

Site Description

The Burlington Northern-Santa Fe Railway Company (BNSF) Somers Former Tie Treating Plant is located in northwestern Montana in the unincorporated town of Somers, Flathead County. Somers has a population of approximately 500 people. The Site, which covers approximately 80 acres, is located immediately adjacent to Flathead Lake in parts of Sections 23, 24, 25 and 26, Township 27 North, Range 21 West. The historical plant area of the Site is bounded by residential areas to the west, east and south-southwest. The area to the south of the plant houses a barn and pasture area, through which a former discharge ditch flowed. The area to the north and northeast drops down a slope into a slough. The Swamp Pond area of the Site is bounded by Flathead Lake on the south and southeast, wetlands area to the east, and undeveloped land to the north and west. The Site is located partially in the floodplain of Flathead Lake. Flathead River enters Flathead Lake approximately five miles east of Somers. Portions of the Site along Flathead Lake and in a slough area adjacent to the Site are wetlands. Groundwater generally flows from the former plant toward the lake and slough. The Flathead Waterfowl Production Area occupies much of the north shore of Flathead Lake east of the site. Waterfowl also use the slough area adjacent to north and northeast of the tie plant as breeding grounds.

Site Risks

The potential routes of migration from soil and sediment sources are primarily air and water. For groundwater the main potential route of exposure is discharge to surface water. The risk assessment determined that contaminated soils and groundwater pose the greatest risk to human health and the environment. The indicator compounds for the risk assessment included: PAH compounds, phenols and zinc. The toxicity assessment identified the presence of carcinogenic and non-carcinogenic compounds, with the PAH - benzo(a)pyrene representing the most potent PAH. Exposures routes identified in the risk assessment were based on a residential exposure scenario, due to the proximity of residential area and potential future use of the property. The exposure routes determined by the risk assessment include: direct contact/ingestion of surficial soil and inhalation of volatile compounds and fugitive dust. Potential exposure routes were identified for ingestion of groundwater from wells down gradient of the CERCLA lagoon, direct contact/ingestion of soil and sediment or water by wildlife, fish or other aquatic life and consumption of environmental contaminants via the food chain.

Site History

The Somers Tie Treating Plant was operated by BNSF between 1901 and 1986. Treatment fluids used by BNSF included zinc chloride (used 1901 to 1943), chromated zinc chloride (used 1940 to 1943) and creosote/petroleum preservative mixtures (used 1927 to 1986). The treatment process generated wastewater primarily consisting of steam condensate containing zinc chloride or creosote. Floor and shop washing, drippage from treated ties pulled from the retort onto the drip track, and storage of treated ties on the property were other sources of process-generated wastewater. An average of 350 gallons of wastewater was discharged per day. Approximately 1,000 pounds of sludge from the retort was generated every 1.5 to 2 years. These activities impacted surface and subsurface soil and groundwater at concentrations that pose a threat to human health and the environment.

Prior to 1971, BNSF discharged wastewater into a lagoon located immediately south of the retort building ("CERCLA Lagoon"). Overflow from this lagoon discharged through an open ditch into Flathead Lake, a distance of approximately 1,200 ft. Sometime prior to 1946, a pond formed in the swamp area (the "Swamp Pond") adjacent to Flathead Lake and waste material discharged through the open ditch accumulated there. BNSF abandoned the lagoon and the ditch in 1971 when the company constructed two wastewater treatment impoundments. In 1984, BNSF began operation of a recycling system and stopped all wastewater discharges.

In February 1984, the MDEQ sampled the soils at the BNSF Somers Plant. Based on the results of this investigation, the site was proposed for listing on the Superfund National Priorities List (NPL) in 49 FR 40320, October 15, 1984. The proposed listing cited potential negative effects on Flathead Lake, which at that time, was community of Somers' water supply. The site was later removed from the proposed NPL in 1992 due to joint Resource Conservation and Recovery Act/Comprehensive Environmental Response Compensation and Liability Act (RCRA/CERCLA) authorities.

