

3 WATER RESOURCE USES AND DESIGNATIONS

As the regulatory authority, OSMRE has the responsibility of assessing the potential impacts of the mining and reclamation operations on the hydrologic balance, and to provide a determination for the potential to materially damage the hydrologic balance outside the permit area. Material damage implies that a quantifiable adverse degradation or reduction of surface or ground waters outside the permit area has occurred, precluding the utilization of water resources for existing and foreseeable uses. The existing and foreseeable water uses within the surface water and groundwater CIA's include:

- Domestic Water Supply
- Industrial Water Supply,
- Agricultural Water Supply,
- Livestock Watering,
- Secondary Human Contact and Partial Body Contact,
- Aquatic & Wildlife, and Fish Consumption.
- Primary Contact Ceremonial (Hopi Tribe), and
- Groundwater Recharge (Hopi Tribe).

3.1 Domestic Water Supply

Domestic water supply is a water body that supports the use of water as a potable water supply (Hopi Tribe, 2011; and NNEPA, 2009). The Hopi Tribe Water Resources Program has designated the N aquifer as a domestic water supply (DWS). The effect of PWCC pumping on the N aquifer on Hopi Tribe and Navajo Nation domestic water supply wells is a concern addressed in this assessment. Domestic water supply concern areas identified include all water supply wells within the groundwater CIA for the N aquifer. Figure 10 illustrates the location of water supply well systems and annual withdraw for calendar year 2011. Well systems may consist of more than one well at locations illustrated on Figure 10. Concern has been raised by Hopi Tribe and Navajo Nation members that drawdown from PWCC pumping will reduce the amount of water in water supply wells, increase electrical cost associated with lifting water an additional height to the wellhead, damage the stability of the aquifer matrix, and induce poorer quality D aquifer water to potentially degrade N aquifer water.

Water supply standpipes are available for public water hauling as part of the PWCC distribution system. The water available for public supply meets compliance with public water supply (PWS) permit ID #NN0400287. The water accessed by the two public standpipes is hauled by area residents and used for both domestic water supply and livestock consumption. The public water stands are located near the N-6 and N-14 mining reclamation areas, and account for approximately 61 ac-ft per year of the total use at the Kayenta Mine Complex (PWCC, v.11, ch.18, 2016).

3.2 Industrial Supply Water

Kayenta Mine Complex is the only location in the CIAs using water for industrial purposes. On February 1, 1964, Sentry Royalty (a wholly owned subsidiary of Peabody Coal Company at the time) entered into a coal lease agreement with the Navajo Tribe. The agreement provided approval "...to develop and utilize water for use in its mining operations, provided, however, that at the conclusion of mining operation all wells will be left properly cased and that any water not utilized in mining operations shall be made readily available for local Navajo use" (Sentry, 1964).

