Overview of the Acid Drainage Technology Initiative (ADTI)

INTRODUCTION

The Acid Drainage Technology Initiative (ADTI) was initiated in 1995 by federal agencies, the National Mining Association and the Interstate Mining Compact Commission to identify, evaluate and develop cost-effective and practical acid drainage technologies. In 1999, ADTI was expanded through the addition of the metal mining sector group, which is focused on drainage quality issues related to metal mines. ADTI addresses drainage quality issues from abandoned, active, and future coal and metal mines.

ADTI is a technology development program. It is not a regulatory or policy development program. The guiding principle of ADTI is to build consensus among industry, federal and state regulatory agencies on acid drainage technology development and technology transfer issues. ADTI is focusing its efforts on mine drainage prediction, sampling/monitoring, modeling and avoidance/remediation, mitigation and pit lakes.

Origin and Evolution of ADTI

The Acid Drainage Technology Initiative (ADTI) developed its name and mission statement in the fall of 1995, although its origin can be traced back to the Third International Conference on the Abatement of Acidic Drainage in Pittsburgh, PA in April 1994. During 1994 and 1995 discussion and correspondence of this consensus building concept lead to the formation of a planning committee in September 1995. David Finkenbinder of the National Mining Association (NMA), Gregory E. Conrad, Executive Director of the Interstate Mining Compact Commission (IMCC), Paul Ziemkiewicz of the National Mine Land Reclamation Center (NMLRC) and Hammond Eve of the Office of Surface Mining Reclamation and Enforcement (OSM) were the principal organizers of the Planning Committee, although representatives from other federal agencies including the Bureau of Land Management (BLM) and the Environmental Protection Agency (EPA) served on the planning committee. NMA appointed several coal mining and metal mining industry representatives to the planning committee, and IMCC appointed several representatives from three state regulatory agencies. The Planning Committee determined that this organization would be named the Acid Drainage Technology Initiative in order to represent the interests of both acid mine drainage (AMD) issues related to coal mining, principally in the eastern United States, and acid rock drainage (ARD) issues related to metal mining, principally in the western United States.

The name ADTI was also selected to provide a central focus on technology development and technology transfer for the organization, rather than regulatory or policy issues. The National Mine Land Reclamation Center (NMLRC) at West Virginia University was designated as the Secretariat of ADTI. The NMLRC and the Planning Committee produced a white paper, dated December 7, 1995 to serve as the foundation for ADTI, and the work of the planning committee was largely replaced by the newly formed Operations Committee.

The Planning Committee decided that the major technical functions of ADTI could be accomplished by two working groups, one on prediction and the other on avoidance and remediation methods. Initially, a number of other committees were considered, but it was decided to keep the organizational structure simple, and to allow these two working groups to

develop a number of subcommittees as needed to efficiently accomplish their work. Working Group 1 developed the following three subgroups on various aspects of mine drainage prediction: (1) Overburden Analysis Test Methods, (2) Sampling and Alternate Sources of Information and (3) Field Validation.

Working Group 2 established the following four subgroups to address the array of existing and developing acid drainage avoidance and remediation technologies: (1) Passive Treatment, (2) Alkaline Addition & Overburden & Refuse Reclamation, (3) Active Treatment Technologies, and (4) Engineered Structural Techniques.

Pursuant to the organizational plan in the December 7, 1995 paper, the roles of the Operations Committee were to:

- Coordinate work of Working Groups,
- Provide guidance to Working groups,
- Monitor progress of the Working Groups and
- Monitor and facilitate the consensus-building process.

The objective of ADTI was set forth in the December 7, 1995 paper as follows: "To identify, evaluate and develop cost-effective and practical acid drainage technologies which will facilitate decision-making and subsequent compliance with permit conditions. As a technology development program ADTI aims to identify and develop the best science available in the field of acid drainage. ADTI recognizes the distinction between technology development and its implementation in the regulatory process. ADTI is a technology development program. It is not a regulatory or policy development program. The latter is outside the scope of ADTI and is within the jurisdiction of state and federal regulatory agencies."

Within the strategy section of that paper, the ADTI mission statement is defined as: "The guiding principle works toward a consensus among industry, federal and state regulatory agencies. Consensus on proven technologies in the areas of prediction, avoidance and remediation will assist both industry and the regulatory agencies."