In May 1985, EPA, BNSF and Sliters (a corporation which owns a portion of the site) signed an Administrative Order on Consent (AOC) providing for an emergency removal action in the area of the Swamp Pond adjacent to Flathead Lake. The area was determined to pose an imminent and substantial hazard to Flathead Lake because of the presence of heavy creosote contamination in water and soil located within 2 feet of the shoreline. Approximately 3,000 cubic yards of contaminated soil and 100,000 gallons of contaminated water were removed from the Swamp Pond as an emergency action under Administrative Order. BNSF removed contaminated soil and groundwater from the Swamp Pond and the drainage ditch. The soils hauled to the BNSF RCRA-regulated facility in Paradise, Montana for treatment. The excavated areas were backfilled with clean soil and riprap was placed along the lakeshore.

In April 1988, a small area of creosote contamination was discovered on the surface of beach sediment on the northern shore of Flathead Lake, adjacent to the Swamp Pond. This area of contamination extended 30 feet along the riprap wall and 20 feet onto the beach. In May 1988, the contaminated area was excavated resulting in removal of 40 cubic yards of contaminated sediment. The contaminated sediment was placed in the CERCLA lagoon. A test pit was installed on the inland side of the riprap wall, resulting in the discovery of creosote-contaminated soil and a groundwater seep. Subsequently, high-density polyethylene liner was placed along the lakeside wall of the test pit to prevent further migration along the seep. The RCRA impoundments were also closed in 1988 under the MDEQ Hazardous Waste Permitting Program.

Cleanup Progress

In October 1985, the EPA, BNSF and Sliters signed a second AOC to conduct a Remedial Investigation/Feasibility Study (RI/FS). The purpose of the RI/FS was to determine the nature and extent of contamination at the Site; to evaluate the impacts of contamination on public health and the environment; and to formulate alternatives for remedial action. The RI/FS identified contaminated soil beneath and adjacent to the CERCLA lagoon, along the drip track, along the drainage ditch and near the former Swamp Pond. The heaviest contamination observed in soil/oil mixture was in the upper few feet of the CERCLA lagoon and the surface of the drip track area. Other areas of contamination included: the slough where treated ties were stored and beach sediments below the high water line. The contamination in the beach area is believed to be either a remnant of discharges from the ditch or contaminated groundwater originating from the Swamp Pond area. The primary contaminants of concern in soils and sediments are polycyclic aromatic hydrocarbon (PAH) compounds and zinc in the area of the slough, due to potential impacts to aquatic life and waterfowl. Zinc is also a contaminant of concern for the drip track area.

The RI/FS identified groundwater contamination in the near surface water table aquifer down gradient of the CERCLA lagoon and in the Swamp Pond area. On closure of the RCRA impoundments, groundwater contamination was also discovered in that area. The primary contaminants of concern in groundwater are PAH, phenols and zinc. Monitoring wells down gradient of the CERCLA lagoon exhibited visible evidence of oil contamination. The contaminant plume was discovered between 400 to 600 feet down gradient of the CERCLA lagoon.

After completion of the RI/FS, a Record of Decision (ROD) was signed on September 27, 1989. The ROD selected a remedy and a contingency remedy for remediation of soil, groundwater and sediments, which were determined to pose a potential threat for human health and the environment. The selected remedy addressed the principal threats by removing the potential for direct contact with soils, by reducing the impact of the soils and sediments on groundwater and surface water, and by treating the groundwater. The contingency remedy was to be implemented if the selected remedy was not determined to be effective. Cleanup levels for contaminants of concern were established. The objective for soil remediation is to reduce exposure from direct contact to an acceptable level and to ensure that the migration of contaminants to groundwater is minimized and requires the following:

