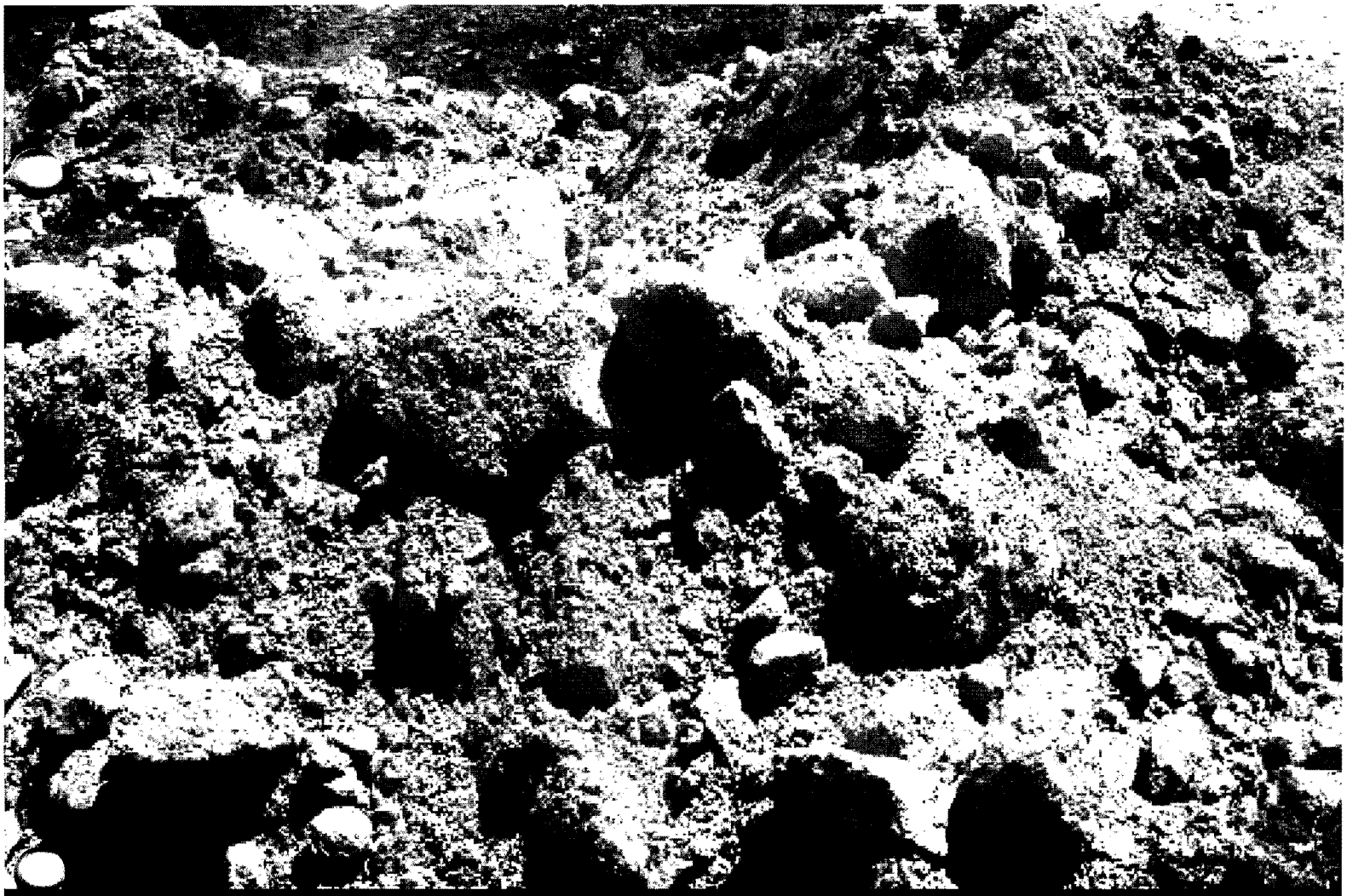
Shaping the Future



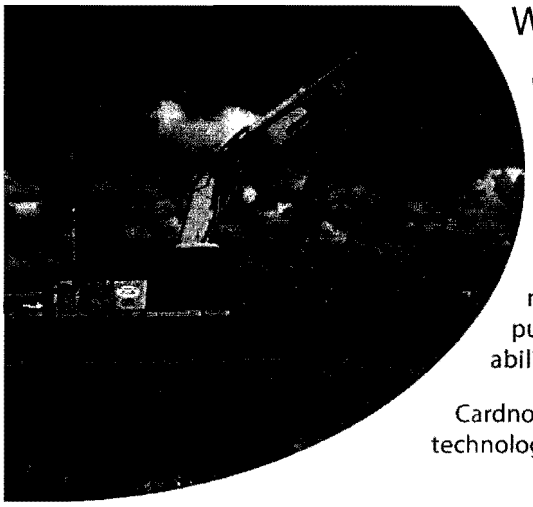


Mining and Mineral Processing Services



We Make The Environment Our Business

Introduction



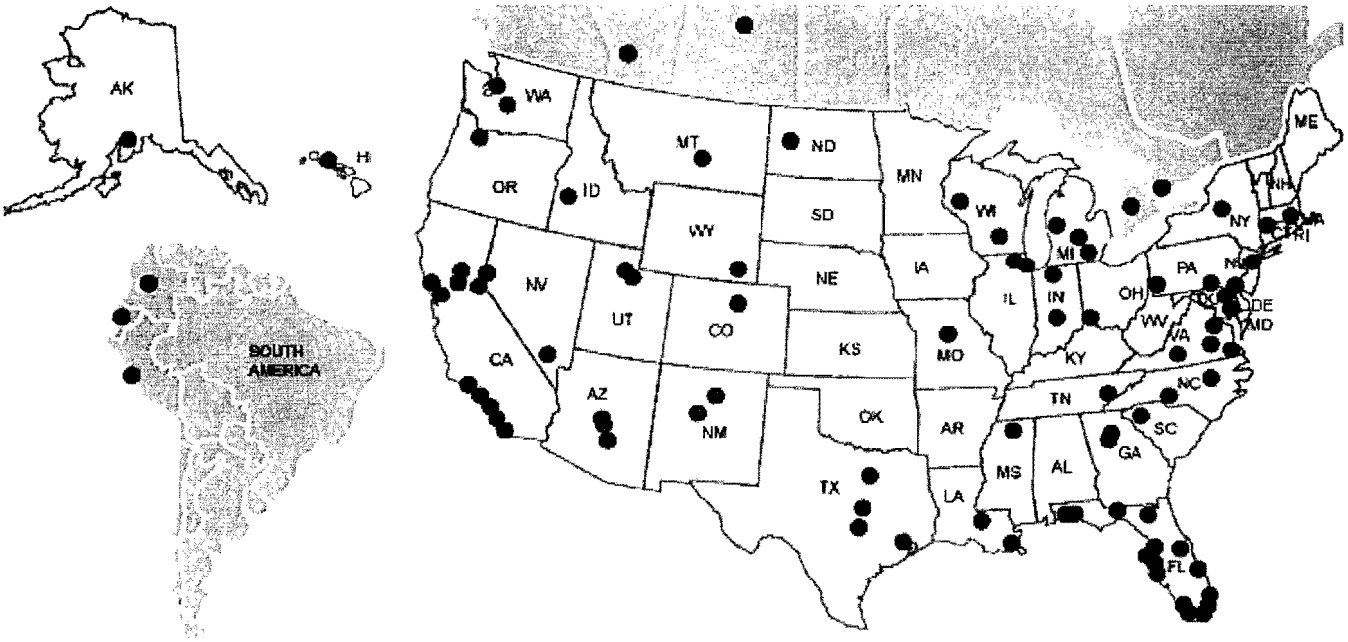
Who We Are

Cardno ENTRIX is a consulting firm specializing in natural resources management, water resources management, permitting and compliance, and liability management. Clients turn to Cardno ENTRIX for help in navigating complex environmental challenges because of our reputation for integrity, responsiveness, and innovation. Our clients benefit from the wealth of knowledge and experience of our multi-disciplinary team of environmental professionals. Cardno ENTRIX senior staff and management are highly regarded and respected throughout private and public sectors for their technical expertise, science-based approach, and ability to provide sustainable business solutions.

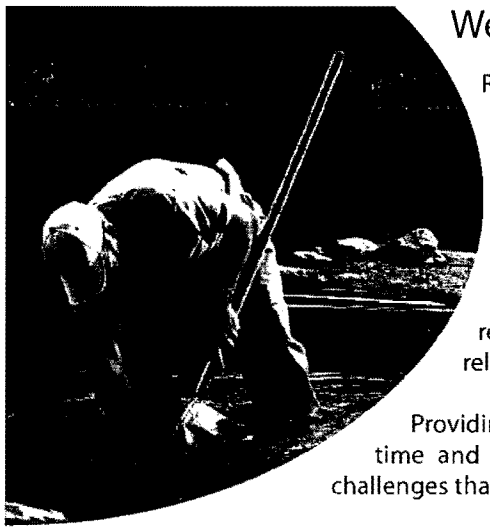
Cardno ENTRIX offers an exceptional team of scientists, planners, engineers, and technology specialists dedicated to meeting your needs with the highest level of expertise and customer service.

For nearly 30 years, we have excelled in providing a full range of planning, permitting, restoration/ reclamation, and compliance services to the mining industry. Our extensive experience with capital-intensive large-scale mining projects as well as smaller operations allows us to provide focused services scaled to meet your objectives and individual operation needs. Our expert staff of professionals can handle any environmental challenge your project may encounter.

The map below highlights key Cardno office locations. Globally today, we have more than 4,600 staff in more than 180 offices.



Cardno ENTRIX: fitting your project into the physical and political landscape.



We Understand Your Needs