Early meetings of the Working Groups demonstrated the great value of coal mining and metal mining representatives working together on common objectives and acid drainage problems confronting both sectors of the mining industry. Similarities and differences between coal mining and metal mining interests and experiences became apparent very quickly. Many of the physical, chemical and biological factors affecting acid drainage formation are quite similar in the eastern and western U.S., and consequently the coal mining representatives learned much from the metal mining representatives about relevant scientific literature and applications of prediction test methods, for example kinetic test methods that are used more frequently in the western U.S. However, significant differences in geology, climate, mining practices and regulatory procedures between metal mining and coal mining caused the working groups and the Operations Committee to rethink and modify some of the initial goals. For example, the mining industry, federal agency, state agency and university members on the prediction working group worked very well together for almost two years in organizing and developing the contents of the prediction handbook, but it became obvious by November, 1997 that a single prediction report would not adequately address or satisfy the various interests and concerns of the metal and coal mining ADTI members. It would be a forced fit, like trying to make a square peg fit into a round hole. Consequently, it was determined that the ADTI report series would contain two prediction volumes, the first devoted to coal mine drainage prediction, and the second to follow with the specific aspects of metal mine

drainage prediction. At approximately the same time, the draft report of the avoidance and remediation working group was being completed, and it was determined that this handbook would principally address coal mine drainage problems, with other volumes to be produced that pertain chiefly to the remediation of metal mine drainage problems. The report by Skousen et al (1998) published on June 1, 1998 as the initial report in the avoidance and remediation series, addresses coal mining issues.

The Metal Mining Sector of ADTI was organized in August, 1998, in order to more efficiently represent the interests of the metal mining industry and the federal and state agencies involved with that industry and the remediation of abandoned metal mine sites. In this context, more efficient representation means conducting ADTI work pertaining to metal mining in a more coordinated and coherent manner than was possible when metal mining and coal mining members were mixed together in the same working groups. For approximately nine months the Metal Mining Sector (MMS) was referred to as "Working Group 3", although it contained a number of different committees or subgroups including a Funding Committee, a Review Committee, a Prediction Committee, a Modeling Committee and a Mitigation Committee. In April, 1999 the Operations Committee voted and approved the addition of four MMS members to the Operations Committee, including the Chairperson of the MMS. From that point, the major organizational components of ADTI became the Coal Mining Sector (CMS) and the Metal Mining Sector (MMS), rather than three working groups.

Subsequently, the Coal Mining Sector appointed a chairman to balance the organizational structure and communications functions with those of the Chairperson of the MMS. The MMS Steering Committee solicited proposals for a Western University Center for ADTI, and in October 1999, approved the University of Nevada at Reno as that center. The result of this four year evolution in the functions and structure of the ADTI organization has been the development of a more balanced organization with better capabilities in technology development and technology transfer.

Present ADTI Organizational Structure

The composition of the ADTI Operations Committee is shown in Figure 1, and the present organizational structure of ADTI is shown in Figure 2. The representation of Operations Committee members is shown in column one of Figure 1, and the names of the current members and their regular place of employment are shown in columns two and three to depict the professional and geographical diversity of the committee members. Since the technical committees of the Coal and Metal Mining Sectors are essentially separate entities as shown on Figure 2, the Operations Committee has at least two important additional roles, beyond those delineated in the December 1995 paper. These two relatively new roles are: (1) to ensure consistency in the content and quality of technology development and technology transfer activities of the CMS and MMS, and (2) to promote, to the maximum extent possible, equal funding for the CMS and MMS programs, and adequate funding for all CMS and MMS committees and research priorities.

Representatives of the eastern and western university centers are members of the Operations Committee, as shown in Figure 1, because these university centers and their affiliated cooperating universities have a very important role in the technology development and technology transfer functions of ADTI. The functions of these university centers are described in more detail in the next section of this paper.