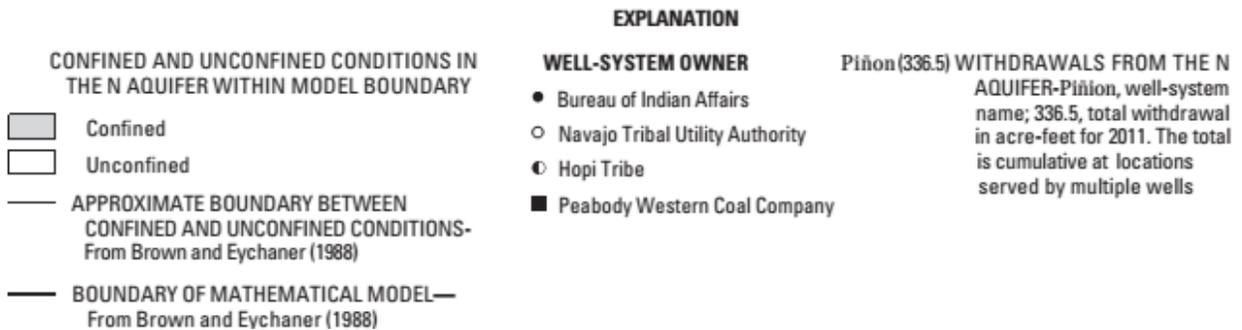
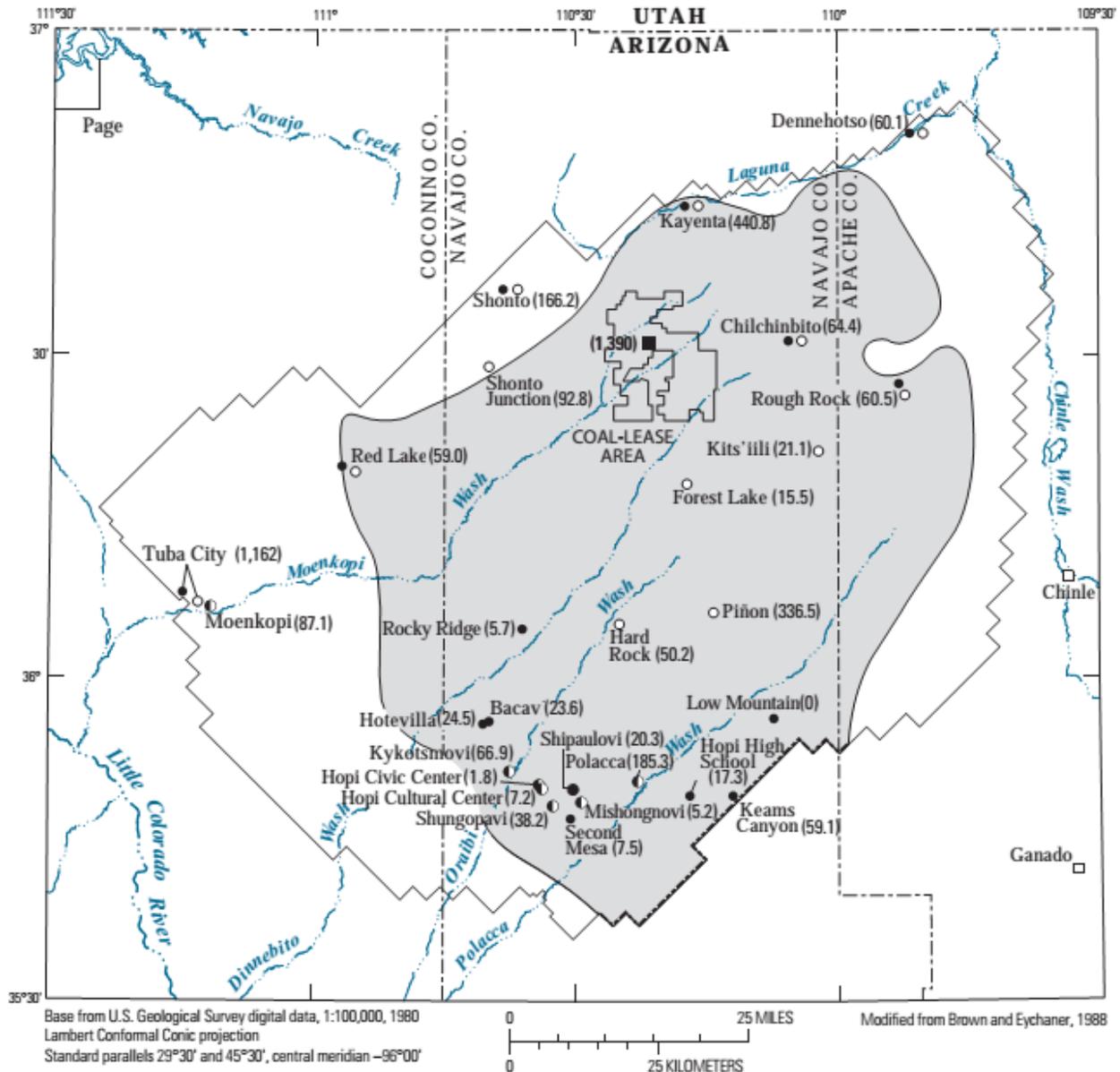


Figure 10: Well Systems Monitored, Black Mesa, Northeastern Arizona (Macy and Unema, 2014)

On June 6, 1966 the Grant of Right to Use Water was further clarified in separate lease agreements between Sentry Royalty and both the Hopi Tribe and Navajo Nation. The agreements established that Sentry Royalty would "...develop and utilize water obtained from wells located on the leased premises for use in its mining operations including the transportation by slurry pipeline of coal mined from the leased premises..." (Stetson, 1966), and royalty rates for water use were established. In 1987, new coal lease and royalty agreements were signed by Hopi Tribe, Navajo Nation, and PWCC, and received Secretarial approval by the Department of Interior (PWCC, 1987). Additionally, the Secretary of Interior reserves the right to require PWCC to provide water in quantity and quality equal to that formerly available or obtain water for its mining operation from another source if monitoring data indicate material damage to the hydrologic balance is occurring due to PWCC pumping.

PWCC began pumping in 1968 at 100 ac-ft per year (Macy and Unema, 2014). The water use rate increased to 3,680 ac-ft per year in 1972 (Macy and Unema, 2014). From 1972 to 2005 PWCC annual pumping fluctuated between 2,520 ac-ft and 4,740 ac-ft; averaging 3,980 ac-ft (Macy and Unema, 2014). Water pumped from the PWCC wellfield was utilized for the transportation of coal to the Mojave Generating Station, dust suppression, and potable water for mine facilities. Approximately 70-percent of the pumped water was used for transportation of coal via a coal slurry pipeline during this period. Coal was pulverized onsite into a powder and mixed with water to make a slurry consistency of approximately 50-percent coal and 50-percent water. The slurry was then transported approximately 273 miles through an underground pipeline to the Mojave Generating Station, the coal burned, and the water utilized as part of the cooling process at the power plant. The Mojave Generating Station and the coal slurry line are no longer operational. The coal slurry pipeline ceased operation on December 31, 2005. PWCC pumping has reduced by approximately 70-percent since 2005, averaging 1,255 ac-ft from 2006 to 2011 (Macy and Unema, 2014).

