FIVE-YEAR REVIEW REPORT FOR BURLINGTON NORTHERN (SOMERS PLANT) SUPERFUND SITE FLATHEAD COUNTY, MONTANA

February 2012

Prepared by

U.S. Environmental Protection Agency
Region VIII
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2/28/12

Date

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Attachments

LIST OF ABBREVIATIONS

AAL	Attenuation Action Level
AMP	Attenuation Monitoring Point
ARAR	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substance and Disease Registry
bgs	Below Ground Surface
BNSF	BNSF Railway Company and its predecessors
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CGA	Controlled Groundwater Area
CL	Confidence Level
COC	Contaminant/Compound of Concern
COV	Coefficient of Variance
DEQ	Montana Department of Environmental Quality
DEQ-7	DEQ Circular DEQ-7 *Montana Numeric Water Quality Standards*
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
FS	Feasibility Study
ft MSL	Feet above mean sea level
GAC	Granular activated carbon
gpm	Gallons per minute
GPRA	Government Performance and Results Act
GWTS	Groundwater treatment system
HASP	Health and Safety Plan
I-90	Interstate 90
IC	Institutional Control
LTU	Land treatment unit
DEQ	Montana Department of Environmental Quality
MCL	Maximum Contaminant Level
NAPL	Non-aqueous phase liquid
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum
MBMG	Montana Bureau of Mines and Geology
NCP	National Contingency Plan
ηg/L	Nanogram/Liter
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PAHs	Polycyclic aromatic hydrocarbons
ppb	Parts per billion
ppm	Parts per million
ppt	Parts per trillion
P&T	Pump and treat
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party

QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Responsible Party
RSE	Remediation System Evaluation
RSL	Regional Screening Level
TI	Technical Impracticability
µg/L	Micrograms per liter
UAO	Unilateral Administrative Order
VOCs	Volatile Organic Compounds
WQB	Water Quality Bulletin

EXECUTIVE SUMMARY

This report represents the Fourth Five-Year Review of the remedial actions implemented at the Burlington Northern (Somers Plant) Superfund Site (Site) located in Somers, Montana. The Site, which is associated with a former railroad tie treating facility operated by Burlington Northern (later renamed BNSF Railway Company), is located on Flathead Lake in the northwestern portion of Montana. The Site is also commonly referred to as the BNSF Former Tie Treating Plant Site in Site documents.

The Third Five-Year Review (September 2006) focused extensively on the "groundwater component" of the remedy because the "soil component" had been certified as complete. The Fourth Five-Year Review presented herein also focuses on the "groundwater component" of the remedy.

This Fourth Five-Year Review has determined the following with respect to protectiveness:

> The soil remedy currently protects human health and the environment because contaminated soil was treated, placed in a Land Treatment Unit at the Site, covered with clean fill, and surrounded by a fence to prevent access. However, to be protective in the long-term, enforceable institutional controls (ICs) for the area need to be implemented.
>
> The groundwater remedy is not protective of human health and the environment because new information generated since the last Five Year Review shows the plume is not stable, the vapor intrusion and drinking water pathways have not been fully evaluated, and the current ICs do not cover all areas where contamination is above the ROD cleanup standards for groundwater. A renewed effort to collect additional information (Geoprobe and TarGOST) began in September 2011. In 2012, based on a review of the data recently collected, EPA, in consultation with the Montana Department of Environmental Quality (DEQ), will determine appropriate next steps for this facility. The long term protectiveness of the groundwater remedy will depend on the implementation of additional measures recommended in this Fourth Five-Year Review and any additional work identified following analysis of the 2011 investigations to characterize and control Site contaminants.

New information obtained by the EPA and DEQ (collectively, the Agencies) since the publication of the Third Five-Year Review in connection with the Site leads the Agencies to conclude that the remedial action for the groundwater remedy at the Site cannot be considered protective of human health and the environment in the either the short-term or long-term.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Burlington Northern (Somers Plant) Site		
EPA ID: MTD53038386		
Region: 8	**State:** MT	**City/County:** Somers, Flathead County

SITE STATUS	
NPL Status: Non-NPL	
Multiple OUs? No	**Has the Site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name (Federal or State Project Manager): Lisa DeWitt
Author affiliation: Montana DEQ
Review period: 9/29/2006 - 7/31/2011
Date of Site inspection: November 16, 2010
Type of review: Statutory
Review number: 4
Triggering action date: 9/29/2006
Due date *(five years after triggering action date)*: 9/29/2011

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None.

Issues and Recommendations Identified in the Five-Year Review:

OU(s):	Issue Category: Changed Site Conditions			
	Issue: Changes since the 1987 Risk Assessment and 1989 ROD. The EPA has determined that the Risk Assessment performed in 1987 contains uncertainty, primarily with respect to derivation of cleanup standards, consideration of all contaminants of concern, and the potential for vapor intrusion. Naphthalene was not considered a carcinogen at the time of the ROD. EPA now classifies naphthalene as a Class C, possible human carcinogen. This will affect the calculation of ROD cleanup goals.			
	Recommendation: Re-evaluate the assumptions and methodologies used in the 1987 Risk Assessment (done prior to issuance of the EPA Risk Assessment Guidance for Superfund) and determine if a new Risk Assessment is warranted. Specifically, the re-evaluation will need to consider derivation of cleanup standards, all contaminants of concern, and the potential for vapor intrusion. In addition, naphthalene has since been classified as a class C, possible human carcinogen. The risk associated with naphthalene needs to be re-assessed and consideration needs to be given to including 2,4-dimethylphenol as a constituent of concern.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	9/30/2013

OU(s):	Issue Category: Remedy Performance			
	Issue: Contaminants exceed DEQ-7 ARAR. Contaminants exceed DEQ-7 ARAR. Although the total phenolic compound concentrations are below the ROD and ESD cleanup standards at most groundwater well locations, concentrations of 2,4-dimethylphenol (a phenolic compound) exceed the DEQ-7 standard by more than an order of magnitude in several locations; and BTEX, 1-methylnapthalene, 2-methylnapthalene, and naphthalene have also been detected at levels exceeding DEQ-7 standards.			
	Recommendation: Evaluate constituents exceeding DEQ-7 standards (e.g., total phenolic compounds, 2,4-dimethylphenol, naphthalene, BTEX, 1-methylnapthalene, 2-methylnapthalene) and determine appropriate cleanup goals for these constituents. Fully characterize the nature and extent of groundwater contamination from constituents exceeding and potentially exceeding DEQ-7 standards.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	9/30/2013

OU(s):	Issue Category: Remedy Performance			
	Issue: Groundwater contaminant concentrations above the ROD levels; Evidence indicates more extensive groundwater contamination. Recent information indicates that contaminants exist beyond previously defined plume boundaries. Separate phase creosote and dissolved phase compounds above ROD cleanup standards have been discovered beyond the proposed TI boundary and CGA. Concentrations of 2,4-dimethylphenol are increasing in downgradient wells indicating that the 2,4-dimethylphenol plume is not stable in the absence of remedy pumping. Benzene is also present at these downgradient locations, and concentrations for benzene exceed the ROD cleanup standards in multiple locations outside of the CGA.			
	Recommendation: Conduct environmental investigations to more fully characterize the nature and extent of Site contamination and potential risks to human health and the environment. This includes the need to more fully characterize the horizontal and vertical extent of separate phase creosote and dissolved phase compounds including benzene and 2,4-dimethylphenol and the potential for contaminant migration. Based on these environmental investigations, update conceptual site model, update groundwater flow paths and potentiometric surfaces, and evaluate the need for a focused feasibility study on groundwater and the need for a revised risk assessment based on new information. Identify actions necessary to delineate contamination and prevent future migration of contamination, including a revised monitoring well network. Continue ongoing evaluation of impacts from the interim shut-down of the GWTS.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	9/30/2014

OU(s):	Issue Category: Monitoring			
	Issue: Vapor Intrusion. EPA has new information since the Third Five-Year Review showing the potential for a vapor intrusion pathway into the indoor air of some local residences. Initial vapor intrusion sampling is not sufficient to draw final conclusions about the human health risks from this potential exposure pathway.			
	Recommendation: Conduct additional vapor intrusion screening(s) to more completely evaluate the vapor intrusion pathway.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	9/30/2013

OU(s):	Issue Category: Monitoring			
	Issue: Town Drinking Water Well. The Somers town well is currently sampled for low-level concentrations of PAHs, zinc and TSS, but not for more mobile constituents such as benzene and 2,4-dimethylphenol, which have been detected outside of the CGA above the Montana DEQ-7 standards.			
	Recommendation: Monitor the town well for VOCs (such as benzene) and phenols (including 2,4-dimethylphenol), because these compounds migrate faster through the subsurface groundwater than PAHs and would serve as an earlier, more efficient indicator for any site-related contamination that potentially is migrating toward the town well.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	Immediate

OU(s):	Issue Category: Institutional Controls			
	Issue: Institutional Controls (ICs). New sampling information indicates groundwater contamination extends beyond the boundaries of existing groundwater ICs, including the CGA. Enforceable soil and groundwater ICs are not in place.			
	Recommendation: Implement enforceable ICs, including but not limited to filing enforceable proprietary soils and groundwater ICs with the Flathead County Clerk and Recorder with signed copies to the Agencies. Increase the size of the CGA as appropriate.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	9/30/2015

Protectiveness Statement(s)
Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
Soil*	Protective	Click here to enter date.

Protectiveness Statement:
The soil remedy currently protects human health and the environment because soil was placed in a Land Treatment Unit, treated, covered with clean fill, and surrounded by a fence to prevent access. However, to be protective in the long-term, enforceable ICs for the area need to be implemented.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
Groundwater*	Not Protective	Click here to enter date.

Protectiveness Statement:
The groundwater remedy is not protective of human health and the environment because new information shows the plume is not stable, the vapor intrusion and drinking water pathways have not been fully evaluated, and the current ICs do not cover all areas where contamination is above the ROD cleanup standards for groundwater. Additional information is needed regarding the nature and extent of groundwater contamination, migration of the groundwater plume, groundwater flow paths, water quality of the town well, the appropriateness of both the CGA and proposed TI waiver, and the implementability of enforceable groundwater ICs for the Site.

**** The soil and groundwater remedies are not formally separate operable units but have been portrayed in this manner to clearly provide the protectiveness determination for each remedy.***

Sitewide Protectiveness Statement (if applicable)	
For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.	
Protectiveness Determination: Not Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: Based on new information obtained since the publication of the Third Five-Year Review, the Agencies conclude that the remedial action for the groundwater component on the Site cannot be considered protective of human health and the environment in the short-term and the remedy is also not protective in the long-term.	

Burlington Northern (Somers Plant) Site

Fourth Five-Year Review Report

I. INTRODUCTION

This report documents EPA's Fourth Five-Year Review of the remedial actions implemented at the Burlington Northern (Somers Plant) Superfund Site (Site) located in Somers, Montana. The Site is also commonly referred to as the BNSF Former Tie Treating Plant Site in Site documents. The purpose of this Five-Year Review is to determine whether the remedy at the Site remains protective of human health and the environment. The methods, findings, and conclusions of this review are documented in this Five-Year Review Report. In addition, this Five-Year Review report identifies remedy issues, if any, and recommends means to address them.