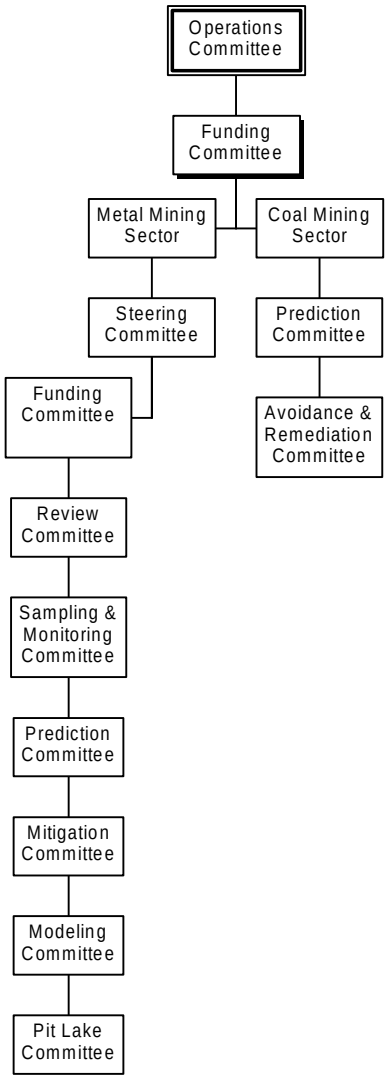
The organizational structure of the CMS as shown in Figure 2 is essentially the same as the original ADTI structure, with two major committees or working groups (Prediction, Avoidance & Remediation) that are composed of several subgroups. The MMS committee structure is significantly different as shown in Figure 2, and hence will be described below. The MMS is composed of seven committees listed in Figure 2.

Figure 1. ADTI Operations Committee

Representation	**Name**	**Place of Employment**
Chairman - BLM	David Williams	BLM – Butte, Montana
CMS Chairman	John Craynon	OSM – Washington, D.C.
CMS- IMCC	Roger Hornberger	Pennsylvania Dept. of Environmental Protection
CMS – Industry	Ken Johnson	CONSOL Energy
CMS – A&R	Barry Sheetz	Pennsylvania State University
CMS – Prediction	Jeff Skousen	West Virginia University
Eastern University Center	Paul Ziemkiewicz	West Virginia University
MMS Chairman	Virginia McClemore	New Mexico Bureau of Mines and Geology
MMS – Industry	Charles Bucknam	Newmont Mining Corp.
MMS – Federal	Nick Rieger	BLM – Washington D.C.
MMS – State	Harry Posey	CO Department of Natural Resources
Western University Center	Dirk van Zyl	University of Nevada at Reno
Secretariat	Lisa Corathers	National Mining Association
Ex Officio Advisor	Karen Bennett	National Mining Association
	Susan Carver	National Mining Association
	Greg Conrad	IMCC

The Metal Mining Sector Steering Committee is made up of metal mining industry, state, federal and academic representatives, which were initially approved by the Metal Mining Sector members, as well as the chairpersons who are elected or appointed by the individual technical and support committees. The Metal Mining Sector Steering Committee appoints the MMS Chairman and the representatives to the Operations Committee.

Figure 2. Organizational Structure, 2001



Five technical focus areas were identified: (1) Sampling/Monitoring, (2) Prediction, (3) Mitigation, (4) Modeling and (5) Pit Lakes. Each focus area has its own Technical Committee which is responsible for selecting its chair and membership. The ADTI-MMS Steering Committee is responsible for developing operating procedures, setting and overseeing the research and technology transfer agenda. Two support committees: (1) Funding and (2) Review assist the Steering Committee in administering the work programs.

The Funding Committee coordinates activities related to obtaining funding for the Metal Mining Sector activities prior to action by the Metal Mining Sector Steering Committee. The Review Committee coordinates activities related to developing the Metal Mining Sector Workbook; including consensus process development, editorial coordination and linkage coordination.

Each of the five technical committees has a similar function in producing workbook sections on metal mining and metallurgical material drainage quality. For example, the Prediction Committee is responsible for writing the workbook section on prediction of drainage quality and for guiding technology development efforts concerning prediction to manage drainage quality from mining and related metallurgical materials for future, active and abandoned mining and associated metallurgical operations.

Other technical committees and topics deemed of interest by the Metal Mining Sector Steering Committee may also be added to the workbook effort. A report section has been started on tools beneficial to predicting mine waste drainage quality, and outlines have also been started for the other sections of the workbook. The prediction report section addresses traditional techniques for solid-phase chemical and mineralogical analyses, static tests, rapid leach tests for metals, kinetic tests, and reference samples for checking analytical results.

