U.S. EPA Site Visit Report
Coal Combustion Waste Minefill Management Practices
- Navajo Nation -

Draft
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OBJECTIVE

From September 2001 to October 2002, EPA conducted visits to collect information on coal combustion waste (CCW) minefill management practices. On October 30-31, 2001, EPA staff conducted an information collection visit to the Navajo Nation. The purpose of this visit was to gather information regarding the regulation of CCW minefill practices within the boundaries of the Navajo Indian Reservation. Because the Navajo Nation does not have regulatory jurisdiction over mine placement at the site located within its boundaries, EPA's CCW Minefill Management Practices Discussion Guide was not completed for this visit.

The visit consisted of two parts: a meeting with Navajo Nation Environmental Protection Agency (NNEPA) representatives, and visits to two sites where CCW is currently being managed. One of the sites places CCW in surface impoundments and the other places CCW in surface mine pits.

PLACES AND DATES

Farmington, New Mexico — October 30, 2001
Four Corners Power Plant (Arizona Public Service, APS)
Navajo Coal Company (BHP Billiton) Mine

Window Rock, Arizona
Navajo Nation Environmental Protection Agency (NNEPA) — October 31, 2001

SUMMARY OF MEETING WITH NAVAJO NATION EPA

The meeting was conducted on October 31, 2001, at the NNEPA building located in Window Rock, Arizona. In attendance at the meeting were:

- Bonnie Robinson, U.S. EPA
- Mike Clipper, U.S. EPA
- Randall Mills, U.S. Department of Interior, Office of Surface Mining (OSM)
- Brent Moore, NNEPA
- Henry Haven, NNEPA
- Arlene Luther, NNEPA
- Cassandra Bloedel, NNEPA
- Danielle Glitz, SAIC

Major topics of the meeting included the Navajo Tribe's concerns over regulatory jurisdiction for tribal land leased to the Four Corners Power Plant (APS) and the Navajo Coal Company (BHP Billiton) and the development of monitoring and reclamation regulations for CCW placement on tribal land.

The vast majority of the 17 million acre Navajo reservation is tribal trust land. This means that while the Navajo tribe owns the land, the deed to the land is held by the federal government. The tribal land on which the Four Corners Power Plant and the Navajo Coal Company mine are located was leased from the tribe in the 1950's. The Navajo Nation has no regulating policy in regards to CCW placement and the Tribe's rights to monitor the operating and land reclamation processes of the two sites were waived when the lease was signed. Therefore, regulatory jurisdiction over these two sites falls on the federal government. Specifically, the power plant is under the jurisdiction of EPA Region 9, San Francisco, and the Navajo Mine is under the jurisdiction of OSM.

The lack of Navajo tribal jurisdiction at the Navajo mine and Four Corners Power Plant is of major concern to the NNEPA. The NNEPA stated that there is currently only one monitoring well in the active ash placement pit (Dobi pit) on the Navajo mine, and that it took a long time to get approval for its construction. The NNEPA feels that there is insufficient data to assess impacts from CCW mine placement. Due to the scarcity of groundwater in the region, even a small impact on the groundwater supply would have larger consequences than in the eastern United States. Potential impacts to surface water could have major consequences since the plant is located two miles from the San Juan River and 10 miles from the town of Shiprock, which pumps its water directly from the river. The NNEPA has concerns that saturation of CCW placed in the mine pits could cause such an impact and therefore, they would like to see the construction of many more monitoring wells to enable them to track constituents of concern.

While the APS and BHP representatives maintain their position that there is very little groundwater in the area, the NNEPA representatives stated that the presence of hydrophillic plant species growing on or near the CCW placement areas is indicative of water flow.

Specifically, the NNEPA would like to see regulations implemented regarding:

- Better siting requirements for CCW placement
- Firmer ash characterization requirements
- Long-term ground-water monitoring requirements
- Ground-water sampling to create a baseline
- Better air quality monitoring
- Tribal access to monitoring samples
- Inclusion of tribal cultural values in risk assessment analyses
- Aesthetics of landscaping/reclamation efforts
- Amendment of "out-dated" laws

SUMMARY OF SITE VISITS

On October 30, 2001, EPA visited two facilities near Farmington, New Mexico where CCW is managed. In attendance at the site visits were:

- Bonnie Robinson, U.S. EPA
- Mike Clipper, U.S. EPA
- Randall Mills, OSM
- Richard Holbrook, OSM
- Brent Moore, NNEPA
- Cassandra Bloedel, NNEPA
- Deb Misra, NNEPA
- Rob Clifford, APS
- Carl Woolfolk, APS
- Richard Grimes, APS
- Dave Bloomfield, APS
- John Mitchell, APS
- Andy Young, BHP
- Pat Risner, BHP
- Danielle Glitz, SAIC