This review is required by CERCLA §121 and the National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) part 300. Section 121 of CERCLA states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

EPA interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This Fourth Five-Year Review Report was prepared by Tetra Tech under contract to the Montana Department of Environmental Quality (DEQ). However, the lead agency for this Fourth Five-Year Review is EPA Region 8. The Site visit for this Five-Year Review was conducted on November 16, 2010. The Site visit was conducted by EPA and DEQ (collectively the Agencies), and provided useful information and analysis for this Five-Year Review (See Attachment 1).

This review is required by statute because hazardous substances, pollutants, or contaminants are or will be left on site above levels that allow for unlimited use and unrestricted exposure.

The triggering action for this Fourth Five-Year Review is the date of the previous (Third) Five-Year review (September 2006).

II. SITE CHRONOLOGY

Table 1: Chronology of Site Events

Date	Event
February 1984	Discovery of contamination
March 1984	Pre-NPL responses, Phase I Investigation
October 1984	NPL listing (proposed)
May 1985	Administrative Order for Emergency Removal Action (Docket No. CERCLA VIII-82-02)
June-August 1985	Removal action in the area of Swamp Pond
October 1985	Administrative Order of Consent for Remedial Investigation/Feasibility Study (Docket No. CERCLA VIII-85-07)
1987	Phase II Investigation
1988	Phase III Investigation
May 1988	Removal of Beach Sediments
September 1988	Remedial Investigation/Feasibility Study complete
1988	RCRA Surface Impoundments Closure
Sept. 29, 1989	ROD signature
1991	Demolition Work Plan
1991-1992	Demolition former operations
December 1991	Consent Decree for Remedial Design/Remedial Action (Civil Action Number CV-91-32-M-CCL)
1991-1992	Remedial Design/Remedial Action initiated
December 1991	Land Treatment Demonstration
June 1992	No Migration Petition
June 1992	Remedial Design of soil component begins
June 1992	Remedial Design for groundwater component begins
June 1992	Explanation of Significant Differences
September 1992	Remedial Design of soil component complete
1992	Site de-proposed from NPL; addressed using CERCLA authority
1993	Remedial Design of groundwater component complete
April 1993	Excavation associated with soil remedy
July 1993	Wetlands Compensation Determination
August 1993	Construction of the LTU
December 1993	Phase I groundwater remedy approved by EPA
April 1994	Construction of the groundwater treatment system GWTS
May 1994	Groundwater remedy begins
May 1994	Soil remedy begins with LTU operations

Date	Event
September 1996	Initial Five-Year Review
July 1998	Explanation of Significant Differences
September 1998	Clean Closure of RCRA Surface Impoundments
December 1999	Draft Technical Impracticability Evaluation for Groundwater Restoration submitted
September 2001	Land Treatment Unit Closure Work Plan
September 2001	Second Five-Year Review
October 2002	LTU Closed
February 2003	Proposed Technical Impracticability Evaluation determined complete
March 2003	LTU Closure Certification
May 2003	Controlled Groundwater Area established
November 2003	Wetland Mitigation Release
April 2004	Request to Modify GWTS to submitted to EPA and DEQ
April 2006	Natural Attenuation Demonstration submitted
September 2006	Third Five-Year Review
October 2007	EPA and DEQ approve two-year shut down of the GWTS
Spring 2008	EPA and DEQ approve Interim Monitoring Plan on March 21, 2008 and Revised IMP on May 8, 2008
December 2008	Deed notification filed with Flathead County prohibiting installation of wells in the alluvial aquifer (i.e., water table aquifer) within the area affected by the LTU
October 2009	EPA and DEQ extend Interim Monitoring Plan for eight additional quarters
December 2009	EPA and DEQ issued letter approving the quarterly monitoring events with revisions to the IMP
October 2010	Additional groundwater wells installed
February 2011	Vapor Intrusion Investigation initiated
Fall 2011	Additional Groundwater Investigation begins under “Additional Work” provision of the Consent Decree

III. BACKGROUND

Location and Physical Characteristics

The Site covers approximately 80 acres and is located in northwestern Montana in Sections 23, 24, 25 and 26, Township 27 North, Range 21 West (Attachment 2). The Site is located immediately adjacent to Flathead Lake in the town of Somers, Flathead County.

The Site is located partially in the floodplain of Flathead Lake, which is the largest natural freshwater lake in the western part of the lower 48 States. 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 (USGS, 1994). Waterfowl also use the slough area adjacent to north and northeast of the Site as breeding grounds.

The plant treated railroad ties and other miscellaneous lumber products to protect the materials from weathering and insects. The plant's industrial operations continued until 1986. Historical features of the Site include a retort building that contained the wood treating equipment, three large insulated creosote product storage tanks, wastewater impoundments, drip racks, one sanitary lagoon, an office building, a boiler house, and support buildings. One lagoon (referred to as the CERCLA lagoon) received process wastewater until 1971. The area to the south of the former 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. Figure 2-2 from the *Request to Modify the Groundwater Treatment System* (ENSR, 2004) depicts key historic Site features, and Figure 1 from the *Third Annual Interim Monitoring Report* (AECOM, 2011a) provides a layout of the Site and well locations (Attachment 2). A groundwater treatment system (GWTS), including extraction and injection wells and support buildings, currently exists at the Site but has been temporarily shut down while an Interim Monitoring Program is conducted to evaluate the stability of the dissolved creosote constituent plume following the temporary suspension of the GWTS operation.

Hydrogeologic Setting

The subsurface investigations performed to date describe the local geology. According to the ROD (EPA, 1989), three aquifers are present at the Site. The shallow water table aquifer (or "surficial aquifer" or "alluvial aquifer") consists of unconsolidated material described as interbedded silt, clay, and sand. A thin man-made layer of gravel fill material that varies between 0.5 to 10 feet in thickness covers the Site. Underlying the fill are discontinuous layers of silty sand and sandy silt to a depth of about 60 feet below grade, underlain by a thick silt unit containing interbedded silty sands and clays. The surficial aquifer discharges to Flathead Lake

during periods of low lake level and is recharged by the lake during summer months when lake levels are high.

An artesian aquifer underlies the water table aquifer and is separated from it by low permeability silty-clay materials. The artesian aquifer was encountered at depths of 60 to 90 feet below grade at the Site and contains a number of sand and gravel deposits separated by discontinuous beds of fine-grained material. Beginning at a depth of approximately 100 feet below grade, lies the bedrock aquifer. The bedrock surface is very irregular and fractured and slopes to the east. At least one residential well, the Somers School well, and the Town of Somers Municipal well are completed in the bedrock aquifer.

The monitoring well network of the GWTS is limited to the unconsolidated surficial water table aquifer. Groundwater flow in the surficial water table aquifer is generally toward the east from the Site to Flathead Lake. Flow can range in a northeasterly direction in the area of the LTU. Based on the Site conceptual model in the *Technical Impracticability Evaluation for Groundwater Restoration* (RETEC, 2003) (TI Evaluation) and the *Request to Modify Groundwater Treatment System* (ENSR, 2004), the Site is characterized by low-permeability sediments with variable hydraulic conductivity. Various attempts to model contaminant transport at the Site suggest a hydraulic conductivity in the range of less than 1 to 7 feet per day and a seepage velocity of approximately 0.1 foot per day. Water Table Elevation Maps submitted with the *Third Annual Interim Monitoring Report* (AECOM, 2011a) depicting interpreted groundwater flow directions are included in Attachment 3. Water level measurements and interpreted groundwater flow directions are discussed in more detail in Section VI of this report.

Current and Future Land Use Near the Site

The former plant area of the Site is located in an unincorporated area of Flathead County with no zoning in place to guide future development or land use. Residential areas bound the former plant area to the east, west, and south-southwest. Farmland exists to the south. The Swamp Pond area of the Site is bounded by Flathead Lake on the south and southeast with wetlands to the east and undeveloped land to the north and west. Flathead Lake is used for recreational fishing and boating. The Flathead Waterfowl Production Area occupies much of the northern shore of Flathead Lake to the east of the Site.

The Somers Water District converted the town's water supply from a surface water source (Flathead Lake) to a bedrock aquifer source for drinking water in 1989. A municipal supply well for the town of Somers exists approximately 1,300 feet to the southwest of the Site. Other drinking water sources in the vicinity include a well located near the Somers Marina, and another bedrock well at the local school located one-quarter mile north of the Site. The well records for these wells are available in the Montana Groundwater Information Center (GWIC) database (http://mbmggwic.mtech.edu/). The Second and Third Five-Year Reviews note six residences with private wells used for purposes other than drinking water and that five of these six wells

along Somers Road are located in the shallow, unconsolidated aquifer. The Site Team also notes that several new monitoring wells along Pickleville Road have recently been installed by private parties associated with residents in that area.

In carrying out Superfund response actions, EPA typically considers the reasonably anticipated future land use of a site in the remedy selection process.[a] The future use of the land near the Site is not anticipated to change significantly from the description of current use provided above.

Brief History of Facility Operations

BNSF and/or its predecessors (referred to as BNSF throughout this document) operated the Site between 1901 and 1986. The plant treated railroad ties and other miscellaneous lumber products to protect the materials from weathering and insects. Treatment fluids used by BNSF included zinc chloride, chromate zinc chloride, and creosote/petroleum preservative mixtures. The wastewater generated from the treatment process primarily consisted of steam condensate containing zinc chloride or creosote. Fluid from washing the floor and the shop, drippings 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. Prior to 1971, wastewater was discharged into what is now referred to as the CERCLA lagoon located immediately south of the retort building. Overflow from this lagoon flowed in an open ditch from the facility into a swamp on the shore of Flathead Lake and subsequently into Flathead Lake. In 1938, Kerr Dam was built at Polson to regulate the lake's water level and provide hydroelectric power and water for irrigation. The concrete structure is 204 feet high and controls the top 10 feet of Flathead Lake. After World War II, a proposal was made to add 10 feet to the full pool elevation lake level and the lake elevation is adjusted yearly between 2,883 in the winter/spring and 2,893 feet in the summer/fall to allow for spring runoff. As a result of raising the Lake level, discharge from the ditch accumulated in a pond that formed in the swamp. The Swamp Pond was determined to pose an imminent and substantial hazard to Flathead Lake due to the presence of heavy creosote contamination in water and soil within two feet of the full pool elevation shoreline. Contaminated beach sediments were also found to extend approximately 150 feet into Flathead Lake. Groundwater was also contaminated with creosote in the vicinity of the CERCLA lagoon and the Swamp Pond area. Figure 2-2 from the *Request to Modify the Groundwater Treatment System* (ENSR, 2004) provides a layout of the historical locations of these Site components (Attachment 2).

BNSF constructed what are now referred to as two Resource Conservation and Recovery Act (RCRA) wastewater treatment surface impoundments in 1971 and abandoned direct use of the CERCLA lagoon and the ditch for process effluent discharge. A recycling system replaced the wastewater discharges in 1984. The RCRA surface impoundments were closed in 1988 under the DEQ Hazardous Waste Permitting Program. Groundwater sampling indicated that

[a] See EPA's 1995 Directive, "Land Use in the CERCLA Remedy Selection Process" (OSWER 9355.7-04).

groundwater was contaminated in the area of the RCRA surface impoundments at the time of closure.

Site Contaminants

Contaminants identified during the 1985-1988 RI/FS include creosote consisting of polycyclic aromatic hydrocarbons (PAHs), including phenanthrene and naphthalene, tar acids (phenols, creosols), tar bases (pyridine) and nitrogen bearing heterocyclic bases, zinc, petroleum derivative compounds (including benzene), phenolic compounds, and metals (arsenic, selenium, lead, chromium, copper, barium, beryllium, mercury, nickel and thallium).