Regulatory requirements for environmental and natural resources permitting at active and inactive mines and mineral processing facilities are complex, and require extensive agency coorperation. A highly skilled understanding of federal, state, and local regulatory frameworks with an extensive science-based approach is critical to uncovering environmental issues and hurdles and resolving them quickly and efficiently. This is particularly true today given the rapid economic fluctuations affecting the mining and minerals markets. Cardno ENTRIX staff members are highly respected by state and federal regulatory, resource management, and trustee agencies and many have previous working relationships established.

Providing strong science and leading experts from varied disciplines allows us to save time and costs in accelerating the permitting and licensing process by addressing challenges that might normally require several consulting firms.

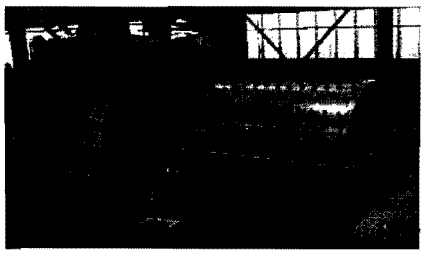
Maximizing ultimate resource recovery and optimizing economic efficiency, while promoting sound land stewardship is our goal. Our experienced professionals can assist you in navigating the complexities of mining and mineral processing permitting by making effective, science-based recommendations from the initial siting and environmental constraint analysis to the completion of final reclamation and decommissioning activities.

Cardno ENTRIX Key Staff	
• Air Quality Specialists	• Permitting Specialists
• Biologists	• Risk Assessors
• Ecologists	• Chemists
• Geologists	• Archaeologists
• Decision/Costing Analysts	• Natural Resource Economists
• Environmental/Civil Engineers	• Regulatory Specialists
• Environmental Toxicologists	• Restoration Engineers
• Wetland Specialists	• Water Supply Specialists

Integrating sustainable practices from the early stages of mining and mineral processing projects is essential to maximize the value of available resources.

Why Choose Us?

With extensive experience in capital-intensive, large-scale mining and mineral processing projects, as well as smaller operations, Cardno ENTRIX offers services scaled to meet your objectives and individual operation needs.