3.3 Agricultural Water Supply

Agricultural water supply means the use of water for irrigation of crops which could be used for human consumption (Hopi Tribe, 2011; NNEPA, 2009). Corn and bean fields are usually located at the foot of the mesas, on sand slopes, in small canyons, along alluvial plains in washes, and in the valleys between mesas in order to maximize the limited surface moisture available (Hopi Tribe, 2016). Another method of cultivation involves gardening on self-irrigated terraces along the mesa walls below villages. Terrace irrigation is possible because of the perennial springs at each village that originally permitted settlement (Hopi Tribe, 2016). In the southern area of Black Mesa, these springs emanate from the Toreva Formation and formations comprising the D aquifer system. In the Moenkopi and Tuba City area, the perennial springs used for irrigation purposes emanate from the unconfined N aquifer.

As presented in section 2.2.1, during the growing season Hopi and Navajo farmers in the Moenkopi area may dig a pit in the Moenkopi channel alluvium until water is reached. The alluvial water is pumped from the pit and piped to the adjacent fields, providing supplemental irrigation water when necessary. HTWQS designate all aquifers as Agricultural Irrigation (AgI) water. NNSWQS designate Moenkopi Wash as Agricultural Water Supply (AgWS). HTWQS designate Moenkopi Wash and Dinnebito Wash as AgI.

3.4 Livestock Watering

Livestock watering means the use of water as a supply for consumption by livestock (Hopi Tribe, 2011; NNEPA, 2009). Livestock watering is a pervasive practice in the CIAs; with livestock typically accessing water at springs and in-channel pools when the opportunity is available. Windmills drilled into water bearing formations that are of suitable water quality for livestock watering provide a more reliable source for livestock watering. HTWQS designate all aquifers, Moenkopi Wash, and Dinnebito Wash as

Agricultural Livestock Watering (AgL). NNSWQS designate Moenkopi Wash and Dinnebito Wash as Livestock Watering (LW).

3.5 Secondary Human Contact and Partial Body Contact

Water designated to support secondary human contact (ScHC) means the “the use of water which may cause the water to come into direct contact with the skin of the body, but normally not the point of submergence, ingestion of the water, or contact of the water with membrane material of the body” (NNEPA, 2009). The Hopi Tribe provides a similar use designation for incidental and infrequent contact and defines as partial body contact (PBC). “Partial body contact means the use of a stream reach, spring, reservoir, and other water body in which contact with the water may, but need not, occur and in which the probability of ingesting water is minimal; examples are fishing and boating (Hopi Tribe, 2011). NNSWQS identify Dinnebito Wash and Moenkopi Wash as meeting ScHC designation. The HTWQS identify Dinnebito and Moenkopi Wash as meeting the PBC use designation.

3.6 Primary Contact Ceremonial

The HTWQS designate that primary contact ceremonial (PCC) means “the use of a stream, spring, reservoir, impoundment, or other water body for religious or traditional purposes by members of the Hopi Tribe; such use involves immersion and intentional or incidental ingestion of water, and it requires protection of sensitive and valuable aquatic life and riparian habitat” (Hopi Tribe, 2011). The USGS undertook a study to identify and characterize springs identified by various methods (Leake et al. 2016). A total of 104 springs characterized as “likely” were identified as emanating from D- and N Aquifer stratigraphic units. The database was compiled from a variety of sources; however, most spring and seep locations were identified from available maps without field verification.

3.7 Aquatic Wildlife Habitat and Fish Consumption

Aquatic and Wildlife Habitat (A&WHbt) water means “the use of the water by animals, plants or other organisms, including salmonids and non-salmonids, and non-domestic animals (including migratory birds) for habitation, growth or propagation” (NNEPA, 2009). Similarly, the Hopi Tribe establish Aquatic and Wildlife (ephemeral) (A&W_e) as “the use of an ephemeral water by animals, plants, or other organisms, excluding fish, for habitation, growth, or propagation” (Hopi Tribe, 2011). Fish consumption (FC) supports the use of water by humans for harvesting aquatic organism for consumption. Harvestable aquatic organisms include, but are not limited to fish, shell-fish, turtles, crayfish, frogs, and salamanders (Hopi Tribe, 2011) (NNEPA, 2009).

3.8 Groundwater Recharge

“Groundwater recharge (GWR) use means any surface water that recharges an aquifer. Surface waters designated as groundwater recharge must meet the standards for the aquifer being recharged as well as surface water standards” (Hopi Tribe, 2011). Additionally, the Hopi Tribe Water Resources Program may designate water as “unique waters”. The Moenkopi Wash watershed from Blue Canyon Springs to the confluence of Begashibito Wash has been classified as a unique Hopi surface water area (Hopi Tribe, 2011). The N aquifer and all areas recharging the N aquifer are classified as unique groundwater (Hopi Tribe, 2011).