Initial Response and Enforcement History

DEQ sampled the soils at the Site in February 1984. As a result of that sampling event, the Site was proposed for listing on the Superfund National Priorities List (NPL) in 49 FR 40320, October 15, 1984. The proposed listing identified potential negative effects to Flathead Lake, the water supply for the unincorporated town of Somers until the town's drinking water source was converted to the bedrock aquifer in 1989. The Site was de-proposed from the NPL in 1992, deferred to RCRA Corrective Action for closure of the surface impoundments, and the rest of the remediation is being conducted using CERCLA authority.

An emergency action was performed in May and June 1985 under an Administrative Order on Consent (AOC) (Docket No. CERCLA-VIII-85-02). Approximately 3,000 cubic yards of contaminated soil and 100,000 gallons of contaminated water were removed from the Swamp Pond. Contaminated soil and groundwater were also removed from the drainage ditch. The excavated areas were backfilled with clean soil and rip-rap was placed along the shoreline. The soils were transported to another BNSF facility in Paradise, Montana, for treatment.

The Remedial Investigation/Feasibility Study (RI/FS) was conducted from 1985 to 1988 under a second AOC (Docket No. CERCLA-VIII-85-07). The RI/FS identified the nature and extent of contamination at the Site. The specific areas of contamination were identified as the Swamp Pond, the drainage ditch, the CERCLA lagoon, and the drip rack area (Remediation Technologies, 1989).

A small area of creosote contamination was discovered on the surface of beach sediment on the north shore of Flathead Lake in April 1988. The contamination extended 30 feet along the rip-rap wall and 20 feet onto the beach. In May 1988, 40 cubic yards of contaminated sediment was excavated from this area and placed in the CERCLA lagoon. More soil impacted with creosote and a groundwater seep was discovered during the excavation of a test pit that was excavated on the inland side of the rip rap. A high-density polyethylene (HDPE) liner was placed along the shoreline wall of the test pit to mitigate further migration of the seep beyond the test pit (Remediation Technologies, 1989).

The RCRA surface impoundments were closed in 1988 under the DEQ Hazardous Waste Permitting Program. Groundwater sampling at the time of closure indicated that groundwater was contaminated and would require corrective action in the area of the impoundments. The groundwater contamination is currently being addressed under the CERCLA Site remediation.

On September 27, 1989, a Record of Decision (ROD) was signed in which a remedy and a contingency remedy was selected for remediation of soil, groundwater, and sediments determined to pose a potential threat for human health and the environment. The selected remedy provided a method for removing the potential for direct contact with soils by reducing the impact from soils and sediments on groundwater and surface water. The groundwater component of the remedy consisted of in-situ biological treatment of groundwater and construction of a groundwater treatment system that utilized a mechanical and chemical treatment process to pump and treat contaminated groundwater. A contingency remedy was identified, to be implemented only if the selected remedy was not effective.

On December 20, 1991, EPA and Burlington Northern Railroad Company and Burlington Northern, Inc. (predecessors of BNSF) entered into a Consent Decree for Remedial Design/Remedial Action (RD/RA) of the selected remedy. The Consent Decree required that a Pilot Study be performed prior to any soil application on the Land Treatment Unit (LTU) to demonstrate the "practicability" of the innovative hot water flushing and in-situ bioremediation component of the selected groundwater remedy in the low permeability conditions of the Site.

To satisfy RCRA, including land disposal restriction requirements, a Land Treatment Demonstration (LTD) and a No Migration Demonstration (NMD) were conducted to satisfy RCRA and land disposal restriction requirements. The results demonstrated the creosote contaminated soils were amenable to biological treatment and that no migration of hazardous substances above health based criteria was expected. EPA granted a variance to land disposal restrictions for wastes to be treated in the LTU in 1991.

In 1992 the EPA issued an Explanation of Significant Differences (ESD) that eliminated the hot water flushing option due to the low permeability of the aquifer materials. The ESD also required the following: excavation of additional soils in the CERCLA lagoon, and Swamp Pond areas increasing the total of excavated materials from 11,700 to 31,000 cubic yards; increase of the size of the LTU from 10 to 13 acres to decrease the time to meet remedial objectives and cleanup goals; decrease of the time to achieve soil remediation goals to four to six years rather than 10 years; and increase the estimated time to achieve groundwater remediation goals from 10 to 15 years to 50 years.

In April 1993, approximately 19,303 cubic yards of soil were excavated from the former Swamp Pond area and a portion of the drainage ditch and placed in the LTU. Dense non-aqueous phase liquid (DNAPL) was observed within and adjacent to the CERCLA lagoon and dissolved components were observed downgradient of the lagoon.

In July 1993, the U.S. Fish and Wildlife Service (FWS) performed a wetlands determination in order to delineate wetlands in the former Swamp Pond and the slough area. BNSF performed semi-annual water quality monitoring and assessed vegetation recovery as a result of this determination. The determination also identified that no excavation should take place in the slough area if no ecological or human health impacts exist. In October 2005, EPA concurred with FWS's determination that wetlands restoration activities were complete and no further sampling was necessary (EPA 2005).

Operation of the LTU began in 1994, following removal of soil from the CERCLA lagoon (22,300 cubic yards), Swamp Pond Area (19,030 cubic yards), and the Drip Track/Retort Building (10,000 cubic yards). ROD remediation levels for soils were achieved in the first year of operation of the LTU.

The groundwater remedy started operation in April 1994. Extracted groundwater was treated with oil/water separation and granular activated carbon to remove free product, dissolved organics, and iron prior to reinjection. Two sets of wells were installed as part of the remedy. The northern set of wells consists of five extraction 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 at the Site. The southern set of wells contains one extraction, four injection wells, and four monitoring wells downgradient of the CERCLA lagoon. The southern well array was installed at a location where the Site team believed effective in-situ biological treatment was considered to be most likely observed over the short term. A Site layout depicting the locations of the extraction and injection wells is presented in Attachment 2. The groundwater remedy and the associated monitoring continued through 2007 in accordance with the approved operations and monitoring plan.

EPA issued a second ESD in 1998 that revised the following: the soil remediation level for carcinogenic PAHs was revised from 36 to 57 milligrams per kilogram (mg/kg) calculated as benzo(a)pyrene (B(a)P) equivalents using the revised cancer slope factor; the limitations for pyrene, naphthalene and phenanthrene in soils were removed, based on the toxicological assessment and the no-migration demonstration; the soil remediation level was revised 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 per day; the groundwater remediation level was revised for total non-carcinogenic PAHs from 0.3 to 40 micrograms per liter (ug/L), based on the revision to the RfD for naphthalene; and the groundwater remediation level for total phenolics was revised from 15,000 to 6,000 ug/L, based on revisions in the RfD for phenol and phenolic compounds.

The groundwater remedy and associated monitoring continued for several years (through 2007). In 2003, BNSF submitted to EPA a TI Evaluation (RETEC, 2003). EPA required that a controlled groundwater area (CGA) be established by the Montana Department of Natural Resources and Conservation (DNRC). The CGA was established by the DNRC in 2003. Figure 1-2 from the *Final Groundwater Treatment System Interim Monitoring Plan* (AECOM, 2011e), illustrates the extent of the CGA (Attachment 4). The order for the CGA was signed May 8,

2003. Using the information provided in the TI Evaluation as a basis, BNSF requested to terminate operation of the GWTS in the September 1, 2004 *Request to Modify Groundwater Treatment System* report (ENSR, 2004). The Agencies approved shut down of the GWTS for an interim period in a letter to BNSF dated September 7, 2007 (EPA and DEQ, 2007). The system was shut-down on October 12, 2007 and the Final Interim Monitoring Plan (ENSR, 2008a) was approved by the Agencies on May 7, 2008 (EPA and DEQ, 2008b). Monitoring has been conducted since that time. Based on the results of this monitoring, additional investigation work is underway.

IV. REMEDIAL ACTIONS

Remedial Action Objectives and Cleanup Levels

The ROD, which was signed in 1989, established cleanup levels for the contaminants of concern at the Site (PAH compounds, phenols, benzene[b], and zinc). The Remedial Action Objectives for groundwater remediation as specified in the ROD 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. The Remedial Action Objectives for soil remediation specified in the ROD are to reduce exposure from direct contact to an acceptable level and to ensure that the migration of contaminants to groundwater is minimized. The objectives selected in the ROD were to reduce human exposure to the contaminants of concern in soil and groundwater. The remedial technologies in the ROD consisted of excavation and on-site biological treatment of soil in a LTU, in-situ biological treatment of groundwater, and a GWTS that utilized a mechanical and chemical treatment process. The process of the GWTS included oil/water separation, equalization, oxidation, particulate settling and granulated activated carbon in order to remove separate phase liquid, metals, particulates, and dissolved organics.

Cleanup Levels

Table 7 of the ROD set forth the original Site cleanup levels for soil and groundwater, which are presented in Table 2, below. Also noted are those modifications in cleanup levels set forth in the 1998 Explanation of Significant Differences.

[b] Benzene was detected in one sample during the remedial investigation, but was not found in other samples. While a cleanup standard was established in the ROD, this contaminant of concern was not selected for further analyses until December 2010.

Table 2: Cleanup Levels from Table 7 of the ROD

Media	Constituent of Concern	ROD Table 7 Soil Excavation Criteria Level	ROD Table 7 Human Health Cleanup Level	1998 ESD Modifications	Aquatic Life Cleanup Level
Soil (mg/kg)	Carcinogenic PAHs	3.6	36[c]	57	
	Total PAHs	1,875		1500	
	Total Phenolics	3,000			
	Zinc	15,750			
	Naphthalene		7.98[d]		
	Phenanthrene		7.98[e]		
	Pyrene		7.28[f]		
Groundwater (ug/l)	Carcinogenic PAHs		0.030		
	Total PAHs		0.300	40	
	Acenaphthene		20		
	Fluoranthene		42		
	Naphthalene				620
	Benzene		5		
	Phenol		3,500		2,500
	Total Phenolics		15,000	6,000	
	Zinc		5,000		110

The ROD required that land treatment continue until the net reduction in Total PAH concentration for a particular year is less than 20% compared to the previous year. The source of remediation goals were: Risk Assessment for carcinogenic PAH in soil and total PAH and total phenolics in groundwater; and ARARs, including the Clean Water Act Water Quality Criterion for carcinogenic PAH, acenaphthene, fluoranthene and phenol in groundwater, and benzene, phenol and zinc for Aquatic Life; the Safe Drinking Water Act Maximum Contaminant Level for benzene in groundwater; the Safe Drinking Water Act Drinking Water Standard for zinc in groundwater; and RCRA Best Demonstrated Available Technology Level for naphthalene, phenanthrene and pyrene in soil.

[c] This number is based on initial treatment residual.
[d] After achieving initial treatment performance standards, land treatment will continue until the net reduction in total PAH concentrations for a particular year is less than 20% compared to the previous year.
[e] Ibid.
[f] Ibid.

Summary of Remedy Selected in the 1989 ROD

The selected remedy includes treatment of soils and sediments for "source control" and to reduce exposure from direct contact to an acceptable level and to ensure that the migration of contaminants to groundwater is minimized. The selected remedy also includes treatment of groundwater for migration control and to reduce potential exposures from groundwater ingestion and to ensure contaminants in groundwater do not adversely affect the quality of Flathead Lake, as described below.

