

Abandoned Mine Lands Case Study



Photo from Dale Chadwick

Kennecott Mining Site

Transformation through Collaboration at a Superfund Alternative Site

Kennecott, UT



- Mining operations at Kennecott began in 1863.
- The Bingham Canyon Mine measures 2.5 miles across and 0.75 miles deep and has yielded 17 million tons of copper during its operational life.
- In 1995, EPA, Utah, and Kennecott signed a Memorandum of Understanding outlining the scope of the cleanup work and providing a unique framework for addressing mining contamination.

This case study presents the story of the cleanup and site reuse successes achieved at the Kennecott Utah Copper Corporation (Kennecott¹) mining operations in Salt Lake County, Utah. It can be used as a resource for mining companies, the federal government, state governments, and other interested stakeholders. The three main lessons that can be learned from this case study are:

- How various regulatory agencies and Kennecott developed strategies for cooperating with one another to clean up mining wastes at the site;
- How cleaning up the site without listing it on the Superfund National Priorities List (NPL) resulted in significant environmental, social, regulatory, and economic benefits; and
- How Kennecott was able not only to financially survive the cleanup costs, but to create an entirely new economic future.



¹ The name "Kennecott" has been used by various entities, some of which are associated with mining, milling, and smelting activities in the Salt Lake Valley and others which are not. In this document "Kennecott" refers to the Kennecott Utah Copper Corporation.

INTRODUCTION

For more than a century, people have mined the Oquirrh Mountains for precious metals. Through the decades, no mine operation has been more prolific than that of Kennecott. It has produced millions of tons of gold, silver, and copper. The main pit has generated so much valuable metal that it has been described as the “richest hole on earth.” At one time, the mine operated 24 hours a day, 365 days a year and employed more than 8,000 miners. This massive operation created pits thousands of feet deep. The many decades of mining activity, much of which predated Kennecott’s interest in the area, resulted in wide-spread mining wastes that contaminated the land and the ground water. Yet because of the vision and perseverance of the many stakeholders, the story of this mining site is one of transformation and rejuvenation.

In the early 1990s, Kennecott, the last remaining mining company in the area, was the subject of lawsuits and threatened regulatory actions. Today, Kennecott is an example of how a cooperative, creative approach can lead to efficient clean up of the environment and new opportunities for the company. At the Kennecott site, former adversaries are now collaborating on environmental cleanups, making possible the redevelopment of large portions of the site. This case study describes the evolution from an adversarial to a collaborative approach and the role of site redevelopment. The lessons learned from the Kennecott experience may be useful to owners and operators of active and inactive mines and may provide the impetus for cleanup and reuse of the hundreds of thousands of acres of mine lands across the country.



Photo 1: Aerial view of Kennecott land holdings and surrounding area.

This case study describes the evolution from an adversarial to a collaborative approach and the role of site redevelopment. The lessons learned from the Kennecott experience may be useful to owners and operators of active and inactive mines and may provide the impetus for cleanup and reuse of the hundreds of thousands of acres of mine lands across the country.

BACKGROUND

For more than 140 years, mining has been a way of life in and around Bingham Canyon, which is southwest of Salt Lake City. Prospectors first walked into the canyon in 1863 in search of ore, but it was ten years before lead, silver, zinc, and gold deposits were worked.

Copper reserves also were found, but initially were considered too sparse to be mined economically. In 1896, though, deposits of copper were found in the Highland Boy gold mine. That discovery was the precursor to the most significant mining era in Bingham Canyon: the mining of low-grade copper ore and the advent of open-pit mining.

As the years passed, the landscape of Bingham Canyon changed significantly due to mining operations conducted by numerous companies. In 1936, Kennecott Copper bought Utah Copper. The mountain that Utah Copper first mined is today a massive open pit that is one of the world's largest copper producers, one with notable related productions of gold, silver, and molybdenum. As the mine operations grew, so did mine-related contamination of the landscape. During the early years between 1863 and 1920s, Bingham Canyon was not surrounded by communities and environmental stewardship was not being addressed by industry or the government. Waste rock piles that contained concentrations of minerals covered much of the landscape. Runoff from rain and snowfall passed through them, carrying away dissolved solids, sulfates, and heavy metals, and contaminating the streams, soils, and ground water.

Kennecott's current land holdings are twice the size of the District of Columbia. They include most of the historic mining area in the Oquirrh Mountains, which form the western boundary of the Salt Lake Valley. The site is divided into two segments: the South Zone where ore is mined and concentrated, and the North Zone, where ore is smelted and refined. Ore and tailings mined in the South Zone are sent to the North Zone, 20 miles away, by slurry pipeline.

Kennecott's South Zone is 25 miles southwest of Salt Lake City. Mining activities at the South Zone began in the 1860s and continue to the present at the large Bingham Canyon open-pit mine. Mining operations in the South Zone produced lead, zinc, silver, copper, molybdenum, and gold ore.

Contaminants found in the South Zone are arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, acids, sulfate, and zinc. Before the threat of these contaminants was recognized, homes were built on former flood plains contaminated with high levels of lead and arsenic. Drinking water wells contaminated with cadmium, chromium, sulfate, and arsenic had to be shut down in the 1980s. Mining wastes continued to leach acid waters and created a 72-square-mile plume of sulfate-contaminated ground water, which put a burden on communities in Salt Lake County. Even though many communities currently rely on surface water for municipal water supplies, they need new sources of drinking water to support rapidly growing populations and cannot use ground water as a municipal water supply if they are above or adjacent to the plume.