Relevant Services

Cardno ENTRIX offers clients a full range of planning, permitting, restoration, reclamation, and compliance services. Geological resource operations served by Cardno ENTRIX include: bentonite, cement; coal; copper; diamonds; gilsonite, gold; gravel; iron; lead; limestone; oil shale, phosphate; sand; trona, uranium; and zinc.

We have served a variety of clients in the mining and mineral processing industry, including operators of underground mines, open pit mines and quarries.

Key Cardno ENTRIX Mining Project Services

Planning and Permitting

- Feasibility Studies
- Environmental Assessments
- Environmental Impact Statements
- Mine Plan Constraints Analysis
- Economic and Socioeconomic Evaluations
- Community Outreach and Communications
- Water Conservation Planning and Consumptive Use Permitting
- Jurisdictional Wetland Delineations
- Water Supply Security
- Threatened and Endangered Species Surveys
- Aquatic Habitat and Stream Assessments
- Vegetative Community Analysis and Mapping
- Fish and Aquatic Invertebrate Community Analyses
- Mitigation Planning

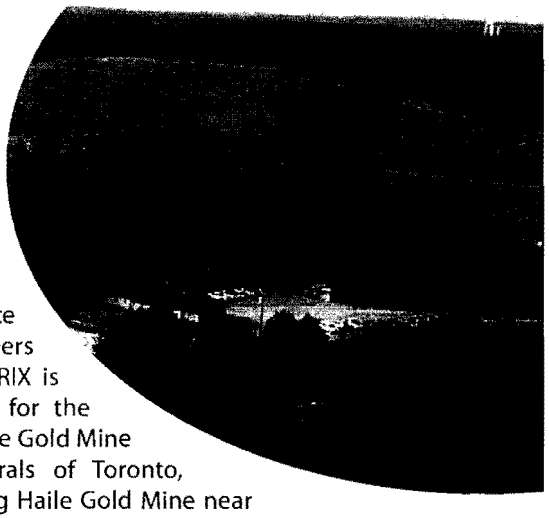
Operations and Management

- NPDES Permitting
- Alternative (Passive Biological) Water Treatment Technology Design
- Net Environmental and Community Benefit Analyses
- SPCC and SWPPP Preparation
- Material Mass Balance Analysis
- Materials Handling Structures Design
- Well Installation and Monitoring
- Milling Process Design
- Wharves and Jetties Design
- Slope Stability Analysis

Reclamation and Restoration

- Mitigation Design and Installation
- Mitigation Banking
- Natural Resource Conservation and Preservation
- Human Health Risk Assessment
- Ecological Risk Assessment/Monitoring
- Natural Resource Damage Assessment (NRDA)
- Aquatic and Terrestrial Habitat Restoration
- Native Plant Nursery and Installation

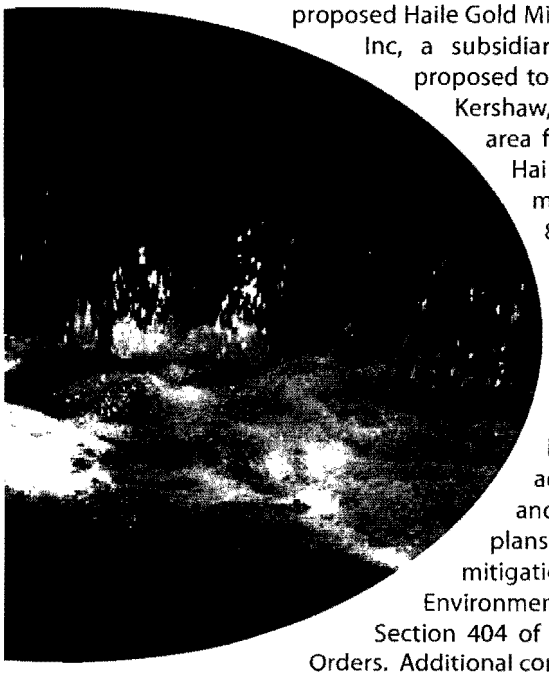
Environmental Permitting for Mines



Cardno ENTRIX has led private industries as well as Tribal stakeholders and government agencies through the mine permitting process with the most effective and efficient operations. Highlights of our key mine and mineral processing permitting projects are outlined below.

Third Party EIS Development for the Haile Gold Mine, U.S. Army Corps of Engineers, South Carolina

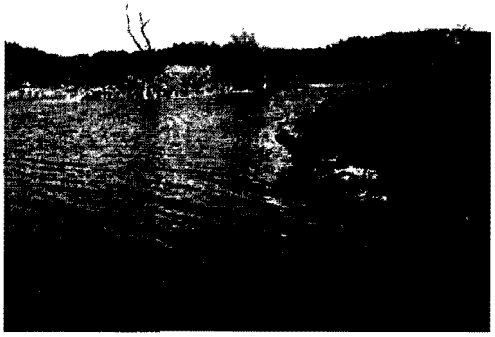
Cardno ENTRIX is currently providing environmental and NEPA compliance services to the Regulatory Division of the U.S. Army Corps of Engineers (USACE), Charleston District. As a third party contractor, Cardno ENTRIX is preparing the Environmental Impact Statement (EIS) for the proposed Haile Gold Mine. The applicant, Haile Gold Mine Inc, a subsidiary of Romarco Minerals of Toronto, proposed to reactivate the existing Haile Gold Mine near Kershaw, SC for the development of gold resources, to expand the area for open pit mining and construct associated processing facilities. The Haile Gold Mine site encompasses approximately 4,231 acres. The phased mine plan includes eight open mining pits, ranging in depth from 110 to 840 feet, to be excavated over a twelve-year period. The proposed work includes the mechanized land clearing, grubbing, temporary stockpiling, filling, and excavation that would impact 161.81 acres of jurisdictional freshwater wetlands and 38,775 linear feet of streams.

