ANNUAL REPORT
to the COLORADO WATER QUALITY CONTROL COMMISSION
from the HAZARDOUS MATERIALS and WASTE MANAGEMENT DIVISION
COLORADO DEPARTMENT OF PUBLIC HEALTH and ENVIRONMENT

SB 181 Implementation
COMPLIANCE WITH WATER QUALITY STANDARDS AND CLASSIFICATIONS
for the Fiscal Year Ending June 30, 2015

September 2015

This is the annual report provided to the Colorado Water Quality Control Commission (Commission, WQCC) by the Hazardous Materials and Waste Management Division (HMWMD). This report documents HMWMD activities that protect water quality in Colorado, support the mission of the Commission, and implement state water quality standards.

The paragraphs that follow present issues and examples of sites where releases have impacted ground water quality and where HMWMD decisions and actions concerning water quality classifications and standards have established clean-up criteria. There are numerous other examples, not chosen, where the state water quality standards have been used to determine the need for further site investigations or remediation to address chemical releases to the soil, ground water or surface water. Any additional information will be provided to the Commission upon request.

GENERAL

The HMWMD finalized both the Policy and Guidance for the Conditional Closure of Low Threat Sites with Residual Groundwater Contamination in January 2014 and amended the same in May 2014. The current versions of both the policy and guidance are on the CDPHE website.

The purpose of the policy and guidance is to terminate ground water monitoring at some sites with contamination above State standards, by achieving certain remedial objectives and relying on enforceable institutional controls to prohibit exposure to residual contamination. This approach would rely on natural attenuation to gradually restore ground water quality, eventually achieving state standards at some future date.

The policy and guidance were revised to incorporate changes meant to lower the bar on some very high hurdles built into the documents, hurdles that presently make very few sites eligible for a conditional closure determination. The documents were also revised to incorporate suggested comments and changes received during the public review and comment period in late 2010, (including comments received from EPA regarding which sites were and were not eligible for conditional closure) and those public comments received in 2014 after the January 2014 release of the final policy and guidance. Some of those comments and suggestions are reflected in the May 2014 final versions of the policy and guidance.

The guidance also incorporates language establishing alternate concentration limits (ACL) at low threat sites for the purpose of closing them. Section 264.94(b) of the Colorado Hazardous Waste Regulations states: "The Director will establish an alternate concentration limit for a hazardous constituent if he/she finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded." Similar to the WQCC's site-specific standard setting process under § 264.94(b), the HMWMD Director considers a variety of potential adverse effects on ground-water quality when deciding whether to grant an ACL, including such things as: the physical and chemical characteristics of the

waste in the regulated unit, including its potential for migration; local hydrogeological characteristics; the proximity of ground water users; the current and future uses of ground water in the area and; the potential for health risks and damage to wildlife, crops, and vegetation. That plan was incorporated as Appendix A in the "Guidance for the Closure of Low-Threat Sites with Residual Ground Water Contamination".

HAZARDOUS WASTE PROGRAM

No major changes have been made in the Hazardous Waste Program over the last year, which is Colorado's equivalent of the federal RCRA, Subtitle C program. Other than the adoption of the Conditional Closure Policy and Guidance described above, there have been no significant changes in implementing regulations that alter the way in which HMWMD applies Colorado's water quality standards and classifications for discharges to state waters, including ground water.

A review of the Hazardous Waste Program and the various mechanisms contained within the Colorado Hazardous Waste Statute and Regulations governing the protection of state waters may be found in the document entitled "Hazardous Materials and Waste Management Division Report Describing How Programs Are Assuring Compliance With Water Quality Standards and Classifications" (April 16, 1991). As discussed in that report, water quality standards are used as clean-up criteria unless a site-specific demonstration can be made showing that Alternate Concentration Limits (ACL) are equally protective of human health and the environment. As was noted earlier in this report, the HMWMD finalized both the policy and guidance for the conditional closure of low threat sites. These two documents provide interested parties with a process whereby an ACL can be established at RCRA regulated facilities, as is currently allowed under Section 264.94(b) of the Colorado Hazardous Waste Regulations. Although the policy and guidance has been in effect for more than a year and a half, only three conditional closure requests have been received and reviewed by the Hazardous Waste Program (as discussed in last year's annual report), while no requests have been received to establish an ACL in Colorado.