Kennecott's North Zone is at the north end of the Oquirrh Mountains, on the south shore of the Great Salt Lake. Metal ore was smelted and processed there for almost a century, resulting in contaminated sludge, soils, surface water, and ground water. Lead, arsenic, and selenium are the main contaminants of concern. A plume of selenium-contaminated ground water enters nearby wetlands through springs and seeps are particularly troublesome because native birds are sensitive to selenium. Kennecott, as the primary landowner and only responsible party at the North Zone, is liable for the area's cleanup.

The United States government, through the Environmental Protection Agency (EPA), works to protect the environment through its laws and policies. Hallmark legislation adopted to advance this goal includes the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The 1980 legislation (amended in 1986) is better known as “Superfund.” Through the Superfund program, EPA can place contaminated landscapes on the NPL for cleanup, and hold companies responsible for the contamination and liable for that cleanup. Under Superfund, EPA has the authority to respond to, and oversee cleanup of a wide array of hazardous waste spills or releases. While EPA requires that private parties responsible for the wastes conduct their cleanup, when responsible parties cannot be found or cannot afford to pay for the cleanup, costs may be covered by Superfund. Cleanups conducted under Superfund can be costly and time-intensive depending on the complexity and extent of contamination. Under certain circumstances, EPA and industry may negotiate to conduct cleanups outside of the traditional Superfund NPL process.



Photo 2: Bingham Creek Tailings during excavation

Source: Kennecott Utah Copper Corp.

Although the Kennecott site was never placed on the NPL, its cleanup can be considered a major accomplishment of the Superfund program and law. The threat of NPL listing served as a potent tool to motivate Kennecott and other parties to clean up the site voluntarily. The desire to avoid Superfund’s enforcement and liability provisions, a changed corporate environmental perspective, and the discovery of new real estate opportunities have come together to drive the cleanup of extensive contamination over thousands of acres in both zones and the reuse of significant portions of that land.

Acronyms

- ARCO – Atlantic Richfield Company
- CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
- EPA – Environmental Protection Agency
- EPCRA – Emergency Planning and Community Right-to-Know Act
- MOU – Memorandum of Understanding
- NPL – National Priorities List
- NRD – Natural Resources Damage
- PRP – Potential Responsible Party
- RCRA – Resource and Recovery Act
- TSCA – Toxic Substances Control Act
- UDEQ – Utah Department of Environmental Quality
- UDNR – Utah Department of Natural Resources
- USFWS – U.S. Fish and Wildlife Service
- USGS – U.S. Geological Survey

The Journey from Contention to Collaboration: Moving Toward a Common Goal

With the passage of new federal environmental legislation in the 1970s, state and federal agencies responsible for ensuring cleanup and oversight of mining wastes became interested in the Kennecott mining operation. By 1983, EPA and Utah's regulatory agencies had launched an investigation of the site. Gradually, over the course of nearly 20 years, Kennecott's posture toward these agencies evolved to one of cooperation. During this transition, state and federal agencies worked together to ensure that the cleanup accomplished their shared goals of protecting human health and the environment in the present and the future. At the same time, Kennecott managers believed that by performing the cleanup themselves and avoiding NPL listing, they saved a great deal of time and money, and helped create a better future for the Kennecott Utah Copper Corporation – a future of valuable land holdings with reuse potential.



Photo 3: Lark Tailings of Kennecott prior to reclamation

Source: Kennecott Utah Copper Corp.

Early Regulatory Efforts:

Under the auspices of the Superfund program, the state of Utah conducted several preliminary assessments of the Kennecott properties in the early to mid-1980s. These initial studies prompted Utah's Department of Environmental Quality to file a Natural Resources Damage (NRD) claim in 1986 under a separate Superfund provision. The NRD provision allows states to recover damages from entities that impair or destroy state resources. In this case, the state of Utah sued Kennecott for ground water damage in the southwest Jordan Valley area caused by leach water at the Bingham Canyon mine and wastewater disposal in the South Jordan evaporation ponds, leading to the designation of Zone A and B ground water plumes.



Photo 4: Lark Tailings (State Motorcycle Park) after soil cap and seeding.

Source: Kennecott Utah Copper Corp.

In 1990, the state of Utah and Kennecott proposed to settle the NRD claim with \$12 million in federal court, with no action required to address the ground water contamination. The Jordan Valley Water Conservancy District did not believe the settlement was in the public's interest and asked the court to intervene. The court rejected the settlement in 1991 and the judge ruled that the information on the ground water plume was insufficient to support the proposed settlement. The negotiations for the NRD claim were put on hold while Kennecott conducted a comprehensive study of the ground water problem.

At the same time Kennecott was working on the ground water study, the EPA Inspector General recommended that EPA consider listing the Kennecott site on the NPL, in part because of exemptions for mining in the state solid waste and hazardous waste laws. The state objected to involving the Superfund program and hoped, instead, to regulate Kennecott's discharges through existing state permitting programs.

Banding Together: The State of Utah and U.S. EPA Join Forces to Motivate Kennecott

In 1990, during the site assessment conducted under CERCLA, state investigators found a strip of contamination along Bingham Creek and its historic floodplain. The creek ran through heavily populated areas. Entire neighborhoods had been built on the former flood plain land. Kennecott denied any association with the Bingham Creek contamination. After a week of intense public pressure, the state requested EPA assistance in conducting an emergency response action under Superfund to address the contamination. After the federal government became involved, the state agreed that CERCLA provided the regulatory tool it needed to get Kennecott's attention.

