

## 3.5 WATER RESOURCES

### 3.5.1 Surface Waters

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As noted in Section 3.3.4.1 of the GEIS, the Wyoming East Uranium Milling Region encompasses 10 primary watersheds (NRC, 2009a). The Antelope Creek Watershed drains the location for the proposed Moore Ranch Project. Surface waters features both in the vicinity of and within the proposed license area include intermittent streams that flow to the southeast ultimately to the Cheyenne River. Water bodies within the Wyoming East Uranium Milling Region are mainly classified as Class 3B surface waters according to the state classification of designated uses. The designated uses for Class 3B surface waters are recreation, aquatic life other than fish, wildlife, agriculture, industry, and scenic value.

#### 3.5.1.1 Drainage Basins

The Moore Ranch Project area lies within the Ninemile Creek drainage basin which covers an area of 63 square miles. Ninemile Creek is a tributary to Antelope Creek which is a tributary of the South Cheyenne River that ultimately flows to the Missouri River. Seven sub-watersheds occur within the proposed license area and are associated with Ninemile Creek, Simmons Draw, Pine Tree Draw and their tributaries (Figure 3-10). Each of these sub-watersheds drains to the southeast; Simmons Draw and Pine Tree Draw flow into Ninemile Creek. As can be seen on Figure 3-10, Wash No. 1 is an intermittent tributary to Simmons Draw and flows to the west of Wellfield 1. Upper Wash No. 2 is another intermittent stream to Simmons Draw and it bisects the central portion of Wellfield 2.

#### 3.5.1.2 Surface Water Features

The arid conditions in eastern Wyoming limit the formation of year round surface water and wetland features. Regional annual rainfall averages approximately 35.5 cm (14 in) per year while annual lake evaporation may reach 101 cm (40 in) per year. [Note: cross reference this number with what was said in climate section to ensure consistency] Surface waters, particularly in the upper headwaters of watersheds, are seasonal in nature, responding to spring-time snow melt. In some instances, surface waters may manifest intermittent flow conditions in response to extreme rainfall events. Otherwise, rainfall is normally absorbed into the soil.

Despite the arid conditions and headwater setting, linear wetland features and nine small, artificial ponds persist and are scattered across the Moore Ranch Project within low-lying drainages in response to the CBM operations that occur throughout the area. CBM-produced water in the vicinity of the proposed Moore Ranch Project is estimated to contribute 9 to 52 percent of surface flows and could result in perennial flows in formerly intermittent channels (Uranium One, 2009b). Approximately 31 CBM wells occur within the proposed license area, with another 101 located within a 3.2-km (2-mi) radius of the

boundary of the proposed Moore Ranch Project. These operations discharge extracted groundwater onto the surface and are responsible for sustaining the existing surface water features (wetlands and ponds).

The CBM discharges are monitored through three Wyoming Pollutant Discharge Elimination System (WYPDES permits) issued to operators located either within or adjacent to the proposed license area. Surface water flow is discussed in Section 3.5.1.3 of this SEIS.

#### **3.5.1.2.1 Intermittent Streams**

Ninemile Creek, Simmons Draw, and Pine Tree Draw are the dominant streams within the proposed license area. Each of these intermittent streams collect surface water runoff from the numerous drainages or "washes" carved into the landscape (Figure 3-10). Because these channels remain dry most of the year, the channels contain upland vegetation growth. Hydrophytes (plants adapted to saturated soil conditions) persist yearlong only in short reaches where near-surface soil saturation extends well into the summer months from discharge from CBM and livestock wells. As previously noted, none of these intermittent streams drain the basins which encompass the proposed wellfields except for Upper Wash #1 and Upper Wash #2.

The stream channels on the proposed Moore Ranch Project are briefly described below. For purposes of this document, unnamed channels are given designated such as "Tributary A" or "Wash #1." Sub-title designations such as "Upper" and "Lower" relate to sub-watersheds based on water quality sampling stations discussed later in Section 3.5.1.4. A map of the stream channels and contributing watersheds is provided in Figure 3-10.

Ninemile Creek flows through approximately 2.4 km (1.5 mi) of the southwest corner of the proposed license area and drains a total area of 16,316 ha (63 mi<sup>2</sup>). The elevation difference from the headwaters to the mouth of Ninemile Creek is 610 feet over an approximate channel length of 20 miles, with an average gradient of 0.6 percent to 0.7 percent.