- Soils and sediments treatment of the remedy selected in the ROD include:
    - Excavation of approximately 11,700 cubic yards of contaminated soils and sediments. Soil above the water table at the location of the CERCLA lagoon, drip track, drainage ditch and beneath the retort building were to be excavated, as well as sediments from the slough.
    - On-site biological treatment of the excavated soils.
    - Restoration and/or replacement of wetlands lost during remedial action and those lost during the 1985 emergency action. The restoration/replacement was to be conducted in consultation with the U.S. Department of the Interior.
- Groundwater components of the remedy selected in the ROD include:
    - Installation and operation of an innovative hot water flushing and water treatment system to remove and treat available free creosote contamination from the water table aquifer in the CERCLA lagoon and swamp pond areas.
    - In-situ biological treatment to degrade both contaminants adsorbed onto the aquifer matrix and residual contaminants dissolved in the groundwater.
- The ROD included the following requirement regarding institutional controls (ICs):
    - ICs designed to prohibit the construction of new wells downgradient from the CERCLA lagoon and in the Swamp Pond area will be implemented and maintained until groundwater quality returns to acceptable levels. For the LTU, the ROD also included a provision for RCRA groundwater monitoring and post-closure care for up to 30 years or a deed restriction to be placed if hazardous constituents remain.

ESDs (1992 and 1998)

There have been two ESDs amending the remedy selected in the 1989 ROD:

- An ESD in 1992 included the following elements:
    - Elimination of the hot water flushing option due to the low permeability of the aquifer materials.
    - Excavation of additional soils in the CERCLA lagoon and the Swamp Pond areas increasing the total volume of excavated materials to be treated in the LTU from 11,700 to 31,000 cubic yards.
    - The increase of the LTU from 10 to 13 acres to decrease the time to meet remedial objectives and cleanup goals.
    - The decrease of the time to achieve soil remediation goals to four to six years rather than 10 years.
    - The increase of the estimate to achieve groundwater remediation goals from 10 to 15 years to 50 years.
- An ESD in 1998 revised the following:
    - The soil remediation level for carcinogenic PAHs was revised from 36 to 57 milligrams per kilogram (mg/kg) calculated as benzo(a)pyrene (B(a)P) equivalents using the revised cancer slope factor.
    - The limitations for pyrene, naphthalene and phenanthrene in soils were removed, based on the toxicological assessment and the no-migration demonstration.
    - The soil remediation level was revised 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 per day.
    - The groundwater remediation level was revised for total non-carcinogenic PAHs from 0.3 to 40 micrograms per liter (ug/L), based on the revision to the RfD for naphthalene.
    - The groundwater remediation level for total phenolics was revised from 15,000 to 6,000 ug/L, based on revisions in the RfD for phenol and phenolic compounds.

Remedy Implementation and Status – Soil

The soil remedy identified in the 1989 ROD and modified in the 1992 ESD was implemented between 1991 and 1994. During the 1991 Remedial Design Investigation, a Land Treatment Demonstration and No Migration Demonstration were conducted to satisfy RCRA and land disposal restriction requirements. EPA granted a variance to land disposal restriction in late 1991. The no-migration petition was submitted as an appendix to the Remedial Design Report. EPA approved the no-migration petition with the issuance of the 1992 ESD in June 1992.

During various times from 1991 to 1993, soil was excavated from the retort building, drip rack, CERCLA lagoon, drainage ditch and the Swamp Pond area and stored in the RCRA impoundments until the completion of the LTU in 1994. Construction of the LTU began in September 1992 and was completed in August 1993. Application and treatment of the first 17,000 cubic yards (first lift) was conducted in May 1994 with treatment occurring until September 1995. 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. The third lift of soil (14,422 cubic yards) was placed on the LTU in August 1998, and treatment continued until 2000. The LTU was closed in 2002 after approval of the Land Treatment Unit Closure Work Plan, dated August 14, 2001. According to previous Five-Year Reviews, remediation levels in soils placed on the LTU were achieved and a closure plan was developed for the LTU and approved by the Agencies in 2002. Closure activities were completed by November of 2002.

Remedy Implementation and Status – Wetland

The Wetlands Compensation Determination indicated a preference that no excavation takes place in the slough area if no ecological or human health impacts exist. In April 1994, BNSF reconstructed areas of the Swamp Pond where excavation activity had damaged wetlands. This was conducted in accordance with a plan developed by the FWS as partial mitigation of past wetlands damage. BNSF purchased land in the Flathead Valley and gave the land to the Natural Resource Conservation Service (NRCS) in 2004 to meet the FWS requirements. Upon completion of this land transfer, FWS made a determination that wetlands restoration activities were complete. In October 2005, EPA concurred with FWS's determination that wetlands restoration activities were complete and indicated that no further sampling was necessary under the wetlands restoration component of the ROD (EPA, 2005).

Remedy Implementation and Status – Flathead Lake Sediments

As part of the Remedial Investigation, EPA determined that contaminated beach sediments extended 150 feet into Flathead Lake. Beach borings showed that contaminated sediments downgradient of the swamp pond begin at a depth of 2 feet below ground surface (bgs) and extend to a depth of over 8 feet bgs and cover an area of approximately 22,500 square feet. Contamination is not continuous, and appears to be limited to decayed root channels. The contaminated beach sediments are also covered by clean sand which acts as a barrier for direct

contact to human and ecological receptors and the contaminated beach area is exposed only when lake levels are low pool elevation (November to May). The lake levels are high during the summer months when swimming and playing at the beach is most likely to occur. Therefore, leaving impacted sediments in place below the continued sedimentation remains protective of human health and the environment but is also a trigger for future five years reviews because waste has been left in place above levels that allow for unlimited use and unrestricted exposure.

Remedy Implementation and Status – Groundwater

The groundwater remedy in the 1989 ROD consisted of extraction of contaminated groundwater and treatment by mechanical and chemical processes, along with in situ biological treatment. A pilot test was performed to evaluate the "practicability" of hot water flushing alternative in low permeability soils. The result of the pilot test was the ESD in 1992 that modified the groundwater remedy by eliminating the hot water flushing alternative. The contingency modification included excavation of additional soil in the CERCLA lagoon to remove more source material. The central feature of the groundwater remedy, installation and operation of the GWTS, was retained and subsequently implemented.

In December 1993, EPA approved Phase I of the groundwater remedy and the associated groundwater monitoring plan. The approval was conditional on providing additional detail on the design for Phase II. The March 1994 addenda indicated that if it was not technically feasible to achieve the ROD cleanup levels in 50 years then several options would be considered, including a modification of project goals. The GWTS started operation in April 1994 and routine operations began in January 1995.

The 2003 TI Evaluation reviewed alternatives to address the groundwater contamination at the Site. In the TI Evaluation, BNSF concluded that the available groundwater treatment technologies are not able to meet the groundwater remedial goals in a reasonable time, that the groundwater ARARs could not be achieved in a reasonable timeframe and that portions of the Site should not be required to meet these standards since ICs would be implemented to prevent exposure and protect public health and the environment. The TI Evaluation and *Request to Modify the GWTS* (ENSR, 2004) included modeling results and evaluations to identify barriers to aquifer restoration of specific areas of the Site. The report identified the specific area of the water table aquifer where meeting ARARs in a reasonable timeframe was proposed to be impracticable ("proposed TI zone"). The proposed TI zone extends from southeast of the LTU, including the area of the CERCLA lagoon, and the area between monitoring wells S-88-1 to S-85-6A/B, south to S-84-16 and east/northeast to the area between S-88-3 and S-91-2 (Attachment 5).

One of the ICs determined to be necessary to prevent exposure to Site contaminants is a CGA. In June 2002, the Flathead County Health Department submitted a Petition for Controlled Groundwater Area with the Montana Department of Natural Resources Conservation (DNRC). The purpose of the petition was to close the contaminated portions of the alluvial aquifer (i.e.,

water table aquifer) to appropriation of groundwater until the groundwater is restored to regulatory (ROD) standards. A CGA was established for 67 acres of the Site in May 2003, prohibiting extraction of water from the alluvial aquifer (i.e., water table aquifer) with the exception of monitoring and remedial wells.

In 2004, BNSF submitted the *Request to Modify the GWTS* (ENSR, 2004), which requested approval to terminate operation of the GWTS on the suggested basis that there was no significant impact to Flathead Lake or the Somers municipal well, and that the rate of groundwater extraction and reinjection was too slow to restore the aquifer within a reasonable timeframe. In a letter to BNSF dated September 7, 2007 (EPA and DEQ, 2007), the Agencies approved a shutdown of the GWTS for an interim period. The system was shut down on October 12, 2007. In May 2008, the Agencies approved the Request to Modify the GWTS after documentation was provided supporting the requested interim shut down and possible future permanent shut down and decommissioning of the GWTS at the Site. The request was based on certain assumptions about the hydrogeologic and contaminant characteristics, source removal, and implementation of a deed restriction. As of 2011, the Agencies note that some of these earlier assumptions appear to be contradicted by recent sampling results; the 2011 Additional Groundwater Investigation identified contamination outside the area of the historically defined contaminant plume, suggesting that the plume may not be stable.

The Third Five-Year Review Report (2006) indicated that, in general, water quality had been meeting the ROD water quality standards. However, water quality standards were not being met for zinc and PAH compounds in the groundwater treatment area.

A *Revised Groundwater Treatment System Interim Monitoring Plan* (ENSR, 2008a) was approved by the Agencies on May 7, 2008 (EPA and DEQ, 2008b. Data Quality Objectives during this period include:

- Demonstrate plume stability following GWTS shut down; confirm containment;
- Monitor natural attenuation parameters to confirm that 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 wells;
- Ensure safety of the public drinking water through continued sampling of the municipal well;
- Continue LTU post-closure monitoring activities as scheduled; and
- Conduct on-going operation and maintenance activities.

The Final Interim Monitoring Plan (ENSR, 2008a) was implemented over a two-year period during which the GWTS was shut off. The purpose of this two year interim monitoring period was to use quarterly monitoring to determine the stability and containment of the dissolved creosote constituent plume. This plan superseded other monitoring plans. The Interim Monitoring Period began in January 2008. As discussed below, review of the data has resulted

in a further revision of the Interim Monitoring Plan and an extension of the sampling time period.

In February 2009, a Memorandum entitled *Review of Interim Groundwater Monitoring Plan, BNSF Former Tie Treating Plant, Somers, Montana* was prepared by GSI Environmental, Inc. (GSI Environmental, 2009) and submitted to the Agencies. The Memorandum was prepared at the request of the Agencies in order to review the Interim Monitoring Plan and provide recommendations on its ability to achieve monitoring objectives in the short-term. A formal analysis of the monitoring network using the Monitoring and Remediation Optimization System (MAROS) software was requested; however, the network had insufficient data to perform many of the statistical analyses contained in the software and the Agencies believe it is premature to proceed with MAROS at this time.

In February 2009, a Memorandum entitled *Concept Review Related to Discontinuing Active Remediation at the Burlington Northern (Somers Plant)* (GeoTrans, 2009) was prepared by for the EPA by GeoTrans, Inc. (currently Tetra Tech GEO). The purpose of the Memorandum was to summarize the GeoTrans review of the Site conceptual model related to source areas, receptors, and plume transport and evaluate the analytical transport modeling performed by the Site contractor regarding validity of assumptions, consistency with the Site conceptual model, and reasonableness of the conclusions. The Agencies requested that the Memorandum provide the following:

- Recommendations for how the transport model could be validated with data currently available and/or with future data to be collected

- An appropriate approach for evaluating plume stability prior to and subsequent to the shutdown of the GWTS, along with recommendations regarding how to evaluate Site data collected during the 2-year shut down period

- Recommendations for establishing point of compliance monitoring points.