The Hazardous Waste Program's Corrective Action Guidance Document, published in May 2002, provides an overall implementation framework and model scopes-of-work for site characterization, interim actions, evaluation of remedial alternatives and remedy implementation. Section 5.1.3.1 of the Corrective Action Guidance Document states that clean-up standards for ground water are established in "The [Colorado] Basic Standards for Ground Water" ("CBGWS") of the Water Quality Regulations (Section 3.11.0 in 5 CCR 1002-8). The guidance also informs facilities that they have the option of developing site-specific ground water standards and petitioning the WQCC for their adoption.

Site-Specific Summaries

NFA Determinations
Former Cornerstone Cleaners, Arvada

In 2009 the HMWMD was notified that ground water beneath this dry cleaner was found to contain relatively low levels of the dry cleaning solvent tetrachloroethene (PCE). Additional testing was conducted for the purpose of characterizing the extent of contamination in soil and ground water. The remediation technology implemented at the site, a soil vapor extraction (SVE) system consisting of multiple extraction points throughout the tenant space, met its objectives of removing residual PCE from the vadose zone to the degree that recovered vapor concentrations achieved low asymptotic levels. Rebound testing results, presented in the Closure Report received in 2015, indicated that there was no residual mass present beneath the building that would pose a continuing threat to ground water and indoor air. In response to these data, the SVE system was decommissioned. The Closure Report also showed that indoor air monitoring results were well below unrestricted use action levels, and results of ground water sampling indicated that PCE and other associated degradation products were all below applicable Colorado ground water standards. The site was closed in August of 2015.

Former Von Feldt Cleaners, Lakewood

Ground water was found to be contaminated with PCE during a limited Phase II site investigation conducted at a pawn shop in 2005. The property owner's representative shared the information with the HMWMD, pointing to the adjoining upgradient property that housed a dry cleaning facility. The property owner on which the dry cleaner was located was notified of the release and they commenced the process of characterizing the magnitude and extent of the contamination beneath and around the dry cleaning establishment. It was determined that low level ground water contamination was limited primarily to the source property and the downgradient pawn shop property. Under an approved Corrective Action Plan, the facility remediated the source area behind the building by excavating it, backfilling the hole with gravel and piping for the purpose of using it to treat deeper soil and ground water with a chemical oxidant. In the meantime, an environmental covenant prohibiting the use of ground water was placed on both properties. After several rounds of injection, the facility monitored ground water quality for the next several years, during which time the concentrations of PCE steadily declined. After the most recent round of sampling showing that PCE concentrations had fallen below the state standard, the HMWMD reviewed and approved their no further action request in July of 2015. At the same time, the HMWMD terminated the environmental covenants on both properties.

Helmerich and Payne, Grand Junction

In June of 2009, an underground storage tank used to collect wash bay water at the Helmerich and Payne International Drilling Company facility resulted in the discovery of soil that was contaminated with chlorinated solvents and petroleum constituents. The tank was removed and a total of approximately 275 cubic yards of soil was excavated, characterized and disposed of, after which the tank pit was backfilled. Monitoring wells were installed adjoining the former tank pit and elsewhere across the property to determine the extent of contamination. The data showed that the chlorinated solvents were only present in wells located in the immediate vicinity of the former tank pit, not unusual considering the site sits atop weathered Mancos Shale. After monitoring ground water quality for several years in the hope that the contamination would attenuate,