Kennecott executives launched an independent investigation to assess the contamination and its implications for the company. Kennecott hired an outside consultant to do the work. When they completed their independent assessment in early 1991, Kennecott executives were surprised to learn that the investigation revealed extensive contamination that would require a shift in corporate perspective. Kennecott officials realized that to maintain public support, they would not only have to cooperate with state and federal regulatory agencies, but would also have to be candid with the public about the environmental contamination. Another incentive for Kennecott to cooperate with regulatory agencies was tied to the impending 2002 Olympic Winter Games. The CEO of Kennecott was also the head of the Salt Lake City Olympic bid committee. He feared that if the site were put on the Superfund NPL, it would endanger the Olympic bid. He also told EPA that he was concerned that NPL listing might affect the cost of capital needed to finance the modernization of the mining operation. These factors together sent Kennecott executives back to the negotiating table, this time with a cleanup proposal, characterization reports, and work plans. Kennecott managers now had new technical and legal negotiators, and their proposal promised an accelerated cleanup in exchange for assurance that Kennecott would not be placed on the NPL.

Coming to an Agreement

To streamline communications and organize work among the various state and federal agencies involved with the cleanup, EPA's Remedial Project Manager for Kennecott formed two Technical Review Committees. The committees, established in 1992, consisted of representatives of the Utah Department of Environmental Quality (UDEQ); the Utah Department of Natural Resources (UDNR); the U.S. Fish and Wildlife Service (USFWS); the U.S. Geological Survey (USGS); EPA; Kennecott; citizens groups; local officials; and academics. These committees served in an advisory capacity to EPA as the Agency worked through complex issues with Kennecott managers and the state of Utah to arrive at a creative, consensual solution.

While Kennecott, EPA, and the state of Utah soon reached an agreement in principle for how the contaminated lands could best be cleaned up, an impasse over legal and administrative terms led EPA move forward with the NPL listing. In the face of staunch opposition to the listing, and recognizing Kennecott's good faith continuing cleanup actions, EPA delayed the listing to continue discussions with Kennecott and the state, eventually leading to a Memorandum of Understanding (MOU) to address the cleanup. Under this MOU, EPA agreed not to finalize the NPL listing if Kennecott completed work set out in the MOU. If the work was not done satisfactorily, EPA would then move ahead with the listing.

Stage One: The Agreement in Principle

In the summer of 1991, negotiations began on a site-wide cleanup consent decree, which is a mechanism frequently used by EPA at Superfund sites and is issued by a court to document a voluntary agreement between EPA and parties responsible for cleanup. The consent decree negotiations proceeded generally along two tracks – legal and technical. The technical negotiators were to develop a work plan, while the attorneys for the parties worked on the legal language. By 1992, it was clear that the great extent of the contamination would require broad remedial measures, which could best be achieved with extensive coordination among many state and federal agencies.

The state and EPA each formed its own internal committee. Earlier, at a critical point in the negotiations with Kennecott, the EPA Superfund staff members had been taken off guard when their colleagues in other EPA offices fined Kennecott \$2 million for violations of the Emergency Planning and Community Right-to-Know Act (EPCRA) and the Toxic Substances Control Act (TSCA). This unexpected censure strained Kennecott’s relationship with EPA and underscored the need for intra-agency coordination. EPA’s Deputy Regional Administrator assembled a team to assure coordination among federal agencies and prevent miscommunication. He selected staff from the EPA offices responsible for administration of the Resource Conservation and Recovery Act (RCRA), TSCA, and EPCRA laws to address, in a comprehensive way, contamination in the water, soil, and air.

Around 2002, the UDEQ Project Manager convened a round table of various state agencies with an interest in the site. This committee allowed state agencies to pool their expertise and knowledge and to articulate the state’s interests in a coherent way. Working through the committee, the agencies were able to avoid duplicative oversight, saving time and resources.

Persistent efforts begun in 1991 among state, federal, and local agencies, as well as Kennecott and local stakeholders finally resulted in the development of a site-wide streamlined cleanup approach that met with the approval of all involved parties. Because the negotiations for the work plan began long before anyone knew the precise nature of the contaminants or which remedies would be necessary, the technical negotiators decided to develop a strategy for characterizing the site and deciding how remedies would be chosen.

History of the Kennecott Site	
1860s and 1870s	Initial exploration and mining activities by various companies, including Kennecott and ARCO
1906	Large-scale open-pit mining begins in Bingham Canyon
1920s	Early miners notice waste rock from the mines draining blue-colored water with high copper content.
1983	EPA and Utah begin investigating Kennecott
1986	State of Utah files Natural Resource Damages (NRD) claim against Kennecott
1991	Outside consultant presents Kennecott with new, independent environmental assessment that shocked Kennecott executives
1991	Negotiations begin on the consent decree
1992	Technical Review Committees formed
1993	Negotiations fail on site-wide consent decree
1994	EPA proposes NPL listing for Kennecott
1995	Kennecott required to perform RI/FS and initiate minimum extraction of acid plume. Also required to establish a trust fund for addressing ground water contamination.
September 1995	Three parties sign an MOU outlining the scope of the cleanup work
1999	Development of master plan for Daybreak community begins
2001	Kennecott Land Company was established to focus on developing Kennecott Utah Copper Corporation’s land.
2003	Construction begins at Daybreak
November 2004	First residents move into Daybreak homes
August 2005	Daybreak Elementary, a school and neighborhood learning and community center, opens.