- An evaluation of the spatial distribution of groundwater monitoring locations to determine if it is adequate for monitoring of flow direction and contaminant transport was requested, in addition to recommendations regarding frequency of groundwater monitoring at those locations.

The Memorandum made the following conclusions/recommendations:

- The current extent of emulsified product should be determined and compared with the original source area to define the rate and direction that emulsified product is migrating.

- Three permanent monitoring wells should be installed outside of the area impacted by emulsified product to help monitor conditions over time.

- The new monitoring wells should be gauged and sampled for PAHs for four quarters, even if emulsified product is identified in the wells to confirm that the emulsified product observed is a source of the dissolved contamination.

- All data should be reviewed to determine the rate of migration of the source material.

- If the data indicate that source migration via emulsified product is occurring, contamination will have the potential to migrate beyond the boundaries of the proposed TI area above standards, and operation of the GWTS or a modified GWTS, would be appropriate.

- The new data should be used to identify the primary migration pathways and locate sentry and/or point of compliance monitoring wells. These may be new or existing monitoring wells.

- Sentry and point of compliance monitoring wells should be monitored quarterly for up to 15 years before determination that the plume is stable. The data should be used to evaluate concentration trends and recalibrate an appropriate transport model

- The GWTS should be restarted if monitoring and modeling suggest potential migration of contamination above standards beyond the proposed TI area.

- The GWTS should be restarted within 90 days of receiving results from the laboratory that concentration of a Site contaminant equal to 50% of the ARAR is detected at a point of compliance well in more than one event (not necessarily consecutive).

- If after 15 years of quarterly monitoring and rigorous modeling and evaluation, plume stability is clear and concentrations outside the proposed TI area do not exceed ARARs, then the proposed TI area is likely appropriate and active remediation would not need to be resumed.

- It does not appear that the town well is a likely potential receptor of Site-related contamination. If additional reassurance is needed, a bedrock monitoring well could be installed midway between the S-85-8 cluster and S-85-7 and sampled for four quarters. If contamination is detected (greater than 10% of the ARAR was suggested), then monitoring could continue on a quarterly basis along with the water table aquifer monitoring. If an increasing trend is observed, additional characterization and evaluation would likely be required.

The Agencies note that the additional work required of BNSF at this location was designed to address many of the recommendations made by GeoTrans, Inc.

In February, 2009, several residents in Somers, Montana contacted the Agencies about meetings that BNSF requested to discuss purchase of their property. If the property owner was not interested in selling their property, BNSF Railway Company offered financial incentive for right of first refusal, access to the property as well as waiver for any damage that may result from BNSF Railway Company personnel or representative from BNSF Railway Company property access. The property owners asked the Agencies for assistance in determining BNSF Railway Company's rationale in their purchase requests and for information to determine whether their properties are contaminated or if their health is at risk. Because the Agencies were not consulted on the property acquisitions, the Agencies could not assure the property owners that they were safe. The timing of these property acquisition actions in conjunction with the interim shutdown of the GWTS, and the recent sampling events showing contaminants identified in an offsite well led the Agencies to request clarification from BNSF in a letter dated March 30, 2009 (DEQ and EPA, 2009) (See Attachment 6).

In its response to the Agencies, BNSF stated that claims representatives have contacted some neighboring property owners in Somers in order to discuss confidential economic options that BNSF may make available to them. BNSF asserted that all data in its possession regarding the remediation project at Somers has been submitted to EPA. BNSF asserted it has not conducted any other environmental investigation or sampling regarding the nature and extent of contamination, other than that required by EPA (Attachment 6).

In December 2009, the Agencies issued a letter to BNSF that approved of the continuing quarterly monitoring events with certain revisions to the existing Interim Monitoring Plan requirements.

In 2009, an investigation on two properties adjacent to the Site was conducted by a private consulting firm on behalf of these two local property owners. The results were shared with the Agencies. The investigation indicated the presence of creosote and/or dissolved phase constituents above the cleanup levels established in the ROD in the subsurface beyond the previously identified areas of contamination as well as the proposed TI zone boundary. Contaminant concentrations were highest on the western side of one of the properties and decreased with distance toward the east. (Applied Water Consulting, 2010)

In August 2010, a *Final Work Plan for Additional Data Collection* (AECOM, 2010) was submitted to the Agencies and approved in a letter from the Agencies dated September 9, 2010. This work plan indicates that phenol concentrations above cleanup standards are present down gradient of the CGA and proposed TI boundaries.

Pursuant to the approved Additional Data Collection work plan, BNSF conducted a subsurface investigation in late October through early November 2010. The results are summarized in the May 2011 *Additional Data Collection Completion Report-Final* (AECOM, 2011d). The report provides the details on the installation of the additional wells and results of soil and groundwater samples analyses in the area of the new wells. Two monitoring well clusters (S-10-1 and S-10-2) were installed down gradient of the CERCLA lagoon (Attachment 7). Three wells screened at

varying depths were installed at each location. Soil samples were collected from the intermediate S-10-1 well from 8.5 to 9.5 feet bgs and from 10 to 11 feet bgs. The ROD level for carcinogenic PAH compounds was exceeded in the soil samples collected from the shallower depth. Multiple PAH compounds and 2,4-dimethylphenol exceeded the individual RSLs.

In February 2011, a *Third Annual Interim Monitoring Report* (AECOM, 2011a) for the period of December 2009 through November 2010 was submitted to the Agencies. The report summarized the results of groundwater monitoring activities conducted in accordance with the previously submitted *Revised Groundwater Treatment System Interim Monitoring Plan* (ENSR, 2008a).

Analytical results were collected from a soil boring/monitoring well (S-10-1s) on a well installed on a residential property in October 2010. The boring/monitoring well was located approximately 8 feet from the residence. The October 2010 soil results revealed fairly high levels of naphthalene at 8.5-9.5 feet below ground surface. Analysis of the November 2010 groundwater samples collected below 10 feet showed high concentrations of naphthalene (108,000 µg/L, Applied Water Consulting, 2010), phenols, and various polycyclic aromatic hydrocarbons. Additional laboratory analyses for volatile petroleum hydrocarbons were provided by Applied Water Consulting for the groundwater sample. Benzene was detected at 319 µg/L along with high concentrations of other BTEX compounds and other short and long chain petroleum hydrocarbons (Total extractable hydrocarbons were 20,800 µg/L). As a result of these concentrations and the proximity to a nearby resident, EPA consulted the Agency for Toxic Substance and Disease Registry (ATSDR). ATSDR strongly supported EPA's decision to initiate a prompt environmental investigation into nearby residential homes to characterize the vapor intrusion pathway based due to the very close proximity of homes to the monitoring well, the concentrations of the various chemicals of concern in the soil and groundwater, and the known health hazards related to inhalation exposure from these chemicals. (ATSDR, 2010).

In January 2011, at the request of the Agencies, BNSF submitted and the Agencies approved, a *Vapor Intrusion Investigation Work Plan*. The work plan provided for expeditious collection and analysis of vapor intrusion data from several residences on Somers Road. The investigation was conducted in February 2011. Field screening equipment in the crawl space, basements, and residential space was used to make real-time decisions. The investigation results are summarized in the April 2011 *Vapor Intrusion Investigation Summary Report* (AECOM, 2011c).

A March 14, 2011 Memorandum from Susan Griffin, EPA Toxicologist (EPA, 2011), summarized EPA's efforts to identify revisions to the EPA Risk Assessment Guidance for Superfund that have occurred since the 1987 Human Health Risk Assessment was prepared for the Site and how those revisions might impact the cleanup standards established in the 1989 ROD and 1998 Explanation of Significant Differences. The Memorandum made the following conclusions:

- Due to inadequate sample collection, assessment of only indicator parameters, and use of different risk assessment processes there is a great deal of uncertainty associated with the accuracy of the risk assessment methods used in 1987.

- A more up to date human health risk assessment may be useful considering that new contaminants have been identified from recent sampling events and vapor intrusion may be emerging as a new exposure pathway.

- An option to re-developing the baseline risk assessment would be to keep the 1987 risk assessment as the basis for unacceptable public health risk, and develop a new PRG document for all analytes detected above a conservation risk-based screening level. This would address the analytes dropped from the 1987 risk assessment and the analytes found in the more recent sampling events, and could also clearly explain the land use and receptors selected, the exposure pathways of concern, and incorporate the most recent exposure and toxicity assumptions.

Also in March 2011, a draft *Revised Groundwater Treatment System Interim Monitoring Plan* was submitted (AECOM, 2011b), and a revised *Final Groundwater Treatment System Interim Monitoring Plan* (AECOM, 2011e) was submitted in July 2011. The primary objective of the plan is to evaluate the stability and containment of the dissolved creosote constituent plume following termination of GWTS operation. The revised Interim Monitoring Plan recommended several specific activities.

The Five-Year Review sampling event was conducted in March 2011 as specified in the revised work plan.

Estimated Annual O&M Costs

This is a responsible party site and costs have not been disclosed. The GWTS system is currently not in operation. Therefore, estimated costs are not provided.

V. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the Fourth Five-Year Review conducted for the Site. The Third Five-Year Review was completed in September 2006. This section presents the conclusions of the previous Five-Year Review and summarizes progress addressing recommendations from that review.

Protectiveness Statement From the Third Five-Year Review

The protectiveness statement from the Third Five-Year Review (September 2006) stated the following:

> *The Remedial Action for the soil component of the remedy is complete and the groundwater component of the remedy is functioning effectively as anticipated; therefore, the remedy for the Site is expected to be protective of human health and the environment.*
>
> *Soil Component*
>
> *The soil component of the remedy at the Somers Site has been certified complete.*
>
> *Groundwater Component*
>
> *The groundwater component of the remedy is functioning effectively and is therefore protective of human health and the environment. Current operation of the Phase I system has hydraulically contained the groundwater plume. The municipal water supply system continues to provide potable water to the Somers residents. There are no residential wells in the area of contaminated groundwater being used for drinking water.*

Status of Recommendations from the Third Five-Year Review

Section IX (Recommendations) from the Third Five-Year Review included three recommendations, which are listed below and in Table 3.

1. Complete evaluation of BNSF request to modify operation of the groundwater treatment system.

2. Issue ESD to provide proposed TI waiver and ruling on groundwater system operation.

3. Evaluate the most recent Montana DEQ-7 Numeric Water Quality Standards for inclusion as Site remediation levels.

Table 3: Status of Third Five-Year Review Recommendations

Recommendation from Previous Review	Party Responsible	Status/Action Taken Since Previous Review	Milestone Date	Still an Issue?
Complete evaluation of BNSF request to modify operation of the GWTS.	Not Stated	EPA and DEQ finalized the Request to Modify The Groundwater Treatment System Report as Appendix A of the Final Groundwater Treatment System Interim Monitoring Plan in May 2008.	May 2008	Yes[g]
Issue ESD to provide proposed TI waiver and ruling on GWTS operation.	Not Stated	EPA and DEQ are currently evaluating layers of ICs as a potential remedial component, rather than grant a TI waiver. BNSF modified its deed in December 2008 to include GW restriction provisions. Agencies approved shutdown of GWTS for an interim period of two years in 2007. It is still too early to determine if shutdown is protective. EPA and DEQ will perform a review and evaluation in 2012 to determine if deed restrictions placed on the affected property are fully protective.	Ongoing	Yes
The Montana Water Quality Standards should be evaluated for inclusion as Site remediation levels.	Not Stated	Protectiveness of the remedy has been deemed appropriate.	January, 2009	Yes[h]

Results of Implemented Actions

The GWTS was shut down in October of 2007 and the last batch of water was treated in May 2008. This was approved in May 2008 (DEQ and EPA, 2008b). Monitoring of Site conditions after the shutdown is ongoing and additional characterization work has been required.