General Goals of ADTI

There are at least five reasons why the Acid Drainage Technology Initiative is needed. They are referred to as general goals here because they are almost equally relevant to coal mining AMD problems in the eastern U.S. and metal mining ARD problems in the western U.S.; as well as acidic drainage problems in general from mining operations throughout the world. They are also relevant to other organizations and governmental agencies, whose mission includes efforts to solve acidic drainage problems associated with active and abandoned mines. These reasons are listed below, and will be discussed briefly in this section as they relate to ADTI goals.

1. Reduce the extent and severity of AMD/ARD impacts on surface waters and ground waters throughout the U.S.

2. Recommend the application of sound science to make sense of the international information explosion concerning AMD & ARD.

3. Resolve the scientific and legal controversy over prediction methods for mine drainage quality by improving and developing consensus on these test methods.

4. Refine avoidance, mitigation, and remediation technology to prevent, treat and abate AMD/ARD pollution in an effective and economical manner.

5. Rely upon the consensus building process to facilitate the solution of mine drainage problems with the participation and mutual benefit of the mining industry, government agencies, university researchers and other stakeholders.

Within the past 30 years, there have been numerous completed and ongoing efforts to inventory the number of streams miles affected by acidic drainage from mines throughout the United States. Much of the acid mine drainage occurring in the Appalachian Coal Region is emanating from abandoned surface and underground mines which were mined and abandoned prior to the enactment of the Federal Surface Mining Control and Reclamation Act of 1977 (SMCRA) and the Federal Clean Water Act (CWA). According to the Appalachian Regional Commission (1969), 78% of the acid mine drainage produced in northern Appalachia is associated with inactive or abandoned mines. More recent U.S. Geologic Survey (USGS) reports (Wetzel and Hoffman, 1983, 1989) provide summaries of surface water quality data and patterns of acid mine drainage problems throughout the Appalachian Coal Basin. A set of companion reports (Hoffman and Wetzel, 1993, 1995) contain similar information for the Interior Coal

Province of the Eastern Coal Region of the United States. Current data compiled by IMCC and EPA document that the number one water quality problem in Appalachia is drainage from abandoned coal mines, affecting over 9,500 miles of acid mine drainage polluted streams in Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Tennessee and West Virginia. A 1995 EPA Region III survey found that 5,100 miles of streams in four Appalachian states are impacted by acid mine drainage, predominantly from abandoned coal mines. Pennsylvania alone accounts for approximately 2,600 acid mine drainage impacted stream miles.

There are currently no accurate water-quality data that give a meaningful measure of the total impact of historical hardrock metal mining activities on surface waters in the western U.S. There is not even an accurate assessment of the number of abandoned hardrock sites on federally administered lands in the western U. S. (Shea, 2000). Estimates range from approximately 50,000 sites to over 500,000. Few of these sites are impacting water quality, but these numbers indicate the magnitude of even quantifying the nature of the problem. In 1991, the Western Governors Association (WGA) compiled data on impacted stream miles in a scoping study of inactive and abandoned noncoal mines in the western U.S. That study found a total of approximately 3,350 damaged stream miles in Arizona, California, Colorado, Montana, New Mexico and Utah. However, legitimate concerns have been expressed about the accuracy of some of these data, in the context of interpretations and inferences from the data. For example, in the approximately 1,300 miles of streams affected by mining in Colorado in that data set, it is believed that the incidence of sediment-bearing samples (i.e. relatively high total suspended solids (TSS) and high total metals), although accurately analyzed in the laboratory, inflates the number of stream miles actually affected by relatively high concentrations of dissolved ionic metallic species.

More recent data are available for the six western states mentioned above, and other metal states from the EPA 303 (d) lists of impaired stream segments used in the Total Maximum Daily Load (TMDL) Program. From those 303 (d) lists for 1999 it could be concluded that approximately 15,900 stream miles in metal mining states are impaired by in-stream concentrations of metals and other inorganic pollutants, but it cannot be concluded that all of these impaired stream miles are attributable to metal mines. That is because the effects of industries other than metal mining and other sources of metals pollution are included in those numbers. State and federal government agency members of ADTI believe that the numbers may be used to infer some upper limit of impacted stream miles, but that more accurate inventory work needs to be completed, specifically related to abandoned metal mines.