- Excavation and biological treatment of 11,700 cubic yards of contaminated soils in the CERCLA lagoon, drip track, drainage ditch, beneath the retort building and in the slough and beach areas in an onsite land treatment unit (LTU). Some soil left below the water table in the CERCLA lagoon and swamp would be treated as part of the groundwater component of the remedy. The ROD included provision for RCRA groundwater monitoring and post-closure care for up to 30 years or deed restriction placed if hazardous constituents remain. A demonstration of no-migration of hazardous constituents was conducted to satisfy RCRA land disposal restriction requirements.
- The original alternative was modified to exclude the excavation of the beach sediments. The RI/FS identified contaminated beach sediments that extended approximately 150 feet into Flathead Lake. However, contaminated beach sediments remain covered by several feet of sand which is only exposed when lake levels are low in the winter months, when use of the beach is limited. Due to the coverage of the sediments and continued sedimentation in the area, EPA determined that leaving the sediments in place would cause lesser impacts to human health and the environment, than would removal. The clean sand provides a barrier for direct contact with impacts sediments and disturbance of the sediments by removal could impact water quality. Leaving the sediments in place below the continued sedimentation remains protective of human health and the environment.
- Excavated areas were backfilled with clean borrow soils and revegetated. The remedy also included replacement or restoration of wetlands lost during the remedial action.

The objectives for the groundwater component are to reduce, by treatment, potential exposures from groundwater ingestion and to ensure contaminants in groundwater do not adversely affect the quality of Flathead Lake and requires the following:

- An evaluation of an innovative technology consisting of either hot water flushing of contaminated groundwater, ozone/ultraviolet (UV) or peroxide/UV treatment at surface and *in situ* biological treatment of residual contamination. The remedy involved the installation of injection and recovery wells in the CERCLA Lagoon and the Swamp Pond area. Recovered groundwater would be treated in a chemical reactor.
- Identify and implement institutional controls to restrict use of groundwater down gradient of the areas;
- Monitoring activities required to assess the performance of the components of the remedy would be performed throughout the life of the remedial activities. Monitoring would involve quarterly groundwater monitoring and semi-annual monitoring of the Somers municipal supply well until cleanup levels are achieved; and
- Site conditions will be reviewed no less than each five years after initiation of the remedial action to ensure that the remedy protects human health and the environment.

On December 20, 1991, the EPA entered into a Consent Decree with BNSF for Remedial Design/Remedial Action (RD/RA) of the selected remedy at the Site. The Consent Decree required performance of a Pilot Study to demonstrate the “practicability” of the innovative hot water flushing and *in-situ* bioremediation component of the selected groundwater remedy, in the low permeability hydrogeologic conditions at the Site. The Consent Decree required the Pilot Study to be conducted prior to any soil application on the LTU.

During the 1991 Remedial Design Investigations, a Land Treatment Demonstration and a No Migration Demonstration were conducted to satisfy RCRA and land disposal restriction requirements. The results demonstrated that the contaminated soils are amenable to biological treatment and that no migration of hazardous constituents above health based criteria was expected. Based on the data, in 1991 the EPA granted a variance to land disposal restrictions for wastes to be treated in the LTU. Demolition of former operations also took place in 1991 and 1992.

EPA issued an Explanation of Significant Differences (ESD) in June 1992 that modified the elements of the selected groundwater remedy, based on the “practicability” determination required in the ROD and increased the total of excavated soils identified in the ROD. The results of the Pilot Study were presented in the *Remedial Design Investigation Report for the Former Somers Tie Plant*. The study was conducted to more accurately define and quantify the conditions under which the groundwater could be

successfully remediated. The ESD presented the "practicability" determination for the innovative bioremediation technology for the groundwater component. Only those changes to the groundwater component described below were made to the selected remedy:

- Increase the size of the LTU from 10 acres to 14 acres to decrease the time to meet remedial objectives and cleanup goals.
- Eliminate the hot water flushing option of the groundwater remedy due to the low permeability of the aquifer materials. Excavation of additional soil in the CERCLA Lagoon would remove more source material and aid the remediation process.
- Decrease the time to achieve soil remediation goals to four to six years rather than 10 years. Increase the estimate to achieve groundwater remediation goals from 10 to 15 years to 50 years.