Helmerich and Payne decided to accelerate the process by using a large diameter treatment column to introduce chemical oxidant into the soil in and around the former tank pit. Subsequent monitoring data showed that the method successfully treated the chlorinated solvents. However, the process liberated relatively low levels of fuel related compounds which were the primary contaminants present in the soil that had originally been excavated. Since the chlorinated compounds that the HMWMD regulated had been remediated, we consulted with the Division of Oil and Public Safety's Remediation Section at the Department of Labor and Employment as to what they would do in this situation, considering that they would have regulated the closure of this tank had it not been for the chlorinated solvents present in affected media. Considering that a) the source area had largely been remediated and b) the fuel compounds present in ground water were limited to sample locations in the immediate vicinity of the former tank pit and there was little to no opportunity for them to migrate, we were told that they would normally close such a site when constituent concentrations are relatively low and the contamination is limited to the subject property. With this desire for consistency in mind, the HMWMD issued a no further action determination and closed the site in June of 2015.

Summary Observations

The no further action (NFA) examples noted above are typical of the ground water impacted sites that the HMWMD's Hazardous Waste Corrective Action Unit succeeds in closing each year. These NFA sites consistently exhibit certain characteristics: they are relatively small in size; the source areas, if found, are small in size and are indicative of a limited release to the environment; the ground water contamination is of limited extent; they take between 5 and 10 years to remediate and; contaminant concentrations in ground water are generally under 200 µg/L when they are brought to our attention. These sites have the greatest chance of achieving state ground water standards, assuming that the responsible party has the will and financial resources to perform the necessary work. Those sites with larger source areas with associated higher levels of contamination in soil and ground water take considerably longer to remediate and either remain subject to corrective action for many years, or if are lucky may be eligible for conditional closure. These longer term cleanups that rely on long-term monitored natural attenuation are required to place an environmental covenant on their property in order to manage the limited risk these sites pose by prohibiting access to the affected ground water until it is demonstrated that standards have been achieved. The majority of our corrective action sites fall into this category.

RADIATION PROGRAM

The Radiation Program, in part, regulates the operational activities and cleanup of current and former uranium processing, mining, and disposal facilities. It works to isolate the radioactive and heavy-metal wastes and by-products produced in Colorado from the public and environment. This program works in conjunction with Remediation programs in the HMWMD and implements the Water Quality regulations for surface and ground water at those sites. The Program works with the Division of Reclamation, Mining and Safety and with the Oil and Gas Conservation Commission on issues relating

to treatment or monitoring of radioactive materials in ground water. The Program issues and oversees licenses for uranium mills and other activities involving radioactive material.

Norm/Tenorm Program staff continued to work closely with WQCD staff and Solid Waste Unit staff to implement the guidance document to address proper management and disposal of water treatment residuals that may contain elevated levels of naturally occurring radioactive material (NORM) or technologically enhanced naturally occurring radioactive materials (TENORM). HMWMD and WQCD staff continue to work together to assess compliance for some of the smaller public water supply systems to help them meet treatment requirements while adequately addressing waste management issues for water-treatment residuals. There has been an increase in the number of information requests relative to NORM/TENORM in oil and gas production. The HMWMD is working on how to apply existing policy to the issue of oil and gas production wastes.

Specific Site Summaries

Lincoln Park/Cotter, Fremont County Uranium and molybdenum continue to be monitored in ground water in the Lincoln Park Water Use Area (Operable Unit 2) near the Cotter/Cañon City uranium mill tailings site. Ground water concentrations of uranium and molybdenum have declined down gradient of the Old Ponds Area and in Lincoln Park. The investigation into the source, extent, and nature of uranium in ground water found moving north-northwest from the Cotter facility is being conducted pursuant to the Comprehensive Environmental Response Compensation Liability Act (CERCLA or Superfund). The Superfund remedial investigation/feasibility study process has just begun. In addition, the Cotter facility is undergoing full decommissioning of it radioactive materials license and will meet Superfund and Colorado requirements. Approximately 31 million gallons of contaminated water was removed and disposed of on site during this past year.