Negotiators made several important decisions: 1) to develop standard sampling and analysis procedures to be used site wide; 2) to use standard remedies based on characterization results; 3) to have a committee structure that would bring local governments and citizens into the process; and 4) to develop a site-wide risk assessment which would be a function of land use and habitat. The negotiation team designed the process to prevent, to the extent possible, redundant studies, duplications in oversight responsibilities, and interference with on-going mining operations.

The group created a decision matrix based on the concentration, leachability, and the acid-generating potential of the wastes. All wastes were tested on those criteria and the remedies for each site were developed based on those site-specific criteria. This strategy provided consistency in the various cleanup approaches, and resulted in fewer disputes on remedy decisions. This progress in negotiations prompted Kennecott to continue its cleanup efforts and to begin new good-faith cleanup actions. This remedy strategy developed at Kennecott was later refined by EPA and adopted as a program called “presumptive remedies.”

Negotiators still needed to decide how much of the cleanup would be Kennecott’s financial responsibility. The ground water contamination in the South Zone involved the highest costs. Even the least expensive effective remedies for ground water would cost approximately \$400 million. When Kennecott, UDEQ, and EPA thought they had resolved these issues, they announced that they had reached an “agreement in principle.” This triggered final negotiations which should have culminated in a consent decree. But in December 1993, Kennecott walked away from the negotiations. Kennecott feared that the consent decree amounted to a “blank check,” and that the agencies would get to fill in the blank. The extent of contamination was uncertain, the action levels and the necessary remedies were unclear, and the costs of the cleanups were therefore impossible to estimate. Because of this uncertainty, no one could predict either remediation or financial assurance costs.

Stage Two: Working Through the Threat of NPL Listing

The failure of the negotiations led EPA to revive the NPL listing process which was deferred for over a year. EPA proposed two Kennecott areas (Kennecott North Zone and Kennecott South Zone) for listing on the NPL in mid-January 1994. Despite the collapse of the agreement, Kennecott’s commitment to cleanup continued. And although Kennecott’s managers responded to the listing threat by opposing it, they continued to pursue the cleanup program.

EPA began characterization of potential problems in residential communities near Kennecott and started a human health risk assessment. UDEQ started characterizing the watersheds potentially affected by Kennecott discharges. Meanwhile, Kennecott began a cleanup at the South Jordan Evaporation Pond, started evaluating cleanup alternatives near the refinery and smelter, initiated an ecological risk assessment for the various habitats at the site, and began a remedial investigation and feasibility study for the ground water issues at the South Zone.

EPA, the state of Utah, and Kennecott were able to move forward with cleanup because, although the final consent decree was never signed, they all agreed that the goals, approaches, and decision-making protocols developed for the agreement in principle were sound, regardless of the site’s NPL status. Because the cleanup was progressing, EPA felt no urgency to push the NPL listing process forward. The listing remained in limbo for another year and a half until 1995 when EPA agreed not to take further action toward placing Kennecott on the NPL since the parties established a memorandum of understanding.

Stage Three: The Memorandum of Understanding

In an atmosphere of intense political involvement, EPA began considering how to end the stalemate on NPL listing. After the site-wide consent decree failed, the agency decided to deal with enforcement on a smaller scale. Instead of one over-arching consent decree, regulators decided to develop individual consent decrees to address the different portions of the site. In a memorandum of understanding, Kennecott agreed to this new approach. This new strategy eliminated Kennecott's concern that an over-arching consent decree would require unknown remedies at unknown costs. The individual consent decrees would only go into effect after the parties had come to agreement on the remedies and work to be performed. The MOU covered only cleanups that had already been designed and agreed to plus the necessary studies to address unassessed portions of the cleanup. The MOU approach retained the best parts of the failed consent decree negotiations, such as generic site-wide ecological and human health risk assessments, generic remedies, generic quality assurance protocols, standard characterization methods, standard community participation, and flexible schedules to fit with operational and funding issues at Kennecott. In addition, this cleanup strategy could leave Kennecott's land holdings in prime condition for reuse. Reuse of the land was an important issue for Kennecott with a lot at stake – the future of a company that has land holdings of almost 93,000 acres.

Success Under the Three-Party Agreement:

- cleanups within a shortened time frame;
- voluntary cleanup for areas of concern;
- completed source control measures;
- deferment of Superfund listing;
- recognition of state permitting authority; and
- use of permits for ongoing operations.

It became clear that because Kennecott is an operating facility, long-term Superfund actions could be monitored using state and federal permits. This resulted in state oversight of long-term operations and maintenance.

Cleanup has already taken place over hundreds of acres in both zones. Kennecott, and to a lesser extent, the Atlantic Richfield Company (ARCO) conducted cleanup activities at the South Zone with oversight by state and federal agencies. ARCO was participating under a unilateral order, which is an enforcement mechanism EPA uses when it cannot reach a voluntary agreement with a party liable for cleanup. Kennecott completed removal of more than 25 million tons of lead- and arsenic-contaminated mining wastes in 1999. The long-term remediation of contaminated ground water at the South Zone was also underway. Removal of the North Zone's surface wastes was completed in 2001. Sludge from the refinery and smelter were placed in an on-site repository, along with contaminated soils found during the modernization of the smelter and refinery. To date, Kennecott has spent more than \$370 million on cleanup and source control. Some Kennecott managers have said that they believe that costs would have been three times as high had the site been listed on the NPL.