The USGS is working with several western states to prepare a more accurate estimate of the number of stream miles impacted by ARD from historical metal mines. Bed sediments can affect aquatic habitats, and metals from historical hardrock metal mining activities can be bioavailable, and thereby enter and impact the food chain. The USGS estimates that more than 40 percent of the watersheds in and west of the Rocky Mountains have been potentially impacted by historical hardrock metal mining activities. Many of these watersheds, however, occur in arid climates where the impact on aquatic resources is minimal. (Church, personal communication, 1999).

The purpose of this discussion is to document that the impacts of acidic drainage from metal and coal mining are extensive and can be severe in mining regions in both the eastern and western U.S. To reduce these impacts and improve water quality in these mining regions will require the type of cooperation among the mining industry, federal and state agencies, and university researchers that ADTI is promoting. For example, remining regulatory incentive

programs and remining operations have resulted in a significant reduction in AMD pollution in Pennsylvania and other states with established remining programs.

The second item in the list of general goals of ADTI refers to the international information explosion on acidic drainage (AMD & ARD) in recent years, which is following a pattern observed in the growth, availability, and quality of scientific information in general.

Although a few citations predate 1950 most of the literature on acidic drainage related to mining has been written in the past 50 years. This body of literature is now very large and is growing rapidly every year. For example, the proceedings of the Third International Conference on Acidic Drainage (ICARD) in 1994 are in four volumes totaling 1648 pages. The following year, the Sudbury 95 conference produced three volumes totaling 1258 pages. The 1997 Vancouver ICARD and the 2000 Denver ICARD were similar in size and scope to the earlier proceedings. The annual proceedings of the American Society of Surface Mine Reclamation (ASSMR) in recent years are contained in a single large volume that resembles the New York City phone book in size; in 1996 it was 875 pages, 787 pages in 1997, 777 pages in 1998, and 736 pages in 1999. In addition to the large amount of scientific papers presented in these mine drainage conference proceedings, each year, there is an even larger amount of mine drainage literature produced annually in numerous journals and periodicals, such as Mine Water and the Environment (Journal of International Mine Water Association).

It is very difficult for mine drainage researchers to keep current with all of this scientific literature. How much of this literature is really read by the average mine operator or mining consultant, who should be aware of significant technological developments that may affect their business? How much of this literature is regularly read by the average permit reviewer or mine inspector in a state or federal regulatory agency who needs to know about major advances in mine drainage prediction, prevention, treatment and abatement technology in order to competently perform their duties? Furthermore, is the average member of a watershed association or other citizens group aware that most of this literature exists, let alone what is worthwhile to further their interests in reducing mine drainage pollution?

Amidst the many mine drainage papers contained in conference proceedings and other volumes of the literature are some papers which represent really good science and some which, unfortunately, represent not-so-good science. The ADTI organization and its members have been working to address these quantity and quality aspects of the mine drainage literature in several ways: by compiling bibliographies and literature reviews on selected topics (e.g. prediction methods); by employing the consortium of members and the consensus building process to produce technological developments that are mutually beneficial to the mining industry, government agencies and others; and by promoting technology transfer of significant findings in the scientific literature. The technology transfer aspects of ADTI are being promoted through the handbook report series, such as Skousen et al (1998), and through information updated on the ADTI website.

The third and fourth items in the list of general goals of ADTI will be addressed jointly because they have similar roots and they both have resulted in large unnecessary expenditures of money, time and other resources of mining companies, regulatory agencies and others. The scientific and legal controversy over the accuracy of the test methods used to predict coal mine drainage quality has been continuing for more than 20 years (i.e. prior to SMCRA requirements). During this time, millions of dollars have been expended in attorneys fees and expert witness fees in many appeals of permit denials and permit issuances, where the accuracy, precision and interpretations of the prediction test methods were central issues in the lawsuit. In addition,

millions of dollars have been spent by coal mining companies in permit applications, permit appeals and other mine drainage litigation cases, for the laboratory analyses associated with some static and/or kinetic test methods that are known to be unreliable or inappropriate for the intended purpose or specific application of that procedure.

The corresponding problems pertaining to the application of avoidance and remediation technology are that many millions of dollars have been expended by mining companies, government agencies, watershed groups and others on: 1) active and passive treatment systems that do not effectively or economically treat the mine drainage:
2) prevention procedures which fail to actually prevent the formation of acidic drainage at active mine sites; and 3) the application of specific procedures to control, mitigate or abate acidic drainage at active or abandoned mine sites where design, construction and operation of these technologies is simply inadequate to solve the acid drainage problems at these sites.