All wells tested in Lincoln Park show molybdenum contamination is below ground water standards. The Colorado molybdenum ground water standard is 210 ug/L. However, the Nuclear Regulatory Commission cleanup goal of 100 ug/L molybdenum for ground water is applicable. Some wells in Lincoln Park show uranium contamination above the Colorado standard of 30 ug/L.

UMETCO/Uravan Complete remediation of the Uravan site was accomplished in 2008. ACLs (alternate concentration limits) are in place for several contaminants in ground water. A long-term program of ground water and surface water monitoring is in place to demonstrate that the ACLs continue to be protective of the river and that contaminant concentrations are stable or decreasing now that the source has been removed. At license termination and deletion from the Superfund National Priorities List (NPL), the facility will be transferred to the U.S. Department of Energy for long-term surveillance. EPA is developing a Record of Decision for the site.

Schwartzwalder Mine, Jefferson County The Radiation Control Program licenses the treatment system being used to clean uranium-contaminated ground water before it enters Ralston Creek. Approximately 62.2 million gallons have been treated and discharged this year.

Department of Energy atomic blast sites, Garfield and Rio Blanco Counties The Radiation Control Program advises the Oil and Gas Conservation Commission on the monitoring and testing of ground water for radioactive materials from gas wells being drilled near the Rulison and Rio Blanco atomic blast sites.

REMEDIATION PROGRAM

Superfund Activities The Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund) requires that remedies chosen to address hazardous substance releases must either meet existing standards or, in limited cases, waive those standards. During each remedy selection process, the HMWMD submits a list of state regulations that are either directly applicable to a particular cleanup situation or which are relevant and appropriate requirements (ARARs) to the EPA. Water quality standards are identified after consultation with the WQCD.

Site Specific or Contaminant Specific Summaries

Asarco Globe Site
The Asarco Globe site was originally proposed to be listed on the NPL in 1989. The property was a metals smelting site which started in 1872, and closed down as part of the Asarco bankruptcy in 2008. The state had been working under a consent decree since 1993, and all the work had been completed, except for the groundwater remedy. As a result of the completion of the groundwater remedy earlier in 2015, the site is now meeting groundwater standards at the site boundary. The EPA removed the Proposed NPL status in March of 2015. The state determined in July 2015 that no active remediaton is required at the site. Groundwater monitoring will continue for the next two years to demonstrate that the remedy continues to work as designed.

Captain Jack Mill Located approximately one mile south of Ward in Boulder County, the Captain Jack Mill Superfund Site was added to the National Priorities List to address soil contamination and acid mine drainage from the Big Five tunnel. Surface remediation was completed in 2012 and removed mine waste from floodplains, consolidated and capped it, and installed run-on and run-off controls. A flow-through bulkhead will be installed in the Big Five tunnel in 2016, along with an in-situ treatment system and monitoring arrays. Water quality exiting the tunnel will be monitored for two years, and if necessary, an ex-situ passive treatment system will be required.

Central City/Clear Creek The Central City/Clear Creek Superfund site is located in Clear Creek and Gilpin counties. Over the years, work along the main stem has been completed, including the capping of more than 15 mine waste piles and the construction of a water treatment plant in Idaho Springs to treat the Argo and Big Five tunnel

discharges and Virginia Canyon ground water. Work has been completed on the North Fork, with 25 waste piles addressed through removal or erosion control measures, and construction of an on-site repository and sediment control dams. A flow-control bulkhead was constructed in the Argo Tunnel in 2015. The bulkhead will prevent future uncontrolled surge events from the Argo Tunnel from impacting Clear Creek. A surge event would likely overwhelm the Argo Tunnel Water Treatment Facility, resulting in a fish kill on the main stem and compromising downstream water supplies.