As the result of the first five-year review, EPA modified the remedy selected for the site through an ESD issued in 1998. The ESD modified remediation criteria established in the ROD and the 1992 ESD. The modification of remediation levels was based on revisions in slope factors and establishment of new reference dose for non-carcinogenic PAH compounds. The modifications included: (1) revision to the soil remediation level for carcinogenic polycyclic aromatic hydrocarbons (CPAH) from 36 to 57 milligrams per kilogram (mg/kg) calculated as benzo(a)pyrene (B(a)P) equivalents using the revised cancer slope factor; (2) removal of limitations for pyrene, naphthalene and phenanthrene in soils, based on toxicological assessment and the no-migration demonstration; and (3) revision of the soil remediation level for total non-carcinogenic PAH from 1,875 to 1,500 mg/kg based on revisions to the Reference Dose (RfD) for naphthalene equivalents which was revised from 0.005 to 0.004 mg/kg-day. Only the initial treatment levels for soils were changed by this 1998 ESD. The ROD requirements for additional treatment of soils, after attaining the new initial treatment levels remained unchanged, with regard to net reduction of 20 percent for TPAH compounds. Groundwater modifications included a revision to the groundwater remediation level for total non-carcinogenic PAH from 0.3 to 40 micrograms/Liter ($\mu\text{g/L}$), based on the revision to the RfD for naphthalene; and a revision of the groundwater remediation level for total phenolics from 15,000 to 6,000 $\mu\text{g/L}$, based on revisions in the RfD for phenol and phenolic compounds.

Soil Component

In April 1993, contaminated soils in the area of the former Swamp Pond and a portion of the drainage ditch were excavated and removed to the LTU. Approximately 1 acre was excavated to a depth of 12 feet, resulting in a volume of 19,303 cubic yards of contaminated soil. The U.S. Fish and Wildlife Service also delineated wetlands in the former Swamp Pond and the slough area in July 1993, to

determine functional wetland values for wetlands compensation determination. As a result of the determination, BNSF reconstructed the Swamp Pond area, performed semi-annual water quality monitoring and assessed vegetation recovery. The determination identified the preference for no excavation to take place in the slough area if no ecological or human health impacts exist. The Swamp Pond excavation removed the majority of contaminated soils. Quarterly groundwater monitoring continued until results met cleanup levels in 1996 and are no longer sampled.

The CERCLA lagoon area exhibited contaminated groundwater consisting of dense nonaqueous phase liquids within and adjacent to the CERCLA lagoon boundaries and dissolved components in the groundwater down gradient from the lagoon and was also excavated to a depth of fifteen feet, resulting in a volume of 22,300 cubic yards. The CERCLA lagoon excavation removed most, but not all contaminated soil. Impacted soil below the water table was to be treated as part of the groundwater remedy as specified in the ROD.

The LTU was constructed in 1993 with a very low-density polyethylene liner overlain by a sand layer with a low profile drainage network embedded in sand. The drainage network discharged to a sump on the south side of the LTU. The LTU consisted of a 14.4-acre lined impoundment which included 1.7-acre soil storage area and 12.7-acre treatment area. The system was designed to promote the degradation of PAH contaminated soil using naturally-occurring micro-organisms. The LTU had an irrigation system, leak detection and leachate collection system and was supported by a retention pond to assist with management of accumulated water. Application and treatment of the first 17,000 cubic yards was conducted in May 1994 with treatment until September 1995, when treatment goals met the cleanup criteria for naphthalene and less than 20 percent net reduction. The second application consisted of 14,500 cubic yards placed on the LTU in October 1995. Treatment of the second lift lasted until November 1997, when the B(a)P equivalent concentrations was less than the revised soil treatment goal and the net reduction in Total PAH from October 1996 to November 1997 was less than 20 percent. The final application was in August 1998 and consisted of 9,367 cubic yards from the stock pile and 5,055 cubic yards of RCRA impoundment soil. The total of 14,422 cubic yards of soil formed a 10-inch lift. Treatment was continued until 2000 when the B(a)P equivalent and the less than 20 percent reduction was attained. The LTU was closed in 2002, after approval of the *Land Treatment Unit Closure Work Plan, BNSF Former Tie Treating Plant, Somers, Montana*, dated August 14, 2001. A deed notification was filed with Flathead County on the areas affected by LTU operations (21.99 acres total) in 2008 that prohibits installation of wells in the alluvial aquifer, with the exception of monitoring wells and wells required for remedial action.