A portion of the groundwater and surface water standards in the DEQ-7 Criteria are lower and therefore may be more protective than standards that were established by the 1989 ROD. The COCs that have lower standards established by the DEQ-7 Criteria are the surface water standards for naphthalene and phenol, and the groundwater standards for phenol and zinc. A comparison of the DEQ-7 Criteria to the standards in the 1989 ROD is presented in Table 7, Section VII of this Five-Year Review. Section VII also discusses the impact of the EPA review of the original risk assessment for the Site.

[g] While the specific recommendation from the Third Five-Year was completed, this continues to be an issue that the Agencies will evaluate at the Site due to new information.
[h] Again, although the specific recommendation was completed, additional evaluation is warranted due to new Site information.

VI. FIVE-YEAR REVIEW PROCESS

This Fourth Five-Year Review for the Site has been conducted in compliance with EPA's Comprehensive Five-Year Review Guidance dated June 2001 (EPA, 2001). This review was performed primarily by (or with the assistance of) the following team members:

Lisa DeWitt	DEQ	406-841-5037	lidewitt@mt.gov
Roger Hoogerheide	EPA Region 8	406-457-5031	hoogerheide.roger@epa.gov[i]
Doug Sutton	Tetra Tech GEO.	732-409-0344	doug.sutton@tetratech.com

Site Inspection

The Site inspection was conducted on November 16, 2010. The inspection was led by Roger Hoogerheide of EPA, Lisa DeWitt of DEQ, and Colin McCoy of Tetra Tech EMI. The purpose of the Site inspection was to evaluate the condition of the Site facilities and structures, and to assess the protectiveness of Site operations and of the remedy through visual evaluation of the Water Treatment Plant and associated components, Site fencing, monitoring wells, and the former LTU area. A completed Site inspection checklist is provided in Attachment 1.

The condition of the GWTS components, condition of the monitoring wells, and the availability of documents such as the O&M Manual and As-Built Drawings, Site security, and other aspects of the Site are detailed on the Site inspection checklist provided as Attachment 1.

During the inspection, several locations were noted where the fence was in need of repair. These were considered minor repairs and did not allow for unrestricted access. No evidence of trespassing was noted in the fenced portion of the Site where the water treatment plant and former LTU are located during the inspection or in discussions with the Site operator. Monitoring wells outside of fenced area are secured with locks and there was no evidence of tampering during the Site inspection or in discussions with the Site operator. Vegetation on the former LTU area is well established and aesthetically pleasing. The GWTS is currently in interim shutdown, with maintenance activities conducted as required. All pumps were pulled from extraction wells and are currently stored in the GWTS building.

There are currently two informational controls associated with the deed informing any prospective purchaser that waste has been left in place above levels that allow for unlimited use and unrestricted exposure. However, these will ultimately need to be updated to include enforceable provisions.

[i] Diana Hammer replaced Roger Hoogerheide as EPA Project Manager in September 2011. hammer.diana@epa.gov; (406) 457-5040.

The remedy as described in the decision documents has not been particularly effective as evidenced by October 2010 and subsequent data collection efforts. Field observations of the recently installed S-10-1 well cluster indicate that emulsified creosote has migrated offsite toward neighboring residences. Previous characterization documentation only showed product at 30 to 40 feet bgs, although review of wells logs S-88-1, S-88-2 and S-93-7 indicate that product was present in the vadose zone when these wells were installed. The presence of emulsified creosote at various depths and near residential properties is of serious concern because the creosote contains naphthalene and a possible indoor air pathway exists. This pathway was not considered when the decision documents were signed. Further evaluation to determine nature and extent of emulsified creosote and dissolved phase contaminants above ROD based standards is warranted in addition to the indoor air evaluation.

Community Notification and Involvement (Including Interviews)

Public notices announcing the beginning of the Fourth Five-Year Review were published in the Daily Inter Lake on November 14, 2010 (a copy of the notice is provided in Attachment 8).

Interviews were primarily conducted by the following people:

- Roger Hoogerheide, RPM, EPA
- Lisa DeWitt, Project Officer, DEQ
- Andrew Schmidt, Hydrogeologist, EPA
- Nancy Gilliland, Site Operator, AECOM

The following people were interviewed and represent a mixture of nearby residents and public officials:

- Andrew Sliter, Resident
- Frances Van Rinsen, Resident
- David and Debbie Hayes, Residents
- Joe Russell, Health Officer, Flathead City-County Health Department
- Nancy Gilliland, Site Operator, AECOM
- Tom Sliter, Resident

An example interview form is provided in Attachment 9. A summary of the community interviews and the issues and concerns raised is provided below.

- Multiple people interviewed recognized the complexity and ambitiousness of the project and that the impacts of the Site and remedy have decreased with time.

- One of the people interviewed lived near the former BNSF facility and given personal historic observations, continues to have concerns regarding contamination discharging to the lake and concerns about additional areas of contamination. This individual also blames the stigma associated with contamination for a general lack of growth in the Somers area.

- Multiple people interviewed expressed concern regarding Flathead Lake and the Town Well.

- Multiple people interviewed expressed a general distrust of BNSF, particularly since the attempt to purchase properties near the groundwater plume.

- Multiple people interviewed would appreciate continued updates, such as a newsletter or flyer.

- One person interviewed specifically mentioned the CGA and the concerns regarding potential expansion of the CGA.

Document Review

The following Site documents were reviewed for the preparation of this report:

- *Revised Groundwater Treatment System Interim Monitoring Plan, BNSF Former Tie Treating Plant, Somers, Montana*, AECOM, July 2011e.
- Pace Analytical Laboratory Data Packages for March 2011 Sampling Event, May 2011
- *Additional Data Collection Completion Report-Final, Former Tie Treating Plant, Somers, Montana*, AECOM, May 2011d.
- *Vapor Intrusion Investigation Summary Report, BNSF Former Tie Treatment Plant, Somers, Montana*, AECOM, April 2011c.
- Memorandum regarding Comments Applicable to the 5 Year Review of the BN Somers NPL Site, Susan Griffin, PhD, DABT (EPA), March 14, 2011.
- *Draft Revised Groundwater Treatment Interim Monitoring Plan, BNSF Former Tie Treating Plant, Somers, Montana*, AECOM, March 2011b.
- *Third Annual Interim Monitoring Report December 2009 through November 2010, BNSF Former Tie Treating Plant, Somers, Montana*, AECOM, February 28, 2011a.

- ATSDR Health Consultation (Technical Assistance), December 6, 2010.
- *Second Annual Interim Monitoring Report December 2008 through November 2009, BNSF Former Tie Treating Plant, Somers, Montana*, AECOM, May 2010.
- *Preliminary Subsurface Investigation Report for the Ortiz and Abel Properties in Somers, Montana*, Applied Water Consulting, January, 2010.
- Memorandum regarding Review of the *First Annual Interim Monitoring Report, January through November 2008, BNSF Former Tie Treating Plant, Somers, MT*, July 10, 2009.
- *First Annual Interim Monitoring Report January through November 2008 BNSF Former Tie Treating Plant Somers, Montana*, AECOM, April 2009
- DEQ and EPA letter to BNSF regarding inquiries into the purchase of nearby residential properties, March 30, 2009.
- Memorandum regarding review of *Interim Groundwater Monitoring Plan BNSF Former Tie Treating Plant, Somers, Montana*, GSI Environmental, February 6, 2009.
- Memorandum regarding *Concept Review Related to Discontinuing Active Remediation at the Burlington Northern (Somers Plant)*, GeoTrans, February, 2009. Later repackaged as *Final Report: Technical Assistance for the Burlington Northern Somers Site, Somers, Montana*, EPA Region 8, April 2009.
- DEQ and EPA letter regarding *BNSF-Somers Progress Report for March through May 2008* (EPA ID No. MTD053038386), July 7, 2008c.
- DEQ and EPA letter regarding Agency approval of the *Request to Modify Groundwater Treatment System*, May 7, 2008b.
- DEQ and EPA letter regarding *BNSF-Somers Progress Report for December 2007 and January and February 2008* (EPA ID No. MTD053038386) April 9, 2008a.
- *Phase I Groundwater Remedy Annual CERCLA Report April through December 2007, BNSF Former Tie Treating Plant, Somers, Montana*, ENSR, April 2008b.
- *Final Groundwater Treatment System Interim Monitoring Plan BNSF Former Tie Treatment Plant, Somers, Montana*, ENSR Corporation, February 2008a.
- DEQ and EPA letter to BNSF regarding proposed groundwater treatment plant shutdown and interim monitoring program, September 7, 2007.
- Third Five-Year Review, Burlington Northern Superfund Site, Somers, Flathead County, Montana, US EPA Region VIII, September 2006.
- Memorandum regarding *Evaluation of Natural Attenuation and Biodegradation Assimilative Capacity for the Somers Former Tie-Treating Plant*, RETEC, April 12, 2006.
- *Request to Modify Groundwater Treatment System, Former Somers Tie Treating Plant, Somers, Montana*, ENSR, April 30, 2004 (Revised September 1, 2004 and May 12, 2008).

- Letter to BNSF Attorney Craig Trueblood from EPA Attorney James Stearns Concurring with FWS Determination that Wetlands Restoration Actions are Complete, October 5, 2005.
- *Technical Impracticability Evaluation for Groundwater Restoration, Former Somers Tie Treating Plant, Somers, Montana*, (TI Evaluation) The RETEC Group, February 13, 2003.
- Second Five-Year Review, Burlington Northern Superfund Site, Somers, Flathead County, Montana, US EPA Region VIII, September 2001.
- Explanation of Significant Differences (EPA), July 1998
- First Five-Year Review, Burlington Northern Superfund Site, Somers, Flathead County, Montana, US EPA Region VIII, September 1996.
- Explanation of Significant Differences (EPA), June 1992.
- EPA Superfund Record of Decision, Burlington Northern (Somers Plant), September 27, 1989.
- *Remedial Investigation and Feasibility Study for the Somers Tie Plant, Volume 1*, Remediation Technologies, April 1989.

Data Review

During the first year after the last Five-Year Review, the Phase I Groundwater remedy was in place and operational. The GWTS operated at the Site starting in 1994, but pumped at lower rates than designed and did not achieve significant progress toward aquifer remediation. A TI Evaluation for groundwater restoration was submitted and finalized in 2003, and a request to modify the groundwater remedy by shutting down the GWTS was made in 2004. The system was temporarily shut down in October 2007 for evaluation under the Interim Monitoring Plan (most recently updated in July 2011).