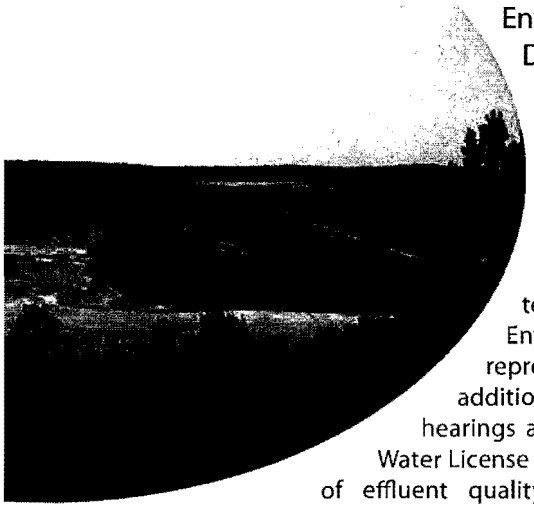


The EIS will analyze the potential direct, indirect and cumulative environmental effects of the proposed project and its alternatives. Key issues may include surface and groundwater quality and supplies, aquatic/terrestrial habitat and biota, wetlands and stream habitats, federal and state listed species of concern, emergency response and contingency plans, mine closure and rehabilitation, social and economic factors, and mitigation. The EIS will be prepared in accordance with NEPA, the Council on Environmental Quality (CEQ) guidelines, USACE regulations implementing NEPA, Section 404 of the Clean Water Act, and other applicable regulations and Executive Orders. Additional components of the project include independent environmental review and analyses, facilitating public involvement/meetings, developing and maintaining the public website, maintaining the project record and eventually developing the Draft Record of Decision, all under the technical direction and management of the USACE.

Contaminant Investigations, Cliff Mines Iron Company, Michigan

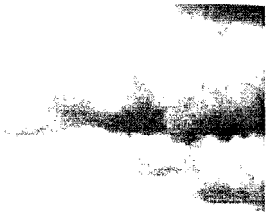
The Deer Lake Area of Concern was investigated for mercury contamination potentially resulting from an historical gold and silver mine, an iron assay laboratory, discharges of untreated municipal wastewater, and continuation of mercury from the atmosphere. Our staff investigated this site and identified probable solutions for remediation. Based on our findings, the Michigan Department of Environmental Quality (DEQ) conceded that sediment dredging and capping remedies were not feasible for this lake. The remedy was endorsed by the local Public Advisory Council for this Area of Concern. A global settlement for the client's total (including NRDA) liability at this site used non-core natural resource assets on CCIC lands to compensate for the contaminant-related liabilities, which reduced the client's total settlement costs by $60 million and resulted in a sustainable solution.



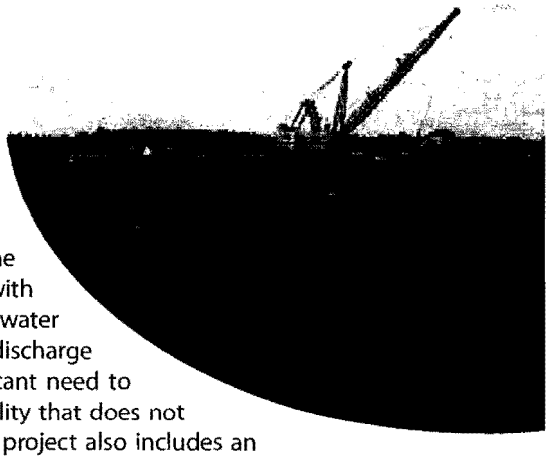


Environmental Impact Statement Review for Diamond Mines, Dogrib Treaty 11 Council, Northwest Territories, Canada

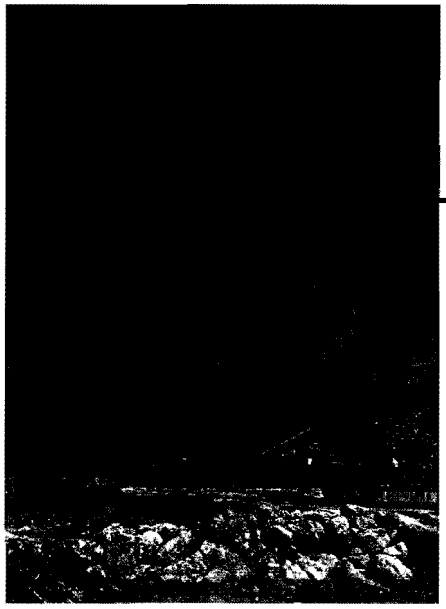
Cardno ENTRIX provided senior technical consultation for the development of four proposed diamond mines in Northwest Territories (DeBeers Snap Lake, BHP Ekati's Sable, Pigeon and Beartooth). Our team reviewed proposed project plans, the Environmental Impact Statement, and related technical reports and memoranda related to water quality, water management, aquatic habitat, fish and wildlife, waste rock management, waste rock pile design and related disciplines. We prepared detailed technical reports and assessments of the project to the Mackenzie Valley Environmental Impact Review Board (MVLWB) on behalf of the Dogrib and represented the Dogrib at technical sessions and hearing-related matters. In addition, Cardno ENTRIX staff represented the Dogrib during water license hearings administered by the MVLWB, regarding BHP's Class A Water License Application and assisted in the development of effluent quality criteria, the surveillance network program, the waste rock management plan and various related components to the water license.



Water Management Analysis using GoldSim, The Mosaic Company, Florida



The primary focus of this project is to develop a contaminant and water budget and management model for Hookers Prairie Mine, using the GoldSim modeling software. The purpose of the GoldSim modeling study is to evaluate the probabilities of the mine meeting its current and future NPDES loading limits for certain contaminants. The model will be used to evaluate the probabilities that several conditions will occur. Specifically, the model will be used to examine: 1) the minimal need to discharge water with water quality meeting the discharge limits, 2) the minimal need to discharge water when water quality does not meet discharge limits, 3) the significant need to discharge water with water quality meeting the discharge limits, and 4) the significant need to discharge water with water quality that does not meet the discharge limits. The project also includes an evaluation of current monitoring data within the mine operations and at discharge locations. We will also develop a complete monitoring plan that will be integrated into a GIS as part of the GoldSim model calibration and validation work.