HMWMD is proceeding with plans to construct the North Clear Creek mine water treatment plant. This plant will be constructed south of Black Hawk and treat the Gregory Incline and National Tunnel discharges, along with surface water flowing through Gregory Gulch. Construction is expected to begin in November 2015, with an estimated 16 month construction schedule. HMWMD was unable to reach an agreement with the City of Black Hawk, Central City and Gilpin County to leave enough water in the stream to allow brown trout to survive while still meeting future municipal needs. However, HMWMD is still negotiating with the City of Black Hawk to obtain any augmentation water that may be required due to the operations of the water treatment plant.

In 2014, HMWMD conducted the Five-Year Review on behalf of EPA for the Clear Creek Site. A contractor was hired to review the significant amount of surface water data available for the site, and to conduct a water quality assessment using the WQCD's 303(d) listing methodologies. The assessment was conducted using the water quality standards memorialized in the Records of Decision for the site and the current water quality standards. HMWMD staff then coordinated with the WQCD staff and it was jointly decided to move forward with reclassification of multiple segments of Clear Creek to establish ambient-based standards for those segments where remediation under Superfund has been completed and no further improvements in water quality are expected. However, EPA's water quality staff indicated that they were not prepared to support the proposal, so HMWMD withdrew the proposal prior to the June 2015 hearing. Other issues raised in the Five-year Review prevented EPA from finalizing it in 2014.

Chemical Sales Company Superfund Site 1,4-dioxane at the Chemical Sales Company Superfund Site may be impacting water supply wells operated by the South Adams County Water and Sanitation District (SACWSD). As a result, the EPA and HMWMD are in the process of installing new monitor wells to better characterize the nature and extent of 1,4-dioxane contamination at the Chemical Sales site. The new wells are expected to be installed by the end of November. In addition, the EPA Site Assessment Program has conducted a South Adams County 1,4-Dioxane Site Investigation to determine if there are other sources of 1,4-dioxane impacting the SACWSD wells. The results of the investigation have not yet been released.

Colorado Smelter Site in Pueblo The Colorado Smelter site Superfund National Priorities Listing was finalized December 11, 2014. EPA and CDPHE have begun work on the Remedial Investigation/Feasibility Study.

Eagle Mine Superfund Site During the process to develop a Focused Feasibility Study for additional remediation to meet water quality standards for cadmium, copper and zinc at the Eagle Mine Superfund Site, stakeholders requested a re-evaluation of arsenic in the Eagle River. Arsenic was not selected as a contaminant of concern in the original Record of Decision because it was not detected in the river. However, now that the 0.02 ug/l water + fish standard has been applied to Eagle River segments, an assessment was needed to determine if arsenic may be present at lower concentrations than earlier analytical methods could attain. Data collected during 2012 and 2013 indicate that the 0.02 ug/l water + fish standard for arsenic is not attained in the Eagle River in segments affected by the Eagle Mine. This discovery resulted in postponing the release of the Proposed Plan and correspondingly delayed implementation of additional remediation. Additional studies were conducted to determine the sources of the arsenic at the mine; which appears to be groundwater in the Belden-area, the same source that causes the early spring concentration peak of the other metals as well. HMWMD, on behalf of EPA Region 8, has prepared a Technical Impracticability (TI) Waiver Evaluation Report that will be sent to EPA Headquarters for review and approval. If EPA Headquarters approves the TI waiver of the arsenic standard, then the remedial process will resume. CDPHE has proposed an alternate remedial goal for arsenic in surface water of 6 µg/l for the site, based on risk assessment conducted by EPA toxicologist Dr. Susan Griffin.

Uranium Mill Tailings Remedial Action (UMTRA) Project

Cleanup of the nine abandoned uranium mill sites in Colorado authorized and required by the Uranium Mill Tailings Radiation Control Act has been completed. The nine Colorado uranium mill tailings sites are: Durango, Grand Junction, Gunnison, Maybell, Naturita, Rifle (2 mill sites) and Slick Rock (also 2 mill sites). Although the main human health concern from mill tailings has been abated through surface remediation, residual risk arises from exposure to groundwater containing uranium and other metals such as arsenic, molybdenum and vanadium. Groundwater contamination, resulting predominantly from the disposal of liquid waste (called raffinate) from the uranium milling process, is present at the majority of the Colorado UMTRA mill sites.