Data reviewed for this Fourth Five-Year Review consists of the following:

- Groundwater elevation measurements

- Groundwater quality data
  - Plume stability (including data new wells installed in 2010)
  - Natural attenuation
  - Site wide wells
  - LTU closure monitoring
  - Town Well and Flathead Lake

- Vapor intrusion data

Groundwater Elevation Measurements

Site-wide groundwater elevations have been monitored quarterly as part of the groundwater quality sampling events. The monitoring wells that are part of the groundwater elevation measurement program vary in the intervals screened and the lengths of the screen intervals. Due to confining layers between various zones, the water levels in two co-located wells can vary substantially. For example, S-91-2 and S-84-15 are co-located. S-84-15 is less than 20 feet deep, and S-91-2 is screened from 25 to 35 feet deep yet the water level in S-91-2 is approximately 0.3 feet higher than S-84-15 during many events. Substantially higher contaminant concentrations are also evident in S-91-2 compared to S-84-15 (concentrations detected in S-84-15 are near the detection limits), suggesting that S-91-2 is hydraulically connected to the source area and S-84-15 may not be. S-84-16 located closer to Flathead Lake is screened from 6 to 11 feet, and there is no deeper well in this location. If S-84-16 shows contaminant levels similar to those found in S-84-15, then the groundwater elevation (and contaminant concentrations) in this well may be significantly different than that of the underlying interval where contamination is more likely to be present. For this reason, attention is merited when selecting the monitoring locations that are used for interpreting groundwater flow directions and contaminant concentration trends. Because of this concern, the Agencies required the following in a February 17, 2011 letter to BNSF:

> Within 30 days of approval of the Completion Report associated with the 2011 work, a draft technical memorandum that contains an analysis of which wells should be used for contouring groundwater elevations, and an assessment of whether multiple groundwater elevation maps (representing different depths/units) should be presented in future quarterly reports.

Groundwater elevations at the Site are also highly variable due to the controlled seasonal change in the water level of Flathead Lake (see Attachment 10). The artificial elevation of the lake, controlled by Kerr Dam at the south end of the lake, appears to create a seasonal condition within the vertical gradient, causing a downward (positive) gradient in early spring when the lake is at low elevation and upward (negative) in late summer when the lake is at full elevation. The lake receives water from the aquifer in the fall and winter and recharges the aquifer in the spring and summer. Given the variation in the potentiometric surface map over time, it is appropriate to evaluate hydraulic head gradients at well pairs over time in addition to potentiometric surface maps. Two well clusters (S-10-1 and S-10-2) were installed in October 2010 and additional well pairs will be installed as part of the 2011 additional data collection efforts to further evaluate hydraulic head gradients at the Site.

Attachment 11 presents several hydrographs illustrating the hydraulic head over time in several well pairs. The tops of the wells casings were re-surveyed in December 2010 to the NAVD 88 benchmark and converted into the NGVD 29 benchmark to be consistent with historical Site information. The hydrographs in Attachment 11 all reference the new survey information and the NGVD benchmark. The following descriptions of groundwater flow are based on the hydrographs presented in Attachment 11.

- Hydrograph 1 – S-93-2S & S-93-2D represents the vertical gradient in the subsurface. During GWTS operation prior to October 2007, the gradient was downward, indicating that the GWTS preferentially pulled from the interval screened by S-93-2D relative to the interval screened with S-93-2S. Subsequent to GWTS shutdown, the vertical gradient has been approximately even. Averaging all of the gradient measurements subsequent to GWTS shutdown suggests a slightly upward gradient, but the results may not be the same if more frequent measurements had been made. Note that the influence of the GWTS pumping on water levels fully attenuated by January 2008. The vertical gradient between S-85-8a and S-85-8b (a bedrock well) consistently indicates a strong upward gradient.

- Hydrograph 2 – S-88-1 & S-88-2 & S-91-2 represents the horizontal gradient between two locations of the source area where emulsified creosote has been repeatedly observed and a downgradient well with increasing contaminant concentration trends. The hydrograph demonstrates that the hydraulic gradient between S-88-2 and S-91-2 changed direction during Spring 2009, but on average is approximately even. Averaging the difference between water elevations at these two wells from January 2008 through October 2010 indicates a slight hydraulic gradient from S-91-2 to S-88-2 (i.e., S-91-2 is generally up or side-gradient of S-88-2 rather than downgradient). There is, however, a significant component of groundwater flow from S-88-1 to S-91-2 such that contamination observed at S-91-2 is more likely from S-88-1 and contamination observed at S-88-2 likely moves in another direction. Note that the influence of the GWTS pumping on water levels fully attenuated by January 2008.

- Hydrograph 3 – S-88-2 & S-85-6A illustrates that there is a component of groundwater flow that changes direction between these two monitoring wells over time. Averaging the measurements over time suggests that on average the flow component is from S-88-2 to S-85-6A.

- Hydrograph 4 – S-85-6A & S-91-2 illustrates that there is generally a flow component from S-91-2 toward S-85-6A.

Groundwater Quality Data

The groundwater from wells within the monitoring area are analyzed for phenols, PAH compounds, TSS and zinc. The ROD and 1998 ESD cleanup levels are 6,000µg/L for phenols, 40µg/L for total PAHs (TPAHs), 0.030µg/L for carcinogenic PAHs (CPAHs), and 5 mg/L for zinc. The presence of emulsified creosote is also noted where present (i.e., in source area wells S-88-1, S-88-2, S-93-2S, and S-93-5S during many of the interim quarterly monitoring events from 2008 through 2010). The interpreted generalized extent of the contaminant plume based on data obtained during the March 2011 sampling event is shown in Attachment 14. The following subsections describe data review with respect to the following groundwater quality topics:

- Plume stability network (including new wells installed in 2010)
- Natural attenuation network
- Site wide wells
- LTU closure monitoring
- Town Well and Flathead Lake

Exceedances of groundwater cleanup criteria are discussed in Section VII.

Plume Stability

The charts referred to in this section can be found in Attachment 12. The charts illustrate contaminant trends in these monitoring wells.

Phenols – Charts 1 and 2

The phenolic substance primarily detected at the Site is 2,4-dimethylphenol (e.g., 8,320 ug/L in S-88-2 in March 2011) (see table in Attachment 13). Based on the quarterly monitoring data, the total phenols groundwater plume does not appear to be stable in the absence of GWTS operation. Chart 1 plots the total phenols concentration at S-91-2 from December 2004 through March 2011. S-91-2 is a well located approximately 450 feet northwest of the source area represented by S-88-2. Prior to January 2008, the maximum concentration was 1,366 ug/L with an average concentration of approximately 750 ug/L. Since January 2008, the minimum concentration has been 1,239 ug/L, the average has been approximately 2,250 ug/L, and the maximum has been 3,510 ug/L. An increasing trend since January 2008 is evident among seasonal spikes caused by changing groundwater flow directions influenced by water level changes in Flathead Lake. Chart 2 plots the total phenols concentration at S-88-3 over the same time period. S-88-3 is approximately 300 feet west of S-88-2. Prior to January 2008, the maximum concentration was 33 ug/L. Since January 2008, the minimum concentration has been non-detect, the average has been approximately 190 ug/L, and the maximum has been approximately 668 ug/L. An increasing trend is evident among seasonal spikes caused by changing groundwater flow directions influenced by water level changes in Flathead Lake. Therefore, changes in lake level impart seasonal fluctuations in the water quality data of these well, but there is also a general increasing trend that suggests the 2,4-dimethylphenol plume is not stable.

Although the increasing total phenols concentrations in the above two wells are below the 1998 ESD standard of 6,000 ug/L, the concentrations of 2,4-dimethylphenol in the two wells have repeatedly exceeded the DEQ-7 Numeric Water Quality Standard of 380 ug/L for 2,4-dimethylphenol. The DEQ-7 2,4-dimethylphenol standard for surface water is also 380 ug/L, and based on the above trend, the plume will likely reach Flathead Lake above this surface water quality standard.

In addition to the above noted changes in two downgradient wells, total phenols concentrations above the 1998 ESD and a 2,4-dimethylphenol concentration more than an order of magnitude above the DEQ-7 standard have been detected in S-10-2I, which is located outside of the proposed TI boundary and the CGA. The compound is also present in the S-10-2D above the DEQ-7 standard. A sheen was also detected during the installation of these wells.

PAHs – Charts 3 and 4

TPAH concentrations at downgradient wells over the past several quarters are low, and the trends are more difficult to determine given the low concentrations. Chart 3 presents the TPAH concentration at S-88-3 from December 2004 through March 2011. Samples with non-detect values were assigned a value of 1 ug/L for the plot. A slight upward trend in the low concentrations is evident. The increasing magnitude of the seasonal peaks, however, is apparent. Prior to January 2008, the maximum total PAH peaks were 10.5 ug/L and 11.3 ug/L. Starting in January 2008, the peaks were 77.6 ug/L, 29.7 ug/L, 636 ug/L and 69 ug/L. The majority of these recent peak concentrations are above the 1998 ESD TPAH standard of 40 ug/L. The primary TPAH contaminant is naphthalene, and with the exception of the 636 ug/L result in October 2010, the naphthalene results in S-88-3 have been lower than the DEQ-7 standard of 100 ug/L.

TPAH concentrations are also increasing at S-91-2 (Chart 4), but the concentrations are much lower than those observed at S-88-3.

It is important to note that 2,4-dimethylphenol has a significantly lower tendency to adsorb to organic carbon than naphthalene. Based on partitioning coefficient (K_{oc} or $\log(K_{oc})$) values provided in the Groundwater Chemicals Desk Reference (Lewis Publishers, 1989) the partitioning coefficient for 2,4-dimethylphenol is approximately 12 times lower than the partitioning coefficient for naphthalene, suggesting that 2,4-dimethylphenol will transport through the subsurface faster than naphthalene. As a result, the elevated concentrations of 2,4-dimethylphenol at downgradient wells is an indication of future elevated naphthalene concentrations at the same wells

Due to the significantly higher adsorption of the ROD-defined CPAHs, ROD-defined CPAHs have generally not been detected at downgradient wells during the interim monitoring period. Sporadic detections at some locations may be due to adsorption of these compounds to suspended material or sediment in the monitoring wells and may not be an indication of ROD-defined CPAH contamination in groundwater. Note that naphthalene (currently considered a potential carcinogen) is not referred to here as a ROD-defined CPAH because it was not defined as a potential carcinogen at the time of the 1989 ROD.

Zinc

Although recorded zinc concentrations for the source area wells indicate levels of zinc below the cleanup levels, the downgradient wells S-85-6B, S-85-5B, S-85-8A and S-86-1 were found to contain levels of zinc above the cleanup standards. These past exceedances have been theorized to be related to well construction with galvanized steel casing, where the loss of the zinc coating used for galvanization may have caused the zinc exceedances rather than zinc resulting from past practices at the Site. These wells were replaced in October of 2010 and will continue to be monitored for zinc and the other plume stability parameters. Zinc concentrations in samples from the replacement wells are significantly lower than the ROD cleanup level of 5 mg/L, suggesting that the zinc historically observed in the original wells were manifestations of well construction rather than contamination migrating from the source area. Sampling for zinc in these replacement wells is planned through the end of 2011 to confirm these results.

Benzene

Benzene and other volatile organic compounds (VOCs) were included in the analyte list for the initial sampling of the new shallow wells S-10-1S and S-10-2S monitoring well clusters. In December 2010 during the initial sampling of these shallow wells, benzene was detected in wells at more than an order of magnitude above the ROD Table 7 standard of 5 ug/L. Although benzene was identified as a Contaminant of Concern in the Record of Decision, it was not analyzed in any groundwater sample until December 2010. As a result of the above detections, VOCs were included in the analyte list for samples collected in March 2011. In the March 2011 sampling event, benzene was detected above the ROD Table 7 standard in 12 wells, including four outside of the current CGA and S-88-3, which is a downgradient well. Like 2,4-dimethylphenol, benzene has a substantially lower partitioning coefficient than naphthalene and may be a better indicator of contaminant migration in the short term.