Simmons Draw, a tributary to Ninemile Creek, flows to the southeast through the western boundary of the proposed license area approximately 13.8 km (6.8 mi) at a gradient of 0.7 percent, with a drainage area of 8.1 square miles. The total basin elevation difference is 260 feet. Simmons Draw has two main tributaries: Simmons Draw Tributary A (Wash #1) and Simmons Draw Tributary B (Wash #2). Wash #1 has a length of approximately 4.5 km (2.8 mi) with a 1.4 percent gradient. Tributary B (subdivided into Upper Wash #2 and Lower Wash #2) have drainage areas of 1.9 and 0.95 square miles, with channel lengths of 0.46 and 1.3 miles with average gradients of 0.012 and 0.007 ft/ft, respectively. Each of these tributaries are intermittent with fragmented wetlands and ponds based primarily on discharges from CBM and livestock wells.

Pine Tree Draw has a drainage area of 124-ha (8.2-mi<sup>2</sup>) and drains the eastern side of the proposed license area. The total basin elevation difference is 360 over a channel length of approximately 12.2 km (7.6 mi) resulting in a gradient near 0.9 percent. Pine Tree Draw Tributary A has a drainage area of 1.8 square miles, a channel length of 5.1 km (3.2 mi), and an average gradient of 0.014 ft/ft.

Pine Tree Spring, a relatively short tributary to Pine Tree Draw, drains the far eastern side of the proposed license area and has a channel length of approximately 1.1 km (0.7 mi).

#### **3.5.1.2.2 Ponds**

Nine small, disconnected artificial ponds (reservoirs) are scattered across the proposed license area and occur within the channels of Ninemile Creek, Simmons Draw, Pine Tree Draw, and their principal tributaries. These reservoirs have been permitted through the Wyoming State Engineers Office (WSEO) within the proposed license area since they could be impacted by CBM produced water discharge. The ponds are classified as palustrine unconsolidated bottom (PUB) in accordance with the Cowardin classification system (Cowardin et al. 1978) and are generally less than 0.4 ha (1 ac) in size. These surface water features result from accumulation behind structures (dams and dikes), in excavated pits, or from the discharge of pumped groundwater from CBM operations, windmills, or livestock watering tanks (Figure 3-11). [Note: check Figure 3-5-3 of the ER and make sure that pond locations are shown on either figure 3-4 or 3-5 of the SEIS]

#### **3.5.1.3 Surface Water Flow**

The CBM produced water in the vicinity of the Moore Ranch Project is estimated to contribute 9 to 52 percent of the surface water flows and could result in perennial flows in formerly intermittent channels (Uranium One, 2009b). The CBM discharges are monitored through three WYPDES permits issued to CBM operators located either within or adjacent to the proposed license area. Thirty outfalls are monitored under the three WYPDES permits; seven outfalls are located upstream of the proposed Moore Ranch Project and the remaining 22 outfalls are located on the proposed Moore Ranch Project. Eight of these locations are in the vicinity of Wellfield 1 and Wellfield 2.

The average historic discharge rate of the CBM unit with the most permitted outfalls on the Moore Ranch Project was 28,800 gallons per day over a period of eight years (2000 to 2008) compared to a maximum permitted limit of 680,000 gallons per day. Flow from this CBM unit is anticipated to be less than 6,000 gallons per day by the year 2013 (EMC, 2007a). The average discharge from outfalls located in the vicinity (which were not dry) was approximately 15,100 gallons per day.

Peak flood flows were also calculated for each of the drainage basins on the Moore Ranch Project as part of the Draft EIS for the Sand Rock Mill Project, docket No. 40-8743 (NRC, 1982). The Draft EIS calculations were reviewed to determine the validity of the analytical methods and to estimate surface water runoff. The applicant used different methods to estimate peak flood discharges as described in EMC (2007b). Based on this

analysis, it was determined that Wellfield 1 and the central plant were located higher than any region that could potentially be flooded. However, Wellfield 2 could potentially be flooded by a 100-year flood event. Therefore, the applicant proposed to minimize damage to infrastructure in a potential flooding event by avoiding installation in main channels of drainages, properly sizing culverts, and implementing best management practices for embankments, culverts, and drainage crossings.