FINDING THE SILVER LINING: CAPITALIZING ON CLEANUPS

In 1989, around the time Kennecott managers realized they would need to clean up almost a century's worth of contamination on their lands, the company was purchased by London-based RTZ Corporation. RTZ later became Rio Tinto, which remains one of the world's largest international mining companies. By 1994, Rio Tinto's management began thinking about sustainable development and being a good neighbor. When Kennecott staff realized that the company was responsible for the largest remaining contiguous land holding in the state, Rio Tinto provided resources and management support to create a new affiliated company that would manage those assets.

This section of the case study focuses on how the cleaned up land at the Kennecott site led to a whole new vision for the future and what steps were taken to make that vision a reality.

"Rio Tinto businesses, projects, operations and products should contribute constructively to the global transition to sustainable development...In practice, this depends on the active awareness of and support for Rio Tinto's principles and policies by each of us as individuals."
- Source: <http://www.riotinto.com>

An Interest Kindles: Preliminary Reuse Thoughts

Although reuse planning did not begin in earnest for the Kennecott land holdings until after 2000, two events in the early 1990s prompted Kennecott managers to begin thinking about reuse possibilities. First, in 1993, Kennecott began cleaning up 50 years of sludge spread over several hundred acres on the South Jordan Evaporation Ponds. Cleanup consisted of consolidating all the sludge onto one portion of the site at a cost of \$15 million. Kennecott officials recognized that as a result of this exercise they had a large, and potentially reusable, land holding in the middle of the City of South Jordan, a rapidly growing suburb in Salt Lake County. In 1995, Kennecott managers hired a top planning firm to evaluate the potential for future use of the reclaimed evaporation ponds. A general land development concept was outlined. While reuse did not occur at that time, several years later the study helped motivate Rio Tinto managers to consider reuse over all of Kennecott's land holdings, which make up 50 percent of the developable land left in the county.

The second event began in 1994 when Rio Tinto asked all of its operations worldwide, including Kennecott, to develop closure plans. Development of this mine-closure plan raised the question, "What happens after a mining project ends?" It prompted Kennecott to consider not only the present mining activities, but also subsequent cleanup, and ultimately, reuse.

Nevertheless, the land could not be redeveloped until it was clean, and Kennecott was looking at hundreds of millions of dollars in cleanup costs. By the late 1990s, declining copper prices were negatively affecting Kennecott's mining income. However, in the course of updating the mine closure plan, Kennecott executives recognized that cleaning up mining wastes restored the land, which could be put to beneficial use and create new sources of revenue.

Although rising copper prices in the late 1990s ameliorated Kennecott's financial difficulties, it became critical to keep the mining operations going in order to pay for the environmental cleanup. While Kennecott officials could have shaved some of the costs of their cleanup by cleaning only to the minimum standards required by the federal government, they decided to remediate portions of the site in accordance with more rigorous guidelines. Kennecott chose to clean much of the contaminated land holdings to the most stringent land use standard – one that would support residential use.

In addition to helping pay for cleanup, the continuing mining operations provided infrastructure for water management and waste management that are not usually available at closed mines. This allowed the cleanups to use the existing infrastructure at much-reduced costs. For example, Kennecott uses the tailings slurry line as a receptacle for acid waters from a ground water remediation project. The tailings neutralize the acid in the water, eliminating the need to build and operate a separate treatment facility.

Kennecott Companies Earn ISO Certification

In January 2004 Kennecott Utah Copper earned the International Standards Organization (ISO) 14001 certification for its environmental management system (EMS) and passed a third-party environmental audit by NSF-International Strategic Registrations. The ISO 14001 certification signifies that a company has met rigorous international environmental criteria. As part of its ongoing environmental efforts, Kennecott Utah Copper is continuing to incorporate its environmental management system into its day-to-day operations through training, communication, and internal audits. Kennecott maintains its ISO certification through environmental cleanup and conservation activities such as reclaiming 100 acres of mining waste disposal areas and reducing the amount of fuel spilled during refueling.

In addition, Kennecott Land Company (Kennecott Land) achieved ISO 14001 certification in 2005, becoming the first U.S. community developer to accomplish that goal. Kennecott Land's leadership has backed up its commitment to sustainable development principles by establishing an EMS and complying with all relevant environmental requirements. It has also pledged to continue improving its environmental performance. Kennecott Land's first development, Daybreak, reflects this commitment to environmental sustainability by incorporating more than 1,000 acres of green space, retaining all storm water onsite, recycling 75 percent of construction waste, and meeting EPA's Energy Star standards for energy efficiency.

Sources: Landdevelopmenttoday.com; kennecott.com; deseretnews.com; and Kennecott Utah Copper 2004 Sustainable Development Report

Recognizing Opportunity: A Reuse Champion Emerges

By 1996, Kennecott management realized that the substantial growth expected in the Salt Lake Valley over the next 30 years meant that Kennecott's land holdings could serve the company well beyond the life expectancy of the mine. Kennecott, however, was a mining company, not a land development company. The decision to seriously consider the reuse of the site would need to come from Kennecott's parent company, Rio Tinto. Rio Tinto was interested in promoting sustainable development and agreed to provide Kennecott with the financial backing needed to assess the potential of its land holdings.

In 1999, a team of experts began a detailed evaluation of the potential for land development on Kennecott's holdings. An internationally recognized land planner produced a general plan for the property. In early 2000, this plan was submitted for outside review, including the Rio Tinto Technical and Business Evaluation Groups. In 2001, Rio Tinto established Kennecott Land Company (Kennecott Land) to protect and develop non-mining land. With nearly 93,000 acres of land in the Oquirrh Mountains and foothills of the western Salt Lake Valley and Tooele County, there was a lot of potential for success. Realizing the great potential of the land, Rio Tinto appointed an independent city planning and urban design consultant to evaluate the business viability of the plan.