Mine Restoration Multi-Criteria Decision Analysis, Confidential Client

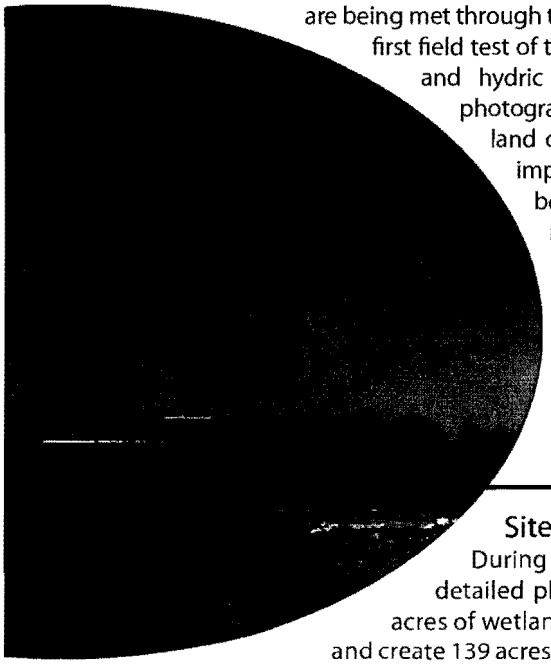
This project involves the use of multi-criteria decision analysis to evaluate mine operations and environmental remediation alternatives for a large copper mine. We provided a technical director and lead modeler for this project. Three alternatives were analyzed including closure in one year, continued operations for the next 20 years, and closing, then later expanding mine operations. The evaluation criteria included: community acceptance, cleanup standards achieved (residential/industrial), net present value, cash flow, and time frame for site resolution. The model indicated that continued operations until 2017 was the preferred alternative, and that it represented an expected net present value savings in excess of $50 million dollars over the next best alternative (closure in one year).

Environmental Impact Statement for the Hardee County Mine, Farmland-Hydro (Mosaic Fertilizer, LLC), Florida

Cardno ENTRIX prepared a draft Environmental Impact Statement (EIS) for the Farmland-Hydro Hardee County Mine in Central Florida. The proposed 15,235-acre phosphate mine was being evaluated with respect to a broad spectrum of environmental and sociological factors. Primary issues of concern include wetland impacts, listed species and wildlife habitat impacts, potential impacts to the quality of quantity of surface and groundwater impacts, and radiological issues. Additional factors included noise, air quality, historical resources, and socio-economic effects of the proposed mine.

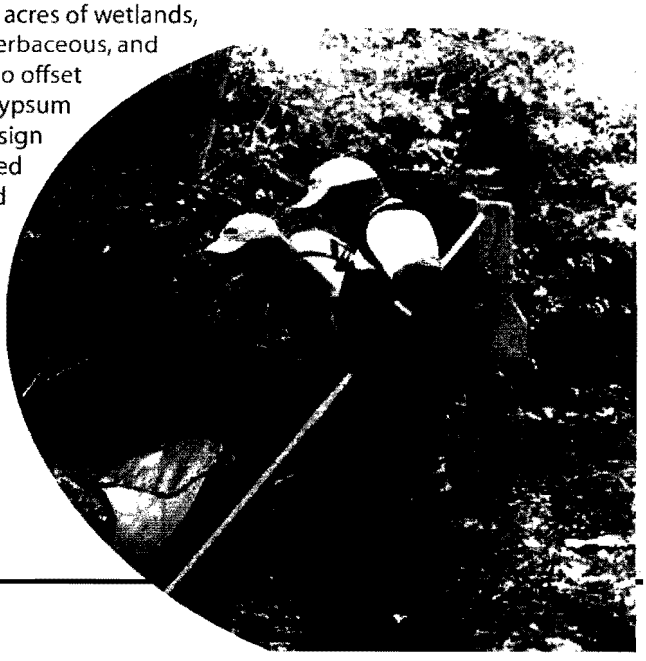
Environmental Permitting and EIS Development Support, Titan American Limerock Mine, Florida

Cardno ENTRIX is the lead consultant in the permitting of the largest new limerock mine in a decade to produce aggregate that meets Florida Department of Transportation standards. The 9,400-acre site provides technical challenges that are being met through the use of both new technologies and strong environmental science. It is the first field test of the "Hydric Soils Standard" for determining where on the site the hydrology and hydric soils actually meet criteria for delineation as wetlands. Supporting photogrammetric and LIDAR analyses of site elevations are being used to facilitate land cover mapping, wetland delineation, and geomorphological analyses. The impacts generated by the mine will occur over a 100-year period. Mitigation is being proffered via preservation and enhancement of buffers adjacent to the mine areas and through enhancement of hydrology and vegetation on a large mitigation site that will ultimately be donated to the Waccasassa Bay Preserve State Park. Cardno ENTRIX is providing environmental support for completion of an Environmental Impact Statement for the mine. In addition, we are providing support for a Florida Environmental Resource Permit and a Section 404 permit from the U.S. Army Corps of Engineers.



Site Restoration, CF Industries, Inc., Florida

During the region's first team permitting project, Cardno ENTRIX produced a detailed plan to restore 1,900 acres of upland pasture to flatwoods, enhance 680 acres of wetlands, restore 53 acres of wetlands, and create 139 acres of forested, herbaceous, and ephemeral wetlands. The plan, intended to offset unavoidable impacts caused by an expansion of phosphogypsum storage facilities, included a comprehensive planting design (incorporating direct seeding of native species) and a detailed monitoring protocol for all restored, enhanced, and created wetlands and uplands. During construction, our staff made field adjustments to better ensure survival of planted and seeded species. We installed all wetland plant species and monitored and maintained wetland mitigation areas. Cardno ENTRIX also provided nuisance and invasive species control in restored upland habitats. We assisted with regulatory agency coordination in determining if criteria for success were being met, and negotiated release from monitoring requirements when appropriate.