Four Corners Power Plant (APS)

The first site visited was the Four Corners Power Plant (APS). The facility, located near Farmington, New Mexico, has a total generation capacity of 2,040 megawatts and is one of the largest coal-fired generating stations in the United States, burning approximately 8.5 million tons of coal per year. The facility has five generating units. Units 1, 2, and 3 went into service in the early 1960's and utilize wet venturi scrubbers as a means of air pollution control. Collectively, these units burn one-third of the coal utilized at the power plant. Units 4 and 5 went into service in the late 1960's and utilize a baghouse and scrubber configuration to control emissions. They burn the remaining two-thirds of the coal.

The power plant generates approximately 2 million tons per year of CCW. CCW from generating units 1, 2, and 3 is managed on the power plant site, while CCW from generating units 4 and 5 is placed in mine pits at the Navajo Mine (the second site visited).

The venturi scrubbers on generating units 1, 2, and 3 remove fly ash and flue gas desulfurization (FGD) sludge simultaneously. This wet mixture is pumped through a cement-lined ditch to on-site ponds. Ash pond #6 currently is the only active pond on site. The discharge point into the pond is moved around to disperse the slurry evenly. Slurry pumping to the pond is not continuous, but rather occurs only when there has been enough material collected in the bottom of the thickeners to send to the pond.

Once in the pond, most of the solids drop out of the fly ash/FGD mixture. However, cenospheres (hollow glass-like balls) float on the surface of the water in the ash pond and are scraped off and sold for use as thickeners, fiberglass, and fillers. When the settled material drys, it sets up very hard. About 3 to 4 feet per year of settled solids accumulate in the active ash pond. Free water from the ash pond is carried via trenches to an evaporation pond and then pumped back to the power plant for use as scrubber makeup water.

Fugitive dust on the roadways in the ash pond area is controlled by a watering truck. The buttresses of the ponds are encrusted with lime in the spring (before the windy season) to prevent

dusting. Sometimes the surface of the ash pond is encrusted with lime as well. Lime is trucked to the site for use on the ash ponds at a rate of 12-15 truck loads/day, 7 days/week. A white precipitate seen on the surface of the ponds in places appears to be salt that has precipitated out of the set-up slurry ash mixture.

The ash ponds were constructed by removing topsoil and installing a clay dam keyed into the weathered shale underlayer. The weathered shale acts as an impervious layer and no additional liners are constructed on the pit floor or along the pit walls. The clay construction has a permeability of about 10^{-6} cm/sec and a minimum plasticity index (PI) of 10. The State of New Mexico Engineering Office examines the structural integrity of the dams. Bottom ash generated in units 1, 2, and 3 is used to construct the buttresses of the dams (walls of the ash pond). No rocks or organics are used in the construction of the ash ponds. The ponds are designed to accumulate a maximum of 80 feet of solids.

Once the currently active ash pond is full (has reached 80 feet in height) it will be reclaimed and covered but there are no details of what this process will entail as of yet. The inactive ash ponds are sometimes used for overflow and the evaporation ponds were built on top of ash ponds 1 and 2. The surfaces of inactive (full) ash ponds are dotted with wild "brush". This naturally occurring vegetation grows directly on the ash without any type of soil cover and was reported to be very salt tolerant.

Groundwater monitoring wells are strung through all of the ash ponds. Well placement and monitoring is done voluntarily by APS. Information collected from the wells, however, is not submitted to any regulatory agency. A representative from the power plant said that metals don't leach from the ash generated from western coal.

This site was under the jurisdiction of EPA Region 6 until 1990-1991. Since then, it has been under the jurisdiction of EPA Region 9. The Federal government has jurisdiction over regulatory issues at this site due to the land lease prohibiting Tribal regulation of the site. APS is currently trying to work out voluntary compliance issues with the Navajo Nation.