This evaluation showed that the South Jordan evaporation ponds site, which had been remediated several years earlier, presented an excellent opportunity for redevelopment. Kennecott recognized that for redevelopment of that area to be successful, it would have to be a collaborative effort with the city of South Jordan. According to South Jordan city manager, the planning and development process has been a partnership from the beginning. Kennecott and the city of South Jordan have worked closely together to ensure that the city's interests are considered and that community residents had input. Though there has been some give and take, the partnership is a successful one. "It's all based on trust," said the city manager, "and that trust has not been violated." The results of this collaboration were captured in a groundbreaking design. After years of legwork and planning, the concept of a sustainable and new-urbanist community was born. The community, ultimately named Daybreak, is unique to that part of Utah, but the city of South Jordan embraced it without reservation. "The overall concept was never questioned," the city manager stated.

During 2003, a cooperative approach was initiated by Kennecott Land and Kennecott Utah Copper to address the removal of gypsum sludge that was consolidated and capped during Kennecott's cleanup of the South Jordan Evaporation Ponds site in 1994-95. The consolidated gypsum sludge was located in an area that Kennecott Land wanted to develop for recreational and residential purposes, and its removal was necessary to prevent the

Daybreak

Where once seepage ponds held 50 years worth of mining sludge, Kennecott Land Company is developing a 4,126-acre, pedestrian-friendly community. The development, called Daybreak, is in the city of South Jordan at the base of the Oquirrh Mountains. The creators of Daybreak designed it to be a model of environmentally and socially responsible growth. In constructing the 13,600 homes and 9.1 million square feet of commercial buildings, Kennecott Land is adhering to EPA Energy Star efficiency guidelines. According to a Kennecott Land spokesman, Daybreak homes are 30 percent more efficient than state building codes require. The community also features 1,250 acres of parks, a recreational lake, pedestrian-friendly town centers, shops, churches, schools, and mass transit. Daybreak's cutting-edge design has begun to attract considerable attention. In June 2003, the development won the Envision Utah Governor's Quality Growth Award. The award recognizes development projects and creative communities that "keep Utah beautiful, prosperous and neighborly for future generations." In October 2004, a group of business and civic leaders from Sacramento toured Daybreak to get ideas about how best to address rapid growth. In a letter to participants, organizers of the trip wrote, "It is apparent that civic leaders of the Salt Lake region have a commitment to the success of their community that, in our experience, is unparalleled."

- Source: *Deseret News* 11/8/04

remobilization of sulfate to the underlying ground water aquifer. Kennecott Land proposed a work plan to EPA to re-use the cap soil and remove consolidated gypsum sludge to Kennecott Utah Copper's repository space. Verification of the successful completion of the removal action was proposed to EPA under a post removal sampling plan. To date the removal work is being continued by Kennecott Land in its efforts to revitalize this area once used for industrial purposes.

Kennecott Today: The Kennecott Land Company

Today, the Kennecott Land Company is a separate corporate entity. The purpose of the company is to act as a "master developer" to design, plan, entitle, develop infrastructure, finance, and prepare design guidelines for communities that will be built on Kennecott properties. Liability for the reuse of Kennecott land is not the deal-breaker it frequently is for other mining sites. Kennecott manages its liability by cleaning to residential standards properties that will be sold to others. In addition, Kennecott only works with developers who are willing to follow its vision of sustainability and safety. Kennecott Land plans to maintain ownership of its properties where waste is safely left in place and to lease them to appropriate parties. This will prevent activities that could jeopardize human health or the environment.

With South Jordan's approval of a development agreement, funding from Rio Tinto secured, and the hiring of a senior management team, the project evolved from vision and planning to implementation. This project represents a new beginning for Kennecott – one that ensures its long-term presence and viability in the region.

LESSONS LEARNED FROM THE KENNECOTT EXPERIENCE

The cleanup process Kennecott used was unprecedented. Cleanup of the Kennecott site took place because the dual threats of CERCLA litigation and NPL listing—along with a new corporate perspective—motivated the company to conduct a proactive environmental cleanup. Together, EPA, the state, and Kennecott developed a process whereby EPA had control and oversight of the cleanup, but without the need to list the site on NPL. This approach, which years later came to be known as the “Superfund Alternative Site” approach, yielded many environmental, social, regulatory, and economic benefits that might not have been realized using the traditional enforcement tactics. For example, cleanup activities started without any legal action. This meant that dangers to human health and the environment could be alleviated years before they might have been had Kennecott chosen to dispute the cleanup in court. Furthermore, when Kennecott performed cleanups, in many instances it went further than the cleanup levels called for by the regulatory agencies. Kennecott cleaned many properties to residential standards. Although the process was not always easy, the end result was a new remedial approach that accomplished EPA's goal of protecting human health and environment.

“Kennecott often cleaned to unrestricted land use standards rather than using the official cleanup requirements ... They found it cost-effective to go after it all rather than remobilize at a later date.”

- Jon Callender, Kennecott

Common-sense, but costly source control measures, such as cleaning up and replacing older reservoirs with state-of-the-art lined reservoirs and discontinuing the use of leach piles, stopped the vast majority of releases that posed the greatest threats to human health and the environment through ground water contamination. The company also financed the construction and operation of two reverse osmosis plants to provide clean water at market price to the residents of South Jordan, West Jordan, Herriman, and Riverton. The plants are a component of the settlement reached under the Natural Resources Damage claim filed by the state in 1986 to address one of the largest ground water contamination plumes in the country.

