Oversight Report

Evaluation Year 2011

Office of Surface Mining

Reclamation and Enforcement

Casper Field Office

Surface Water and Groundwater Monitoring

Special Study Oversight Evaluation

Montana

August 15, 2011

Introduction – Surface Water and Groundwater Monitoring Oversight Evaluation

The Office of Surface Mining Reclamation and Enforcement (OSM) Casper Field Office (CFO) and the Montana Department of Environmental Quality (MDEQ) Industrial and Energy Minerals Bureau (IEMB) selected surface and groundwater monitoring as a special study oversight evaluation topic for evaluation year 2011. This topic was selected for review after CFO received input from stakeholders, in response to CFO's outreach conducted to solicit oversight topics. The evaluation was conducted to determine compliance of permit-specific surface and groundwater monitoring requirements with hydrologic monitoring requirements, as defined by Montana state program rules; and to determine the overall effectiveness of surface and groundwater monitoring. CFO's Detailed Oversight Work Plan for conducting the evaluation recommended that CFO and MDEQ staff evaluate 20 per cent of all active coal mine permits in Montana. The CFO and IEMB staff selected five permitted areas of Western Energy Company's (WECO) Rosebud Mine complex (Areas A, B, C, D and E) for evaluation.

WECO's Rosebud Mine complex and adjacent areas contribute to a convoluted hydrologic setting. A power plant, adjacent to the mine complex, with related activities such as leaking fly ash ponds affect water quality at the eastern (down gradient) permit margin. There is discussion in the Cumulative Hydrologic Impact Analyses (CHIA) about numerous perturbations to the hydrologic system from industrial and domestic non-mining activities in the Colstrip area.

Dynamics of mining within the WECO complex include open pits that intercept groundwater, inconsistent groundwater recovery due to changes in mining focus (may have some recovery in areas during periods of inactive mining, but resumption of mining may cause decline in groundwater levels again), localized hydrologic setting changes (e.g. Area D is "high and dry" and therefore will recover slowly), and various stages of reclamation.

Evaluation Methodology Used by the OSM-CFO/MDEQ-IEMB Evaluation Team

The evaluation team was comprised of staff from the MDEQ-IEMB and staff from OSM-CFO. Evaluation team members included Jim Consort, Tom Golnar, Angela McDannel, Melissa Mitchem, Alan Boehms (Team leader) and John Sieving. The evaluation team performed the review April 19-20, 2011 at the IEMB office facilities.

The evaluation focused on reports/data received from mine operators, permit revisions, field inspection reports, and correspondence relevant to surface and groundwater monitoring for the five-year period ending December 31, 2010, of five permitted areas of Western Energy Company's Rosebud Mine complex (Areas A, B, C, D and E). Specifically, the reports/data review consisted of (1) Annual Hydrology Report (AHR) Reviews, (2) Inspection Reports, (3) Monitoring Plans, (4) Cumulative Hydrologic Impact Analyses (CHIA), (5) Minor Revisions, and (6) miscellaneous documents consisting of various correspondence.

The surface and groundwater monitoring work plan specified three measures of the overall effectiveness of monitoring. The first measure was based on the monitoring plans and water parameters monitored. The second aspect was based on MDEQ utilization of monitoring data for substantiating requirements for Montana phase IV bond release (demonstrating disturbance to the hydrologic balance has been minimized and offsite material damage has been prevented). The third measure was based on MDEQ utilization of monitoring data for recognizing any significant trends in fluctuations of water quality parameters or water quantity/flow that could influence future permitting of hydrologic monitoring plans or specific mining and reclamation practices in Montana.

Findings of the OSM-CFO/MDEQ-IEMB Evaluation Team

Review of State Documents

Annual Hydrology Report (AHR) Reviews

- MDEQ receives semi-annual monitoring report data which is also included in the annual report along with data from the last half of the monitoring year.
- Response letters from MDEQ to Operators regarding deficiencies and recommendations are identified during review of the AHR
- Electronic copies of previous reports and data are well organized and archival data is comprehensive (cumulative) for easy access and review

Inspection Reports

- Examples of discipline specific (groundwater and surface water) field examination and evaluation of monitoring sites and equipment contain identification of problems

Monitoring Plans

- Kept current as changes are needed; updated plan reported in each AHR
- Listed water quality parameters, list monitoring sites and frequency of monitoring at each site

Cumulative Hydrologic Impact Analyses (CHIA)

- CHIAs for amendment applications 180 (Big Sky) (2008), 172 (2006), 184 (2011- in progress)
- Contain summaries of historic and current hydrologic responses to mining using monitoring data (hydrologic responses/changes to mined aquifers, aquifers adjacent to or below mining, spoil water recovery)
- Graphs show changes in water level (hydrographs), water quality, surface water flows and water levels (streams, ponds, springs)

- Maps show
    - mining disturbance and reclamation of drainage basins within cumulative impact area
    - potentiometric surfaces and changes in water levels over time of affected aquifers
    - monitoring site locations, private wells, springs, ponds (water resources)
    - contour maps of water quality changes over time

Minor Revisions

- Updates in monitoring plans

Miscellaneous Documents

- Correspondence between Department and Operator regarding monitoring site insufficiencies or problems
- Written findings (Area B Renewal 2010) response to interest group concerns regarding water quality and adherence to statute and rules

Monitoring Plans and Water Parameters Monitored

Compliance of permit-specific surface and groundwater monitoring requirements with hydrologic monitoring requirements was conducted by reviewing monitoring plans of the specific permits. Montana rules that address groundwater and surface water monitoring are found at ARM 17.24.645 and 646. These sections refer back to ARM 17.24.314 – Protection of the Hydrologic Balance. Monitoring sections of permits are required to include quality assurance/control programs for data management, as required by ARM 17.24.645 and 646.