Litigation Support and Expert Testimony, for the Atlantic Richfield Company, Leviathan Mine, California

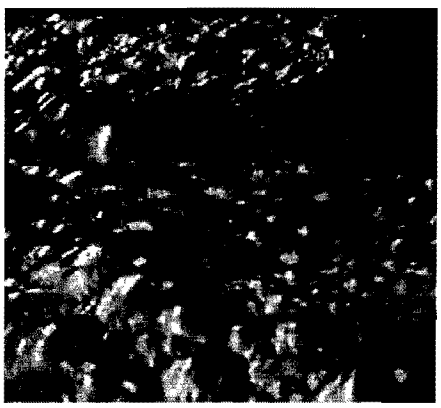
Cardno ENTRIX is providing senior technical consultation, litigation support and expert testimony regarding the ecological impact of acid mine drainage (AMD) from a former sulfur mine located on the eastern slope of the Sierra Nevada range. Our experts provided a detailed review of stream chemistry and biological community data in the watershed downstream of the mine over a more than 30 year time period. These data were used to evaluate the efficacy of AMD management over time. An expert report has been prepared in anticipation of litigation.

Environmental Impact Statement, Bornite Project and Underground Copper Mine, Oregon

Cardno ENTRIX prepared the biological section and assisted in writing other technical sections of the third-party EIS under the direction of the U.S. Forest Service for the permitting of this underground mine. Our team gathered pertinent background information on the resources, analyzed alternatives, assessed impacts, conducted agency consultation and coordination, and peer reviewed numerous sections of the document.

Environmental Impact Statement and Environmental Impact Assessment, Fruta del Norte Gold Exploration and Mining Project, Loja, Southern Ecuador

Cardno ENTRIX is providing Environmental Assessment, EIS, and third-party environmental monitoring for the Fruta del Norte (FDN) Decline North and South projects located within a 95,000 hectare land package in southeastern Ecuador.



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Environmental and Natural Resource Management Consultants

Shaping the Future

Cardno ENTRIX is committed to conserving and restoring our natural resources and the environment. We practice stewardship through the conduct of our business, the development of our staff, and the services we provide our clients.

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Conestoga Rover & Associates (CRA)
Relevant Radiological Project Experience

CRA has experience in addressing the characterization, handling and proper disposition of radiologically impacted environmental media over our greater than 35 years of experience providing environmental engineering and consulting services. The following sections provide some example relevant experience with U.S. and Canadian regulatory programs in dealing with residues from uranium, radium and sodium refinement, and with naturally occurring radioactive material, usually resulting from technical enhancement from ore processing. CRA also has significant experience in dealing with groundwater assessments at nuclear generating stations, particularly with tritium, which often persists at the leading edge of impacted groundwater bodies at these facilities.

CRA Experience With Low Level Radioactive Waste and NORM

The following section provides description of some of CRAs' experience in the investigation, characterization, remediation and monitoring of low level radioactive waste impacted materials. Many of these facilities were impacted as the result of industrial refinement of radioactive materials and some resulted from naturally occurring radioactive material that was technically enhanced as a result of ore material processing at the property. In each of these cases, CRA provided services in the characterization of the impacted materials and determined the appropriate means for safe handling of the materials in accordance with applicable regulations. In several cases, CRA designed closure facilities for this radioactive material.

AECL Port Hope Area Initiative, Ontario

The Port Hope Project involves the cleanup and long-term management of historic low-level radioactive waste, marginally contaminated soil, and certain other industrial wastes currently located within the Municipality of Port Hope. The project will address historic waste presently located at approximately 19 "uncontrolled" locations throughout the municipality including sediments in the Port Hope Harbour, as well as waste currently contained at several controlled temporary storage facilities. Over 1 million cubic yards of low-level radioactive wastes are located in the Port Hope area, resulting from the disposal of waste from Eldorado Nuclear Limited's radium and uranium refining operations in the 1930s to the 1950s. The low level radioactive waste consisted of uranium and radium ores that were refined to remove the radium. The Low-Level Radioactive Waste Management Office (LLRWMO) of Atomic Energy of Canada Limited (AECL), on behalf of the Government of Canada, are overseeing the clean-up and construction of long-term management facilities. CRA has performed environmental assessments of the site under the Canadian Environmental Assessment Act (CEAA). The assessments define the existing geophysical environment (including physiography, topography, geology, seismicity, hydrogeology, and groundwater quality) at site, local, and regional scales for each of three proposed long-term low-level radioactive waste storage facilities. CRA is providing engineering support to the LLRWMO for two of the facilities and peer review of the existing conceptual design for all three facilities. CRA prepared

engineering design reports, including Port Hope Long-term Waste Management Facility Design and Operations Plan (DOP) and Waste Excavation Management Plan (WEMP), in support of the Canadian Nuclear Safety Commission (CNSC) licensing process for the project. CRA has also performed an evaluation of existing wastewater treatment at the facilities, including best available technology reviews and has continued design work through bench and pilot testing for the design of new wastewater treatment systems. CRA has also been conducting the monitoring and reporting program on landfill-related impacts to groundwater, surface water, and landfill gas at one of the landfill facilities.

Fields Brook Site, Ashtabula, Ohio

CRA, on behalf of the Fields Brook Action Group (PRP Group), completed delineation sampling for radium 226 and 228 and chlorinated solvent dense non-aqueous phase liquid (DNAPL) impacted floodplain soils and sediments along a 3.5 mile tributary to the Ashtabula River in northeastern Ohio. The sampling program for radium 226 and 228, as well as uranium, was extensive within the two exposure units adjacent to the historic source. The remedy for the site included removal of impacted soils, classified as Naturally Occurring Radioactive Material (NORM), from the floodplains and removal of contaminated sediments from the brook. CRA designed a 3-acre double-lined landfill to be constructed on site for the disposal of the majority of the impacted materials, with modifications to allow disposal of the NORM. Air monitoring for thorium, VOCs and particulates was completed for excavation and landfilling areas during intrusive activities. CRA completed site supervision activities including oversight, monitoring, and Construction Quality Assurance (CQA) testing for the PRP Group.