The soil component of the remedy at the Somers Site has been certified complete.

Groundwater Component

The groundwater component consists of *in situ* biological treatment of contaminated groundwater within the water table aquifer, supplemented by extraction and treatment by mechanical and chemical processes. A 1991 Consent Decree, required that a pilot test of the hot water flushing and *in situ* biological treatment technologies be conducted to evaluate their "practicability" in the low permeability conditions. Subsequently, the 1992 ESD modified the groundwater remedy through elimination of the hot water flushing option due to low permeability. The contingency modification was excavation of additional soil in the CERCLA lagoon to remove more source material.

In December 1993, EPA granted conditional approval of the *Final Design Report for Phase I of the Groundwater Remedial Action at the Burlington Northern Tie Treating Plant, Somers, Montana*. EPA approval was conditional upon submittal of additional detail on the design basis for Phase II of the remedy. The Phase I groundwater remedy was designed to achieve two main objectives: 1) removing and controlling the most heavily impacted groundwater at the Site; and 2) obtaining field-scale data on the effectiveness of *in situ* bioremediation for use in the Phase II design. Two sets of wells were installed to achieve these objectives. The northern set consists of five extraction wells and ten injection wells located in the former CERCLA lagoon (north of Somers Road). The northern well array was installed to remove and control the most heavily impacted groundwater. The southern well array contains one extraction, four injection wells and four monitoring wells down gradient of the CERCLA lagoon. The southern well array was installed at a location where effective *in-situ* biological treatment was considered to be most likely observed in the short term. The construction of the well system was completed in 1993.

The construction of the groundwater treatment system (GWTS) plant started in 1993 and was completed in April 1994. The *Final Construction Completion Report for Phase I of the Groundwater Remedial Action, Burlington Northern Tie Treating Plant, Somers, Montana, "As-Built Construction Document"* describes the design and construction of the system. The *Operations and Maintenance Manual* details the operations and maintenance of the groundwater treatment system. The GWTS began treating groundwater in a limited capacity in April 1994, with routine operations established in January 1995. Extracted water was piped to the GWTS where physical and chemical processes were used to remove free product, dissolved organics and iron. Treated water was discharged to an infiltration trench and injection wells, to promote *in-situ* bioremediation of the aquifer.

A March 1994 addenda to the design report identified that if Phase I data indicate that it is not technically feasible to achieve the ROD cleanup levels within 50 years, then several options would be considered. One such option could be modification of project goals in terms of cleanup levels and restoration time frame, while remaining protective of human health and the environment.

A site-wide groundwater monitoring program was implemented in 1993. The program incorporates sampling and analysis of groundwater collected from the on-site monitoring well network. In general water quality has been below water quality standards with the exception of zinc and PAH compounds in specific wells close to the treatment area (CERCLA lagoon). The impacted groundwater in this area is characterized by the presence of residual creosote within the boundaries of the former lagoon and by dissolved creosote constituents down gradient of the lagoon. Operations and associated monitoring for the groundwater remedy have been reported in quarterly progress reports and annual reports since 1995.

In May 1998, BNSF prepared a *Phase II Remedial Design, Somers, Montana* document to present a summary of site characteristics and report on progress regarding implementation of the groundwater remedy. The document presented information from Phase I operations indicating that due to characteristics of site geology, hydrogeology and contaminant characteristics, it is not technically feasible to achieve the ROD clean up levels.