Navajo Coal Company (BHP Billiton) Mine

The second site visited was the Navajo Mine (BHP) which is the sole source of coal for the Four Corners Power Plant, which is located about 15 miles north of the southern-most actively mined pit at the mine. A presentation was given by Andy Young, an environmental specialist from the Navajo Mine, at the Area 3 Facility Building

Approximately 8.5 million tons of bituminous low-sulfur coal per year are surface mined at the site and approximately 1.3 million tons per year of CCW is placed in the mine pits. The source of the CCW is generating units 4 and 5 at the APS Four Corners Power Plant. These generating units are equipped with baghouses which remove nearly 100 percent of the fly ash. The fly ash is

then mixed with slurry from the same units' sulfur dioxide scrubber systems. This mixture is then loaded into trucks, transported to the mine, and end-dumped into the mine pits in 85 ton loads. Bottom ash generated in units 4 and 5 also is end-dumped into the mine pit. Ash placement occurs between the hours of 3:00 pm and 7:00 am. A one foot layer of spoil (dirt) is placed on the dumped CCW at the end of every shift to prevent fugitive dust. There is no real compaction of the CCW aside from vehicular traffic.

Following completion of placement, CCW is covered with 10 feet of cover and then vegetated. Cover consists of spoil (dirt, rocks, etc.). The spoil has a low permeability of approximately 10^{-6} cm/sec. The uppermost 4 feet of cover must meet material fragment, SAR, EC, pH, and boron and selenium concentration requirements. The 10 feet of cover is then topped with six inches to one foot of top soil. Irrigation is required for reclamation due to very low rainfall amounts in the region (about 8 inches annually). Irrigation of the reclaimed site is performed once every 11 days during the first season, and less frequently in subsequent seasons. A 19 inch irrigation line is used to pump water from Morgan Lake, a man-made lake adjacent to the APS power plant, to the site sprinkler system. Post-mined land is used primarily for grazing, although two-thirds of the land was badlands prior to mining. Disturbed areas are bonded for 10 years after seeding.

The Dobi pit is currently the only pit on site receiving ash. Future pits to be used for placement of CCW are the Pinto and South Barber pits. South Barber is a very large pit about 200 feet deep and 8,000 feet in length and is estimated to be the site of 75 to 80 percent of all future ash placement at the mine. It is expected that it will take 20 years of continuous ash placement to fill this pit to capacity.

Site representatives stated that, due to the lack of appreciable groundwater, there is little chance of impact from mine placement of the CCW. However, if water from another source does come into contact with the CCW, contamination is a possibility. The Dobi pit is an example of where this concern exists. Irrigated fields (not part of the mine land lease) in close proximity to the pit seep water into the pit area. To prevent water from contacting the ash, a french drain was constructed along the side of the pit facing the irrigated fields butted up against low-permeability spoil. To construct the drain, a 4-by-4 foot trench was dug into the low permeability shale. Fabric was used to line the trench and the pipe was laid on top of the fabric. The pipe was covered with gravel and then another layer of fabric. The purpose of the second layer of fabric is to keep fines from filtering into the gravel. The final step in construction of the drain was to fill the entire trench with sand. This type of construction creates a lot of transmission allowing the water to run through the gravel if the pipe were to happen to clog. And, if the gravel were to clog, the water could run through the sand. The construction is essentially a drain within a drain within a drain. Seepage water is drawn away from the ash pit into this drain system and rerouted off site back to the Chinle Wash.

The Dobi pit sat idle for a period of time prior to ash placement. During this time, water seepage resulted in the containment of wet ash within the pit. BHP officials attribute the water

accumulation to field irrigation seepage from adjacent agricultural lands. They do not expect the ash seepage to extend very far. Annual groundwater monitoring is conducted from about 7 or 8 wells installed about 6 years ago in the pit area. Engineering controls also prohibit ash from being buried beneath large drainages.

Hydrologic concerns at the Dobi pit site are mainly erosion issues. According to BHP, groundwater contamination is of very little concern due to the high pH of the CCW and the fact that the CCW does not leach metals. The high clay content in the soil forms a natural impermeable barrier. Vegetation, grazing, surface and ground water, physical characteristics, and leach studies have been conducted by BHP. Site representatives contend that the results of these studies support BHP's prediction of low potential environmental impacts.

Specifically, BHP states that on-site groundwater evaluations show only insignificant increases in the concentrations of arsenic and boron. Current groundwater concentrations of boron have increased from the typical concentration in this area of 1 to 3 mg/L to 14 to 15 mg/L. Increases in arsenic concentration have been observed in wells within the ash, but have not been detected downgradient. In 1995, arsenic concentrations in the ash wells were approximately 40 µg/L. More recently, however, arsenic concentrations are less than the lab detection limit of 4 µg/L. Arsenic concentrations 100 feet downgradient are also currently at the detection limit. According to BHP, while the high pH of the ash will solubilize low concentrations of arsenic, attenuation mechanisms in overburden (spoil) are preventing migration. The spoil is very fine-grained and consists of clay containing negative particles which results in high absorption rates as well some precipitation of the arsenic.