Ambrosia Lake, New Mexico

CRA was contracted by Rio Algom Mining LLC (Rio Algom) to construct a 1,000-year flood diversion channel and embankment to protect an existing mine tailings pile from erosion effects of surface water flow during storm events. The project took place on the site of a former uranium processing facility located in Ambrosia Lake, New Mexico.

Over 525,000 cubic yards of earth was excavated, placed, and compacted in a 9,600-lineal-foot berm. When the embankment was completed, CRA placed over 80,000 cubic yards of rip rap ranging from 1 inch to 12 inches in size per Nuclear Regulatory Commission (NRC) guidelines. During construction, CRA used GPS survey and machine control systems on equipment to expedite placement of material and ensure that elevations and placement of material were within project tolerances. All work was completed with in-house personnel.

Pfhol Brother Landfill Site, North Cheektawaga, New York

The Pfhol Brother Landfill site is a 130-acre inactive waste site that received municipal and industrial wastes from 1932 to 1971. Investigative results indicated the presence of VOCs, semi-VOCs, PCBs, PAHs, metals, dioxins and low-level radioactive materials.

CRA performed investigation and design of the final remedy for the site, which included consolidation of site materials to reduce the area to be capped; a perimeter barrier system; a modified RCRA-compliant cap; an interior groundwater extraction system; and wetlands mitigation. A component of the RA was the handling of low-level radioactive wastes. The protocol for low-level radioactive materials involved passing each loaded transport vehicle through a portal monitor. Loads that trigger the portal monitor were to be unloaded and further scanned. Material identified above the established site criteria was to be segregated and further characterized for appropriate off-site disposal. Prior to backfilling, a closeout walkover survey was performed in conjunction with confirmatory soil sampling and analysis.

Chicago Property Investigation, Chicago, Illinois

CRA completed a Site investigation at a property near the Lindsay Light Superfund Sites where soils containing levels of radioactive thorium have been reported. CRA's investigation confirmed the presence of radioactive thorium in the soil at levels well above the cleanup level established by the USEPA for the neighboring sites.

Confidential Client, Joliet, Illinois

CRA performed investigations of a site that was impacted with TNORM phosphate rock wastes associated with fertilizer manufacturing that were disposed on the property. CRA delineated the extent of low-level radioactive waste disposal at the site, completed RESRAD modeling for the site, and developed a proposed remedy that included capping of the wastes. CRA participated in a meeting with the Illinois Emergency Management Agency's Division of Nuclear Safety to discuss the results of the investigation, RESRAD modeling, and the proposed remedy for the site. The IEMA and the Illinois EPA (IEPA) approved the proposed closure and IEPA and IEMA agreed to work cooperatively towards closure under Illinois' SRP.

Northwester Wire and Steel site in Sterling, IL

CRA performed screening and radiological survey of radioactive scrap metal/scale, a radium dial, lightning arrestors and smoke detectors for disposal characterization during site remediation. The majority of the radioactive materials consisted of scrap metal/scale and these were determined by the survey to contain naturally occurring radioactive materials caused by deposition of radium naturally occurring in groundwater in the interior of steam piping. This material disposed of at a landfill that accepts NORM waste rather than a radioactive waste landfill. The lightning arrestors and smoke detectors were found to exempt items according to NRC listings and were disposed of with the radioactive scrap metal.

Slag Pile Capping and Wetlands Restoration, Midwestern US

Pursuant to the requirements of the USEPA and US Nuclear Regulatory Commission, CRA was contracted to design and construct stormwater retention basins, engineering wetlands, and slag pile caps for a confidential client. This work is governed by a Decommissioning Plan for worker and public health and safety at sites containing low-level radioactive materials. The scope of work included remediation of wetland soils/sediments, the permanent closure of the slag piles; the installation of stormwater retention basins and erosion control measures; capping; and creation, restoration, and/or enhancement of wetland areas.

Ground Water Data Evaluation Plan, Pickering Nuclear Plant, Ontario

CRA provided expertise to Pickering Nuclear's environmental compliance staff to characterize groundwater monitoring data and develop appropriate methodologies for assessing compliance with operational environmental requirements. The project was mainly focused on tritium in the groundwater, which is a big part of the plant's monitoring program. As part of this project, data from over 2000 monitoring wells were evaluated using hundreds of statistical graphics and different assessment techniques to develop a recommended program for monitoring assessment. CRA developed final recommendations for integration of the proposed assessment program with a site-specific MS Access database application. The final project report synthesized and presented the conclusions in a concise and accessible format and made recommendations for triggers and evaluation methods to help them understand the massive amount of information that is generated.

Experience at Nuclear Generating Facilities

CRA's site investigation experience including that at several dozen nuclear facilities demonstrates CRA's ability to provide high-quality site investigation and monitoring services as a qualified engineering consulting firm to the nuclear industry. CRA has a team of approximately 30 professionals (technicians, geologists, and engineers) with experience designing, performing, and/or evaluating the results of site characterization and monitoring programs at nuclear facilities. Furthermore, CRA has experts who specialize in emergency management and business continuity and are capable of assisting clients in complying with the required regulations to ensure a state of emergency preparedness and readiness.

CRA was the prime contractor responsible for conducting a fleetwide hydrogeologic investigation at 11 operating nuclear generating Stations located in Pennsylvania, New Jersey, and Illinois. The fleetwide hydrogeologic investigation was completed under an extremely aggressive schedule with each station being evaluated in parallel. The

purpose of the investigations was to determine whether groundwater at and near the nuclear power generating facilities had been adversely impacted by any releases of tritium and other radionuclides.