Keeping the site off the NPL offered a number of advantages including social and regulatory benefits. Some feared that if the site had been listed on the NPL, the company might have been forced to temporarily or permanently shut down operations. The alternative cleanup process helped ensure continued mining operations that provided an ongoing source of funding for cleanup. Ultimately the entire community benefited; local workers kept their jobs and new home ownership opportunities were created in the area.

The regulatory benefits of cleaning up the site without listing on the NPL were not easily gained. Not everyone at EPA supported the decision to hold NPL listing in abeyance. In fact, many at EPA thought the process would undermine the agency's ability to list other sites and to force responsible parties to pay for environmental cleanups. In addition, many did not think that EPA would have the leverage it needed to oversee cleanups that were protective of human health and the environment if the site were not on the NPL. To assuage some of these concerns and keep the process at Kennecott moving forward, the cleanup was designated as a "pilot" to avoid setting any precedent.

Throughout the process, the potentially responsible parties (PRPs) and some members of the community continued to express concerns about NPL listing. Critics of the NPL process have theorized that a Superfund NPL designation has negative effects on neighboring communities and can reduce local land values. Regardless of the merit of these criticisms, in unique cases EPA has provided flexibility in the cleanup process. Although the decision to clean the site without listing it was initially controversial, it led to an approach that has proven effective at motivating responsible parties to clean up sites. There are now over 100 designated Superfund Alternative sites around the country, including several mining sites and many site reuse success stories.



Photo 5: "No one moves dirt better than we do."

- Frank Joklik, Former CEO, Kennecott Utah Copper Corporation

Additional regulatory benefits afforded by the approach used at Kennecott include faster cleanups without litigation and improved relationships among EPA, state agencies, and the PRPs.

Lessons Learned

- ***The threat of NPL listing may serve to motivate potentially responsible parties to remediate contamination caused by their activities.*** In some cases, the threat of NPL listing is enough to prompt firms responsible for site contamination to cooperate with EPA in cleaning up the environment.
- ***Cooperation with regulators and willingness to interact with community leaders engenders goodwill.*** After an initial period of resistance, Kennecott managers worked with regulatory agencies and followed through on the company's commitment to environmental cleanup. This enabled Kennecott to maintain and perhaps even enhance its standing in the community.
- ***Under the correct circumstances, flexibility in the cleanup process can result in successful and timely cleanups.*** Through its actions, Kennecott proved itself willing to work with state and federal agencies to address contamination. The agencies, in turn, introduced flexibility in the regulatory process that allowed the cleanup to proceed as a Superfund Alternative site. Because all parties ultimately worked together while adhering to their unique responsibilities, the alternative cleanup process proved successful.
- ***An open, transparent process engenders trust among stakeholders and reduces regulatory overlap.*** Throughout the cleanup process, there were avenues for stakeholders to communicate and express their concerns. Federal, state, and local government officials were willing to think creatively and worked with Kennecott to develop a cleanup approach. When there were overlapping authorities, agencies worked together to establish a lead authority. This approach eliminated confusion and duplication. Because of this open and cooperative process, when Kennecott moved forward with cleanups, there was little opposition in the local community or among the regulatory agencies.
- ***Alternative cleanup processes can save time and money.*** Kennecott managers believe that by avoiding the costs of litigation often associated with NPL listing, and by using their own infrastructure and equipment, they saved hundreds of millions of dollars and were able to address contamination quickly.
- ***Cleanups are an investment.*** Ultimately, the cleanup costs were an investment in the future of Kennecott and in the future of the Salt Lake Valley. Because Kennecott cleaned much of the site to residential standards, it was able to reuse the land and create new communities for the growing population of the region. As a former Kennecott executive put it, "Contaminated land is valuable. Kennecott ultimately converted a potentially big liability into a whole new business with long-term value to shareholders."

NON-NPL APPROACH YIELDS BENEFITS FOR KENNECOTT

Through 2004, Kennecott has paid more than \$370 million to remediate its land holdings. The total cleanup costs could have been much higher outside of the Superfund Alternative process, and in the end, the economic investment Kennecott makes in the cleanup of its properties should see a substantial return.

Through the collaborative non-NPL approach, Kennecott was able to avoid some legal costs, so that more funding could go toward remediation rather than litigation, and human-health risks could be eliminated more quickly. The former CEO for Kennecott concluded that legal maneuvering would not change the cost of cleanup and the longer the company waited to start cleanup, the more it would cost in the long run. The company's reputation also benefited from its willingness to cooperate with regulators and expedite the cleanups.

Kennecott also believes it may have saved \$100 million or more for a major modernization project by avoiding NPL listing. At the same time Kennecott was confronting its responsibilities under CERCLA, it was planning to launch a massive modernization project, including building an entirely new smelter, a refurbished refinery, and upgraded infrastructure. Kennecott believed that Superfund liabilities as verified by the site's appearance on the NPL could raise the cost of capital by at least a percentage point. Because the company would need to borrow a minimum of \$1 billion for the modernization project, even a small interest rate increase would have been costly. To avoid these costs, Kennecott sought to conduct its cleanup activities without listing the site on the NPL.

In addition, Kennecott had at its disposal infrastructure, staff, and other assets necessary to clean up its properties. It was in the company's interest to work with the agencies to develop cleanup strategies rather than to have an unknown strategy forced on it. By working with the regulatory agencies, Kennecott was able to plan cleanups that allowed its mining operations to continue and even to be used to support the cleanup activities. Some of the revenue generated from the mining operations paid for the cleanup of the properties.