There is insufficient space available here to provide many detailed examples and extensive documentation of the millions of dollars spent unnecessarily or inappropriately on the prediction and mitigation problems described above. Also, much of the case-specific data on legal and expert witness fees and site-specific or nationwide data on mitigation expenses is proprietary or otherwise difficult to obtain. However, from recent cases in Pennsylvania where some litigation fees are made public because judges award recovery of these fees to the winners of the litigation, it can be shown that individual cases where the total of attorney and expert witness fees are in the range of $500,000. to $1,000,000 are not unusual. Not all of these apparently wasted expenses are avoidable, but they can be significantly reduced through better technology development and technology transfer.

Two major components of the ADTI mission are to improve mine drainage prediction methods through the consensus building process, and to refine mitigation technology to prevent, treat and abate AMD/ARD pollution in an effective and economical manner. The ADTI members believe that it is more productive to solve differences of opinion on prediction methods through the application of good science and consensus building rather than litigation. An example of this is the book edited by Brady et al. (1998) which is the outgrowth of a major lawsuit on prediction methods between the Pennsylvania Coal Association and the Pennsylvania Department of Environmental Protection. ADTI members are confident that the works in progress by the prediction committees of the CMS and MMS will produce meaningful results to advance the state of the art and science of mine drainage prediction. The ADTI members are absolutely committed to using this consensus building approach to recognize and refine proven mitigation technologies and to develop and promote new technologies to ameliorate mine drainage problems in metal and coal mining regions.

The Functioning of ADTI

Most of the current and future work of ADTI will be completed by the committees shown in Figure 2 and the university centers. The committees are composed of members from the mining industry, state and federal regulatory and research agencies, commercial laboratories, consulting firms and university researchers. That diverse collection of members and interests promotes technical information exchange, consensus building on which technologies do and do not work well, and the delineation of mutually beneficial research needs. The university centers serve as focal points for technology development and technology transfer, through their laboratories and other research and educational facilities and staff.

The NMLRC at West Virginia University (WVU) has been the focal point for the activities of the CMS since the start of ADTI in 1995. The Pennsylvania State University (PSU) is a partner with WVU in the NMLRC, and is increasing its involvement in ADTI activities through the efforts of key research professors on several CMS committees. The eastern universities were chosen based on their proximity to critical problems areas and experience. Both West Virginia and Penn State Universities have long histories of successful research and demonstration. Indiana University of Pennsylvania (IUP) is located in the heart of a major acid drainage area, which is rich in potential demonstration sites and can network with nearby watershed organizations. The program at IUP is led by its National Environmental Education and Training Center. It developed the initial web page and other technology dissemination tools. It will also assist in training both students and community-based watershed organizations in acid drainage technologies and their applications.

The University of Nevada, Reno (UNR) was selected as the Western University Center for ADTI. The newly formed Mining Life-Cycle Center (MLC) of the Mackay School of Mines will administer the Western University Center. Through the MLC a Western University Consortium (WUC) consisting of five universities (University of Nevada, Reno, University of Alaska, Fairbanks, University of Idaho, University of Utah and New Mexico Institute for Mining and Technology) will cooperate in performing MMS related research. This will be accomplished through a Coordinating Committee of representatives from each institution. The WUC could be expanded in the future to include other Universities with expertise and interest in ADTI-MMS research. Membership in the ADTI-MMS University Research Network remains open to qualified universities interested in competitive bidding on future research projects.

Through the WUC, the ADTI will have access to a larger pool of technical expertise. Excellent laboratory and analytical facilities at all the member institutions of the WUC will be available for research activities, as well as experts with knowledge of a wide range of climatic conditions. These researchers have close relationships with local regulatory and industry representatives, allowing access to a much broader base for data gathering, experience sharing, information dissemination and other professional activities.

The WUC team will work closely with the ADTI-MMS Steering Committee to accomplish the following:

- Administer competitive research sponsored by funding identified and made available by the ADTI-MMS Steering Committee,
- Define research needs and potential funding sources,
- Obtain funding through the Congressional budget process, and
- Conduct workshops, or other activities, to transfer technology of ADTI-MMS compilations and technologies.