The hydrogeologic investigation involved the concurrent completion of station visits; evaluation of existing information pertaining to structures, systems and components that store, use, or convey potentially radioactively contaminated liquids; evaluation of confirmed or potential historical releases of radionuclides; and evaluation of subsurface structures that might affect groundwater conditions. Additionally, CRA reviewed existing geologic and hydrogeologic conditions at each Station through existing documents such at the Updated Final Safety Analysis Report (UFSAR), Radiological Effluent Tracking Statistics (RETS) Report, Annual Radiological Environmental Operating Report, pre-operational and annual Radiological Environmental Monitoring Program (REMP) reports, and Annual Radiological Environmental Operating Report. CRA's review of Station-specific systems, records, and release history was combined with a review of subsurface environmental conditions into the development of custom, station-specific work plans to evaluate the geologic and hydrogeologic conditions at each of the stations with respect to contamination from radionuclides. A complete chemical analysis of groundwater samples collected at each station was conducted including analysis for a full spectrum of heavy and light radionuclides including Tritium and Strontium-89/90 and Gamma-spectrum parameters including Manganese-54, Iron-59, Zinc-65, Zirconium-Niobium-95, Cesium-134 & -137, Barium-Lanthanum-140, and Cobalt-58 & -60. As a follow up to the assessments, CRA is performing additional monitoring (including REMP), hydrogeologic investigations, and other evaluations at select Stations. These additional studies are focused on the fate and transport of tritium. CRA is also working with the client to support regulatory requests, which resulted from the fleetwide work. This includes interaction with the State EPA, State nuclear agency, and with the Nuclear Regulatory Commission (NRC).

CRA has supported one of these facilities where the tritiated water releases occurred with environmental services from initial investigations to routine monitoring of active groundwater remedial systems. Key tasks have included:

- Review of Station documents such as the UFSAR, plant construction drawings, and other sources to identify releases or source areas;
- Field investigations involving thousands of samples for tritium and for gamma-emitting radionuclides;
- Development of a calibrated flow model and a transport model for use in negotiating clean-up objectives, remedial design and third party inquiries;
- Design and implementation of groundwater remedial options ;
- Development of a Web Site, presentations at public meetings, and discussions with stakeholders
- Technical assistance to the Station in response to the NRC White findings; and
- On-going assistance in coordination with NRC inspections and inquiries from the State and Federal NRC offices.

Statement of Qualifications
Technical University of Crete
Department of Mineral Resources Engineering

The primary goal of the Department of Mineral Resources Engineering at the Technical University of Crete is to educate engineers in a broad range of scientific and technical activities related to the extraction and processing of minerals (www.mred.tuc.gr).

Faculty is organized in divisions: The Division of Exploration and Positioning includes the Inorganic and Organic Geochemistry and Organic Petrography Lab, the Applied Geophysics Lab, the Petrology and Economic Geology Lab and the Geodesy and Geomatics Lab. The Division of Mining Technology includes the Applied Geology Lab, the Rock Mechanics Lab, the PVT and Core Analysis Lab and the Mine Design Lab. The Division of Mineral Exploitation includes the Applied Mineralogy Lab, the Ceramics and Glass Technology Lab, the Coal Gasification Lab and the Ore Processing Lab. The Labs are also augmented by Research Units such as the RU on Management of Mining / Metallurgical Wastes and Rehabilitation of Contaminated Soils, the RU on Quality Control – Health and Safety in the Mineral Industry, etc.

Most faculty members have obtained one or more degrees of their higher education by Universities in Europe or the US and Canada and have international collaborations both at the EU level and elsewhere. Research funding comes mainly from EU sponsored programs, contracts with private companies as well as from the Greek National Research Foundation. Applications for grants or responses to requests for proposals are usually submitted by individual faculty or small faculty groups. Also faculty members may provide consulting services.

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Dr. Gerald H. Luttrell, Ph.D.
Virginia Tech
STATEMENT OF QUALIFICATIONS

Dr. Gerald H. Luttrell is a Professor of Mining and Minerals Engineering at Virginia Tech in Blacksburg, Virginia. He joined the faculty as an Assistant Professor in 1986 and was promoted to Associate Professor in 1991, Full Professor in 1997 and Massey Professor in 2004. He has served as the Assistant Head of the Department of Mining and Minerals Engineering since 2009. He has participated in sponsored research and development projects worth more than $14 million and his scholarly works include 18 patents, 10 book chapters, 120 referred journal and proceedings papers, 129 conference proceeding articles, as well as more than 200 technical reports. Dr. Luttrell is a five-time recipient of the Departmental Outstanding Faculty Award (1988, 1989, 1992, 1994, 1999, 2005), a five-time recipient of Virginia Tech's Academy of Teaching Excellence Award (1988, 1995, 1999, 2005, 2010), and a recipient of the College of Engineering Dean's Award for Excellence in Public Service (1998). He also received SVCC's Outstanding Alumnus Award (1987) and Virginia Tech's Mining and Minerals Engineering Outstanding Alumnus Award (2005). His national and international recognitions include the PCMIA Stephen McCann Educational Excellence Award (1995), Henry Krumb Lecturer (2001), Percy Nicholls Award (2005), Frank F. Aplan Award (2007), Henry Krumb Lecturer (2009), and Robert H. Richards Award (2012).

Dr. Luttrell is well qualified to provide technical information and expert analysis of uranium milling issues in Virginia. Dr. Luttrell's R&D efforts have contributed to the development of a variety of innovative technologies used in mineral processing. He has extensive experience working with process engineering concepts for advanced particulate separations, equipment design, process modeling/simulation and circuit optimization. He has participated in the development of several patented processing technologies for solid-solid and solid-liquid separation in the coal and minerals processing industries. He has also extended his worked to apply particulate processing technologies for pollution prevention and environmental restoration. This diverse body of work includes the removal of air pollutant precursors from coal, decontamination of radioactive soils, hydrocarbon soil remediation, and recycling of plastics. He also worked as a member of the review committee for the recent NAS/NAP study of uranium mining in Virginia.

Dr. Luttrell is also well qualified to assist in the distribution of information obtained from this project. Dr. Luttrell actively promotes technology transfer and has presented numerous short courses and workshops for the mining and related industries. Since 1992, he has presented 39 short courses and 126 workshops, which represents an average of more than 8 professional development events per year during this period. He participates in a variety of extension activities including field services for industrial organizations, federal and state agencies, engineering firms, manufacturers, and chemical suppliers.