#### **3.5.1.4 Baseline Surface Water Quality**

The Moore Ranch Project lies entirely within the Antelope Creek drainage basin as shown in Figure 3-10. Antelope Creek and its tributaries are listed as not having been impaired surface waters by the EPA. The WDEQ classifies Antelope Creek Class 3B surface water, meaning it is suitable for recreation, other aquatic life, wildlife, agriculture, industry, and scenic value.

All surface water sample locations within the proposed Moore Ranch Project are characterized as existing stock ponds or areas in drainages where ponding occurs. Water ponded at all surface water locations are typically fed by springtime snowmelt runoff or high intensity rain events in the summer.

As noted above, 31 CBM outfalls occur in the proposed license area under three WYPDES permits. These permits monitor maximum flow, pH, specific conductance, chlorides, total recoverable arsenic and barium, and dissolved iron. Other chemical species are also monitored including total radium-226.

Three sets of surface water samples collected during fall 2006, early spring 2007, and late spring 2007 were analyzed from nine locations within the Moore Ranch Project as shown on Figure 3-4. No surface water samples were collected from locations MRSW-10 and MRSW-11 which were both dry during the above sampling events. Table 3.5-XXXX summarizes the sample results.

The sample results indicate a seasonal variability in surface water quality largely influenced by the CBM operations in the area. The surface water in the ponds typically exhibit saline characteristics of CBM surface discharge (higher conductivity, total dissolved solids, and bicarbonate readings) in the summer and fall when there is less precipitation. The surface water sample results indicate that surface waters are basic, with numerous samples exceeding the CBM permitted pH limit of 9.0. The average of all pH readings during all sampling periods was 9.08, which is above the Wyoming Class I (domestic use), Class II (agricultural use), and Class III (livestock use) standards. Although sampling for lead appears to exceed the 0.015 mg/L Class I standard, the minimal detection limit in the laboratory for lead was set at 0.05 mg/L for the fall 2006 samples. Therefore, the actual lead concentration fell below the 0.05 mg/L detection limit. Subsequent sampling indicated lead concentrations below the lead Class I standard.

As expected, the water samples taken during the fall months at CBM discharge locations commonly exhibited significantly higher values for bicarbonate, carbonate, chloride, conductivity, fluoride, TDS, gross alpha, gross beta, nitrogen, arsenic, potassium, magnesium, and sodium compared to samples taken during the spring months indicating that surface water quality improves during the springtime as a result of diluted surface water from snow melt and/or large precipitation events.

### **3.5.2 Wetlands**

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Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions (USACE 1987).

A wetland delineation was performed as part of the baseline assessment for the proposed Moore Ranch Project using the methodologies outlined in the Regional Supplement to the USACE Wetland Delineation Manual: Great Plains Region (2006) to support reclamation planning and wellfield infrastructure (EMC, 2007b). The wetland survey methodology is described in EMC (2007b). Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, and intrusive soil sampling to determine the presence of wetland criteria indicators (EMC, 2007b).

The proposed license area was found to contain nine wetlands classified as palustrine emergent based on the Cowardin et al. (1979) wetland classification system (EMC, 2007b). Emergent wetlands are located in channels and total 12.6 ha (31.2 ac). Similarly, nine ponds classified as palustrine open water were delineated, totaling 1.7 ha (4.1 ac). These wetlands and ponds are shown on Figure 3-12.

Wetlands comprise narrow, linear emergent systems within drainages and stream channels as a direct result of CBM and livestock well discharges. Several CBM outfalls also jointly serve as livestock watering holes, comprising open water pools located along or within drainages. Some of the outfalls, and accompanying watering tanks, were observed releasing water and influencing the presence of wetland parameters. In those drainages where water is released, the wetland characteristics are actively present. In those drainages where there is a gradual decrease in the volume of CBM water being discharged via the outfalls described in Section 3.5.1 of this SEIS, the wetland parameters are receding, particularly wetland hydrology and hydrophytic vegetation, and upland vegetation is encroaching into the streambeds.

The wetlands delineated on the proposed Moore Ranch Project include the following systems: a single thread confined to the Ninemile Creek channel at the southern end of the proposed license area; three systems found within the Simmons Draw channel; one wetland within Simmons Draw Tributary A and Simmons Draw Tributary B; and three wetlands within the Pine Tree Draw drainage basin as shown in Figure 3-12.

The disconnected, isolated nature of these pond and wetland systems render them not jurisdictional under Section 404 of the Clean Water Act since there is no connection to navigable waters. However, final determination of the jurisdictional determination is pending the ongoing USACE review.