In December 1999, BNSF prepared a *Draft Technical Impracticability Evaluation for Groundwater Restoration, Former Somers Tie Treating Plant, Somers, Montana*. This document was subsequently revised in 2000 and in 2001. The draft TI Evaluation reviewed alternatives for the groundwater remedy due to the challenges the subsurface conditions and contaminant types pose to achieving the ROD designated cleanup levels. The TI Evaluation was determined to be complete by EPA in 2003. A Controlled Ground Water Area was also established in 2003 that prohibits drilling new ground water wells within the site properties. The order was signed on May 8, 2003.

Given EPA's approval of the TI Evaluation and implementation of groundwater institutional controls (Controlled Groundwater Area), BNSF requested to terminate operation of the GWTS in the September, 2004 *Request to Modify Groundwater Treatment System* report. The request was based on the on the site geology and hydrogeologic conditions below the site that limit the movement of groundwater and creosote and the inability of the GWTS to restore groundwater to ROD remediation levels. Fate and

transport modeling of the most mobile creosote constituent (naphthalene) demonstrated that the presence of residual creosote and dissolved contaminants of concern in the surficial aquifer are not a significant threat to the water quality of Somers well or Flathead Lake. In addition, the groundwater component of the remedy has demonstrated limited mass removal of contaminants through the groundwater treatment system (3 percent of total contaminant loading estimated to reside in the subsurface) and limited improvement of groundwater quality contamination in the treatment zone. Operational changes have been required due to low extraction and injection rates (25 percent below design rate), as a function of subsurface conditions of low permeability. Only about 9 percent of the water treated on-site is reinjected in the well field. Based on these conditions, EPA, DEQ, and BNSF agreed to turn off the GWTS for an interim period of two years and develop an Interim Monitoring Plan (IMP) that incorporates all monitoring and reporting requirements during the interim period.

The IMP superseded previous groundwater monitoring requirements. Data quality objectives (DQO) during the interim monitoring period, which commenced in January, 2008 included the following:

- Demonstrate plume stability following GWTS shutdown; confirm containment of contaminants of concern;
- Monitor natural attenuation (NA) parameters to confirm natural attenuation is occurring;
- Measure creosote accumulation in the former CERCLA lagoon area; demonstrate an effective means by which accumulated creosote may be removed from the wells;
- Ensure safety of the public drinking water through continued sampling of Somers municipal well;
- Continue LTU post-closure monitoring activities as scheduled; and
- Conduct ongoing operating and maintenance activities.

The DQOs are ascertained through monitoring. Two well networks have been identified for monitoring. One network ascertains stability and containment of contaminants of concern and is monitored quarterly. The second network monitors for NA parameters to verify that in-situ degradation is occurring in the larger proposed TI boundary area and is also monitored quarterly. The municipal well is also monitored semi-annually. Additional wells are monitored quarterly to determine sitewide groundwater elevations and/or to gauge creosote accumulation.

Results of this monitoring demonstrate that sitewide groundwater flow direction has not changed perceptibly from flow directions when the GWTS was operating. The groundwater contours show dissipation of the drawdown cone of depression observed during GWTS operations which has dissipated with time. In general, geochemical data collected during the interim period demonstrates that natural

attenuation is occurring in the proposed TI boundary area. No measurable creosote has been measured in any well and sampling of the municipal well demonstrates that no contaminants of concern are present.

Contacts

EPA

Roger Hoogerheide
Remedial Project Manager
U.S. EPA, Montana Office
10 West 15th Street, Suite 3200
Helena, MT 59626
(406) 457-5031
hoogerheide.roger@epa.gov

Montana Department of Environmental Quality

Lisa Dewitt
Project Officer
P.O. Box 200902
Helena, MT 59620
(406) 841-5037
1-800-246-8198 (in-state calls only)
lidewitt@mt.gov

View Documents at:

U.S. Environmental Protection Agency
Montana Office
10 West 15th Street, Suite 3200
Helena, MT 59626
(406) 457-5046