The U.S. Environmental Protection Agency (EPA) recognized the difficulty in restoring groundwater at the abandoned mill sites when it established the cleanup regulations for the UMTRA Title I program in 40 CFR 192. These provisions state that if the Department of Energy (DOE) determines that sole reliance on active remedial procedures is not appropriate and the groundwater can be more reasonably cleaned up through natural flushing, then the period for remedial procedures may be extended to a term not to exceed 100 years if:

- The concentration limits are projected to be satisfied at the end of this extended period.
- Institutional control (IC) is instituted and maintained as part of the remedial action at the processing site and wherever groundwater contamination from the site is found, or is projected to be found. Institutional controls, such as land-use restrictions and environmental covenants, must have a high degree of permanence, must effectively protect public health and the environment, must

satisfy beneficial uses of groundwater during the extended period, and must be enforceable by the administrative or judicial branches of government.
- The groundwater is not currently and is not projected to become a source for a public water system subject to provisions of the Safe Drinking Water Act during the extended period.

EPA regulations also allow for the application of Alternate Concentration Limits (ACLs) if the constituent will not pose a substantial present or potential hazard to human health and the environment as long as the alternate concentration limit is not exceeded. The regulations include a number of factors that must be evaluated, including hydrogeologic characteristics and current and future uses of the groundwater, when seeking an ACL. An application for an ACL at an UMTRA mill site must receive the concurrence of the U.S. Nuclear Regulatory Commission (NRC).

Over the past 15 years, HMWMD has concentrated efforts on ensuring that enforceable and effective institutional controls prevent exposure to groundwater at each of the sites. HMWMD also reviews groundwater monitoring data in reports provided by the DOE. In recent years, DOE has requested HMWMD approval of ACLs for some of the sites. HMWMD does not have the independent authority to approve an ACL for an UMTRA mill site, so the HMWMD informed DOE that the ACLs must be approved through site-specific classifications and standards as set forth in the Basic Standards for Groundwater, Regulation 41. HMWMD prepared a document titled "Proposal for Site-Specific Groundwater Standards for UMTRA Mill Sites" which was submitted to the DOE (after review by the WQCD Groundwater Quality Coordinator.) DOE has recently decided to proceed with a request for approval of ACLs through the WQCC process, however, they will need at least 1 year to prepare the necessary documentation for such a hearing (or hearings). HMWMD is continuing to coordinate with the WQCD Groundwater Quality Coordinator on this issue.

Voluntary Cleanup and Redevelopment Activities The Voluntary Cleanup and Redevelopment Act (VCRA) staff continues to encounter issues related to surface and ground water contamination. The staff works closely with the WQCD on each site-specific decision to assure compliance with the appropriate regulations. Meeting ground water standards is an ongoing issue at VCRA sites. Since these sites are most often the subject of real estate transactions, the buyers and sellers try to ensure that the cost of cleanup does not make the economics of the deal unfeasible. Therefore, most cleanup plans focus on source control or removal, rather than treatment of contaminated ground water plumes. The VCRA staff strives to assure that ground water standards are met at the property boundary. HMWMD requires any applicant that exceeds ground water standards at the property boundary to apply to the WQCC for a variance, a site-specific standard, or a change in point of compliance (unless this will only be temporary during cleanup activities and the applicant can show that no surface water body is impacted and no exposure is occurring during this period). This ensures that the program complies with water quality regulations.

SOLID WASTE AND MATERIALS MANAGEMENT PROGRAM

No major changes have been made in the Solid Waste Program that alters the way in which HMWMD applies Colorado's water quality standards and classifications. The Solid Waste and Materials Management Program continues to implement water quality standards and classifications in remedial cleanup actions, enforcement actions, and design and operations reviews for new or existing facilities.