A process will be established to develop a competitive research program that will be widely advertised and open to research organizations consistent with the program requirements. A review process will be established to ensure that a consensus-building procedure is used in reviewing and finalizing reports, research proposals and procedures, through the coordination of the Review Committee. Research needs will be identified and requests for proposals will be developed by the technical committees. Activities will be aligned with funding opportunities through the coordination of the Funding Committee.

The Metal Mining Sector of ADTI will maintain close communication with the coal sector, to optimize technology transfer on topics common to both types of mining. The informational base developed by the Canadian initiative Mine Environment Neutral Drainage (MEND) will be considered, as well as past efforts in the U.S. Communication will be maintained with efforts presently in progress, including those sponsored by the Western Governor's Association (WGA), Australia, Sweden, Canada and its provinces, and the International Network for Acid Prevention (INAP).

Results and Expectations of ADTI

In June 1998, the Avoidance and Remediation Working Group of the CMS, under the direction of Chairman Charles Miller, completed its workbook, entitled "A Handbook of Technologies for Avoidance and Remediation of Acid Mine Drainage", by Skousen et al. (1988). That report was published by the National Mine Land Reclamation Center at West Virginia University, and copies can be obtained from the NMLRC. The contents of the report are also available from the ADTI-CMS website at www.nrcce.wvu.edu/nmlrc/. The address of the ADTI-MMS website is http://www.mackay.unr.edu/adti/ Additional information about the websites is discussed below.

The prediction workbook of the CMS, edited by Dr. Robert Kleinmann, original chairman, CMS Prediction Working Group, was published by the NMLRC in December 2000 with funding provided by OSM and NMA. The report is available on the CMS website.

The initial focus of ADTI-MMS was to develop a workbook covering the five areas served by the Technical Committees, with each Committee taking responsibility for writing one chapter. Preparation of the workbook was completed with financial support from OSM, and coordination through the NMLRC, and the University of Nevada at Reno, and is undergoing reviews in 2001 on the ADTI-MMS website. Preparation of the Prediction Chapter, sponsored by the EPA Mine Waste program, is also proceeding in 2001.

In addition to the workbook project, the ADTI-MMS Prediction Committee is actively working in a cooperative program with the American Society for Testing and Materials (ASTM), USGS, EPA and the National Institute of Standards and Technology (NIST) in development of standardized testing methods for mine and metallurgical waste characterization, as well as a series of mine waste standard reference materials. This program was extended into the coal sector to prepare a shale standard reference material for their acid-base accounting methods.

The ADTI website ultimately will have two components, structured to the needs of its internal and external users. The internal audience will access communication centers for the Operations Committee, and each technical committee. These will be set up so that members can hold on line meetings and thus minimize travel. Technical issues can be debated as the organization develops consensus. In addition, the website will be the window for members to get updates on activities and to share ideas.

The external users will be able to access information, which the Operations Committee has cleared for public release. For example, the workbooks prepared by the technical committees will be indexed and placed, in searchable format, on line. In addition, the external site will be a resource for the public to access spreadsheets enabling them to perform otherwise complicated calculations regarding conversions, flow calculations, acidity, treatment cost options and other mine drainage information.

The preparation of the ADTI workbooks has been partially funded by OSM and NMA. In addition, OSM has provided financial support for the development of the CMS website and other activities of the NMLRC and its affiliated universities (WVU, PSU and IUP). The MMS has received some financial support from EPA and WGA, and some further work is planned with UNR and other members of the WUC with support from the U.S. Army Corps of Engineers.

Significant additional funding will be required to complete some of the bigger and more long-term projects, objectives and expectations of ADTI. The Operations Committee is exploring the development of a partnership of federal agencies to fund some mutually agreed upon priorities in field demonstration technology projects and research and development program projects. For example, the U.S. Army Corps of Engineers (USACE) is planning to develop a database on mitigation technologies in cooperation with ADTI. That database development effort is consistent with ADTI long-term goals of building national database components for mitigation technologies and the field validation of mine drainage prediction techniques. Some field validation database development has already been funded by EPA in Pennsylvania and OSM in West Virginia, with plans to continue these efforts in other states. A partnership among OSM, USACE, EPA and other federal agencies (eg. BLM, DOE, USGS, USFS), coordinated with ADTI and its eastern and western university centers, could develop several useful national mine drainage database components for the mutual benefit of these federal agencies, state regulatory agencies, the mining industry and other stakeholders.

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