The monitoring plans within the permits are kept current as changes are needed. Updated plans are reported in each Annual Hydrology Report. The monitoring plans list water quality parameters, monitoring sites and frequency of monitoring at each site.

Appropriate parameter analysis: Concerns about toxins and carcinogens associated with changes in groundwater quality at mine sites has reinforced the commitment of the Department to include testing for additional metals in all water quality analyses. Interest groups have shown particular interest in parameters identified as carcinogenic or toxic (e.g. As, Cd, etc.) during recent comments on renewals.

The MDEQ-IEMB has also been discussing additions, changes and other improvements to hydrologic monitoring plans, field sites, historic and long-term data assessment and analyses to address short and long-term reclamation and bond release issues.

MDEQ Utilization of Monitoring Data for Substantiating Requirements for Montana Phase IV Bond Release

The MDEQ-IEMB is establishing Post-Mining Hydrologic Assessment criteria in planning for future Phase IV releases by establishing the types of data and trends expected to meet regulatory requirements. Historic and current monitoring data will be used to establish whether impacts to the hydrologic balance have been minimized and offsite impacts have been minimized to prevent material damage (statute defined). The MDEQ addressed concerns of interest groups regarding material damage in the recent WECO Area B renewal comment period. In the "Findings For Permit Renewal," the MDEQ-IEMB found no compelling evidence that groundwater quality outside the mine permit area has been affected by mining.

MDEQ Utilization of Monitoring Data for Recognizing any Significant Trends Influencing Future Permitting of Hydrologic Monitoring Plans or Specific Mining and Reclamation Practices

As previously mentioned above under **Monitoring Plans and Water Parameters Monitored**, concerns about the potential for toxins and carcinogens associated with changes in groundwater quality at mine sites has reinforced the commitment of the MDEQ to include testing for additional metals in all water quality analyses.

MDEQ has utilized regional and local peak flow monitoring data and drainage morphology to help estimate bank full channel and floodplain morphology for reclamation. The MDEQ has published channel reclamation guidelines.

Permit commitments addressed in ARM 17.24.501(4)(c) have influenced the MDEQ to devote closer attention to the approval of permit language addressing post mine topography changes which influence surface water runoff / sediment yield (explained on p.7 in C-North surface water CHIA). An example of this permit language is, "… to more closely approximate premine topography and channel configurations utilizing premine profiles and cross sections..."

For Montana Pollutant Discharge Elimination System (MPDES) monitoring, renewals of MPDES permits are utilizing Western Alkaline Standards where appropriate (areas in reclamation). Numeric standards will continue to be used where operations are still active.

MDEQ has been providing technical input, mapping and hydrologic data and field assistance to researchers from the WEPP-Mine project, funded though the OSM Applied Science Program. The WEPP-Mine project, based on the USDA's Water Erosion Prediction Project (WEPP) model and current GIS interfaces for WEPP, is a practical computer simulation tool for evaluating site-specific sediment control and reclamation plans for National Pollutant Discharge Elimination System (NPDES) Western Alkaline Coal Mining Subcategory. The developed tool will allow the user to simulate watershed discharge and sediment yield for pre- and post-disturbance, reclamation areas, and other modeling needs. The development of the WEPP-Mine project includes development of runoff and sediment modeling at WECO's Rosebud Mine and Peabody's Big Sky Mine as representative surface coal mines in southeast Montana.

Summary – Surface Water and Groundwater Monitoring Oversight Evaluation

The reviewers found the five permits are in compliance with the hydrologic monitoring requirements of the Montana rules.

Based on the documents reviewed, OSM found that the MDEQ-IEMB is effectively utilizing monitoring data for (1) substantiating requirements for Montana phase IV bond release and (2) recognizing any significant trends in fluctuations of water quality parameters or water quantity/flow that could influence future permitting of hydrologic monitoring plans or specific mining and reclamation practices.

Some large areas of recent final reclamation (soiled and seeded) such as Area C-North and East part of Area D provide the opportunity for IEMB to begin recovery monitoring of groundwater outside the influence of active mining. These areas are the focus of new well installations in backfill aquifer and aquifer below spoil (sub-McKay aquifer).

OSM found that the MDEQ-IEMB is effectively utilizing monitoring data in planning for future final bond releases by establishing the types of data and trends expected to meet regulatory requirements.

OSM found that the MDEQ-IEMB is effectively utilizing monitoring data in the permitting of hydrologic reclamation plans and in the permitting of mining and reclamation practices related to post mine topography changes.