In the end, the money saved by avoiding litigation and increased loan rates led to long-term economic viability for the company. Additionally, the company's willingness to work with stakeholders to assess and solve problems generated untold goodwill. Not only did Kennecott foster a positive relationship with EPA, the quality of the cleanups went well beyond required standards. The transfer of remediated land holdings from Kennecott Utah Copper Corporation to the Kennecott Land Company will secure a place for Kennecott in the local community for decades to come.



Photo 6: Mining trucks traversing Kennecott's Brigham Canyon Mine

Source: EPA

CONCLUSIONS

The contamination in the Salt Lake Valley that is the legacy of over a hundred years of mining is enormous, as is the amount Kennecott is spending to clean it up. Since the mid-1990s, Kennecott has demonstrated that continued corporate success can be achieved while being open with the public and regulatory agencies about contamination problems. Kennecott's decision to continue expensive assessment and cleanup activities after the breakdown of negotiations on a consent decree demonstrated its commitment to cleanup. Kennecott's current president says the corporate culture has evolved to the point that employees take as much pride in mending the landscape in the wake of mining as they do in producing the metals for society's use. The willingness to try new things (such as using tailings to neutralize acid and constructing reverse osmosis treatment plants to treat contaminated ground water) turned out to have cost advantages for the company. But its most important and innovative thinking may have been the decision to look outside of their standard mining company framework to see the potential value of the post-mining uses of their lands and to tailor cleanups to support the most advantageous future uses.

Meanwhile, the regulatory agencies also broke some new ground. Foremost, this site showed that alternative cleanup approaches could succeed at sites where the PRPs have the funding available and the corporate commitment to address contamination problems. By introducing flexibility in the regulatory process while remaining committed to their mandated responsibilities, EPA and the state agencies played an active part in ensuring the success of the cleanup. In addition, they improved communications by speaking to regulated parties with a unified message and establishing intra- and interagency coordinating committees, as well as a state-federal partnership. Finally, all agencies realized the importance of an open process, and established technical review committees that allowed meaningful input from a wide range of stakeholders.

The city of South Jordan is just beginning to see the benefits as people start moving into homes in Daybreak and financially important commercial projects loom on the horizon. The city is pleased with the process and confident about the future. "The Daybreak project is like something Utah has never seen before. This project can be a model for the nation," according to the city manager.

The Kennecott story is not over. There is still a lot of ground water cleanup to be done and difficult negotiations remain. The tremendous potential from the new land development has just begun, but the last ten years of progress give reason for optimism about the future.

REFERENCES

In addition to interviews with individuals associated with the Kennecott site, including Eva Hoffman (former EPA RPM) and Rick Horst (South Jordan City Manager), the following references were used in developing this case study:

ATSDR Division of Health Assessment and Consultation (1996). "Public Health Assessment for Kennecott (North Zone), Magna, Salt Lake County, Utah." Available online at: http://www.atsdr.cdc.gov/HAC/PHA/ken/ken_toc.html. Accessed May 2006.

ATSDR Division of Health Assessment and Consultation (undated). "Public Health Assessment for Kennecott (South Zone), Copperton, Salt Lake County, Utah." Available online at: http://www.atsdr.cdc.gov/HAC/PHA/kensouth/ksz_toc.html. Accessed May 2006.

Enviro Science Inquiry, Web site of Lehigh University. Available online at: <http://www.leo.lehigh.edu/envirosoci/geology/geo/1/copper1/copper1.html>. Accessed May 2006.

Kennecott Land Web site. Available online at: <http://www.kennecottland.com>. Accessed May 2006.

Kennecott Utah Copper Corporation (Spring 2003). "Managing Environmental Cleanup." Available online at: http://www.kennecott.com/pdf/kuc_envir.pdf. Accessed May 2006.

Kennecott Utah Copper Web site. Available online at: <http://www.kennecott.com>. Accessed May 2006.

Smeath, Doug. "Daybreak Project is Rising Star." Deseret Morning News. 8 October 2004. Web edition available online at <http://deseretnews.com/dn/print/1,1442,595096882,00.html>. Accessed May 2006.

Southwest Jordan Valley Groundwater Technical Review Committee. Meeting minutes. January 26, 2000. Southwest Jordan Valley Groundwater Project Web site. Available online at: <http://www.jvwcd.org/swjvgp/swjvgp.html>. Accessed May 2006.

U.S. Environmental Protection Agency (May 2003). Fact Sheet for Kennecott North Zone. Available online at: <http://www.epa.gov/region8/superfund/sites/ut/kennn.html>. Accessed May 2006.

U.S. Environmental Protection Agency (May 2003). Fact Sheet for Kennecott South Zone. Available online at: <http://www.epa.gov/region8/superfund/sites/ut/kennes.html>. Accessed May 2006.

U.S. Environmental Protection Agency (18 January 1994). NPL Site Narrative for Kennecott South Zone. Notice at 2568 - 2574 Federal Register; Vol. 59, No. 11; Tuesday, January 18, 1994; Proposed Rules. Available online at: <http://www.epa.gov/superfund/sites/npl/nar1428.htm>. Accessed May 2006.

Utah Department of Environmental Quality. "State of Utah Natural Resource Damage Trustee Southwest Jordan Valley Groundwater Cleanup Project." Available online at: <http://www.deq.utah.gov/Issues/nrd/index.htm>.