Natural Attenuation

Dissolved methane and elevated ferrous iron concentrations are evidence of natural degradation of contaminants and/or organic matter at the Site. However, the above discussion regarding the lack of stability of the total phenols, benzene, and TPAH plumes indicates that natural degradation may not be sufficient to maintain plume stability with the current source in the absence of remedy pumping or another form of active remediation.

LTU Closure Monitoring

The LTU was closed in 2002, and a vegetative cover was established. Post-closure operations include ongoing maintenance of the vegetative cover. Post-closure groundwater monitoring is required at a frequency of 6 months and 1, 2, 4, 8, 16 and 30 years from the start of the post-closure, to confirm that hazardous constituents from the LTU are not impacting the upper aquifer. During the 2010 sampling event (8 years after closure), wells S-5R and S-6 could not be sampled because the wells were dry. Samples collected from well S-93-7 slightly exceeded the CPAH target cleanup level both from the initial October sampling event and the resample collected in November 2010 (AECOM, 2011, *Third Annual Interim Monitoring Report*). Although the LTU wells are not scheduled to be sampled again until 2018 to meet post-closure requirements, they were included in the Spring site-wide sampling event, and no detections of CPAHs were noted. The low-level CPAH detections in previous samples may result from CPAHs adsorbed to sediments in the well boring that become entrained in the sample.

Town Well and Flathead Lake

The Somers Municipal Well (the "town well") continues to be sampled semi-annually to ensure protectiveness of the public drinking water supply. These samples are analyzed for PAH compounds, zinc and total suspended solids. The town well samples and duplicate samples have been reported to be non-detect for all PAH compounds except for naphthalene in the March 2008 event, and benzo (gi) perylene and indeno (1,2,3-cd) pyrene in the April 2009 event which were below the reporting limit of 24 ηg/L.

The town well is located in bedrock, approximately 1,300 feet away from the source area. In the *Concept Review Related to Discontinuing Active Remediation at the Burlington Northern (Somers Plant)* (GeoTrans, 2009), an analysis of the plume migration noted that data from the only bedrock well between the source area and the town well (S-85-8b) suggest little or no contamination migrating toward the town well.

During the review for the TI Evaluation, an analytical contaminant transport model developed by BNSF was used to estimate the attenuation of contaminants of concern between the source area and Flathead Lake. This model estimated that it would take 5,000 years for the indicator parameter, naphthalene, to reach Flathead Lake (RETEC, 2003). Subsequent analytical transport modeling was conducted by GeoTrans, Inc. on behalf of EPA and described in a memorandum titled *Concept Review Related to Discontinuing Active Remediation at the Burlington Northern (Somers Plant)*. This subsequent modeling revised the model parameters based on calibration with historical sampling results. The results of the additional simulations suggested that plume migration could impact Flathead Lake in approximately 120 years and plume stability may not be reached for 200 years. The rate of concentration increases at S-91-2 and S-88-3 confirms that transport times to Flathead Lake are significantly faster than the 5,000 years indicated in the initial modeling and may be even faster than the 120 years suggested by the latter modeling if transport of 2,4-dimethylphenol and/or benzene is considered.

Vapor Intrusion Data

A vapor intrusion investigation was motivated by the detection of benzene in the shallow groundwater underlying residential properties at an order of magnitude greater than the ROD cleanup level as well as by the detection of elevated concentrations of naphthalene. The purpose of the February 2011 vapor intrusion investigation was to determine whether contaminants in soil or groundwater may be migrating as vapors into the indoor air of the five residences being tested. Vapor intrusion investigation took place at five residences located along Somers Road, just east of the Somers Site source area wells. Samples were collected from the soil underneath the crawl spaces of four residences and the dirt floor of the basement of the fifth and from the main floor of the five residences. These results did not indicate exposure to contaminants via the vapor intrusion pathway; however, no final conclusions can be drawn from this single sampling event. Additional data collection is needed to fully evaluate the public health risks potentially associated with the vapor intrusion pathway.

VII. TECHNICAL ASSESSMENT

The following responses to questions support the determination that the remedy at the Burlington Northern (Somers Plant) Site is not currently functioning as designed, but has been closely monitored and additional groundwater and soil investigations are underway. At this time, the groundwater remedy is not protective of human health and the environment because new information shows the plume is not stable, the vapor intrusion and drinking water pathways have not been fully evaluated, and the current ICs do not cover all areas where contamination is above the ROD cleanup standards for groundwater. Additional information is needed regarding the nature and extent of groundwater contamination, migration of the groundwater plume, groundwater flow paths, water quality of the town well, the appropriateness of both the CGA and proposed TI waiver, and the implementability of enforceable groundwater ICs for the Site.

Question A: Is the remedy functioning as intended by the decision documents?

The answer to Question A is "**yes" for the soils remedy**. The soils remedy is considered complete in the short-term. While BNSF filed a deed notification (Institutional Control) at the request of the Agencies in 2008, it has been determined that an enforceable proprietary Institutional Control (IC) is necessary for the long term protectiveness of the remedy. The Site team is working on this enforceable IC for areas where treated soils have been placed.

The answer to Question A is **"no" for the groundwater remedy**. The groundwater treatment system was temporarily discontinued in 2007 and a period of interim evaluation began. Since the GWTS was shut down for evaluation, concentration increases have been evident for total phenols and TPAHs. Contaminants, including benzene (a contaminant identified in the ROD), are also present outside of the CGA above the ROD cleanup standard at multiple locations.

Therefore, during the groundwater remedy interim monitoring period, the groundwater remedy does not appear to be achieving the Remedial Action Objectives stated in the ROD. Preliminary results from the fall 2011 groundwater and soil investigation indicate Site contamination is more extensive than had been indicated by previous investigations and sampling activities. Results of the 2011 investigation fall outside the time frame for this Five Year Review, but will be considered along with recommendations in this Five Year Review when conducting further review of the groundwater remedy.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

No. The exposure pathways that were considered significant during the compilation of the ROD included many important pathways, including the protection of the drinking water well for the town of Somers. This objective is being met and is still valid. However, the presence of VOCs, including benzene and naphthalene in shallow groundwater beneath residential properties, has suggested the potential for a vapor intrusion exposure pathway. The initial vapor intrusion screening to date suggests the pathway may not be complete, but additional testing will need to be conducted to confirm the results. It should also be noted that there is an on-going groundwater investigation to more precisely define the extent of Site contamination. These results will be used to update the Conceptual Site Model, update the groundwater flow paths, and prepare a Focused Feasibility Study for the Site. This information will be used to select appropriate locations for monitoring wells. The report is expected in spring 2012 and the plan is to install the wells in the fall of 2012.

It has also been noted that the indicator parameters or contaminant categories that were the focus of the original ROD and 1998 ESD may not be fully representing the human health risk at the Somers Site. In March 2011, the EPA prepared a Memorandum that summarized the EPA's effort to identify revisions to the EPA Risk Assessment Guidance for Superfund that have occurred since the 1987 human health risk assessment prepared for the Site and how those revisions might impact the cleanup standards established in the 1989 ROD and 1998 Explanation of Significant Differences. The Memorandum made the following conclusions:

- Due to inadequate sample collection, assessment of only indicator parameters, and use of different risk assessment processes there is a great deal of uncertainty associated with the accuracy of the risk assessment methods used in 1987.

- A more up to date human health risk assessment may be useful considering that new contaminants have been identified from recent sampling events and vapor intrusion may be emerging as a new exposure pathway.

- An option to re-develop the baseline risk assessment would be to keep the 1987 risk assessment as the basis for unacceptable public health risk, and develop a new PRG

document for all analytes detected above a conservative risk-based screening level. This would address the analytes dropped from the 1987 risk assessment and the analytes found in the more recent sampling events, and could also clearly explain the land use and receptors selected, the exposure pathways of concern, and incorporate the most recent exposure and toxicity assumptions.

Another consideration regarding cleanup levels is that groundwater and surface water standards have been promulgated since the development of the cleanup criteria in the 1989 ROD. These standards are known as the Montana DEQ-7 Numeric Water Quality Standards (DEQ-7 Criteria). Some of the groundwater and surface water standards in the DEQ-7 Criteria are lower and therefore may be more protective than standards that were established by the 1989 ROD. The COCs that have lower standards established by the DEQ-7 Criteria are the surface water standards for naphthalene and phenol, and the groundwater standard for phenol and zinc. The ROD and ESD also did not provide individual compound-specific standards for naphthalene and 2,4-dimethylphenol. A comparison of the DEQ-7 Criteria to the standards in the 1989 ROD is found in Table 4. Benzene, 2,4-dimethylphenol, and naphthalene are three examples of compounds for which the ROD and ESD do not provide cleanup standards but exceed the DEQ-7 criteria at one or more wells. Additionally, if the CPAH designation for a cleanup standard in the ROD is retained, then consideration will need to be given to specific EPA standards for naphthalene, which, at the time of the ROD, was not considered to be a potential human carcinogen, but has since been so designated by EPA. Table 5 presents the wells inside and outside of the CGA where benzene, 2,4-dimethylphenol, and naphthalene exceed the DEQ-7 criteria. The figure in Attachment 14 illustrates the locations of these exceedances.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. Recent groundwater results (i.e., through 2011) indicate that the plume has expanded beyond the existing CGA and there may be a vapor intrusion pathway that could pose risks to public health. It was also learned during this review that there are no zoning ordinances in place in Somers that can restrict future land use in the surrounding area. As indicated above, results of the 2011 environmental investigation are pending and will be carefully reviewed by the Agencies for appropriate follow-up.

Table 4: Cleanup Criteria: ROD vs. 2010 Montana DEQ-7 for Detected Compounds

	Montana DEQ Surface Water Quality Standards (µg/L)	Montana DEQ Groundwater Quality Standards (µg/L)	ROD/ESD Human Health Cleanup Level (µg/L)	Maximum Detected Concentration March 2011 (µg/L)	Well with Maximum Concentration
Zinc	2,000	2,000	5,000	804	S-6R
2,4-Dimethylphenol	380	380		17,800	S-88-1[1]
Phenol	300	300	3,500	10,300	S-93-5S
2-Chloronaphthalene	1,000	1,000		0.27	S-88-1
Acenaphthene	670	670	20	3,990	S-10-1I[2]
Anthracene	8,300	2,100		1,200	S-10-1I[2]
Benzo(a)pyrene	0.038	0.05		135	S-10-1I[2]
Benzo(b)fluoranthene	0.038	0.5		207	S-10-1I[2]
Benzo(k)fluoranthene	0.038	5		87.9	S-10-1I[2]
Chrysene	0.038	50		369	S-10-1I[2]
Dibenz(a,h)anthracene	0.038	0.05		14	S-10-1I[2]
Dibenzofuran	0.00000005	0.00000200		2,430	S-10-1I[2]
Fluoranthene	130	130	42	2,000	S-10-1I[2]
Fluorene	1,100	1,100		2,340	S-10-1I[2]
Indeno(1,2,3-cd)pyrene	0.038	0.5		38	S-10-1I[2]
Pyrene	830	830		1,390	S-10-1I[2]
Benzene	5	5	5	580	S-10-1I
1,1-Dichloroethene	0.57	0.60		0.22J	S-10-2S
Ethylbenzene	530	700		616	S-10-1I
Methylene Chloride	5	5		205J	S-10-1I
Naphthalene	100	100		19,900	S-10-1I[2]
Styrene	100	100		292	S-10-1I
Toluene	1,000	1,000		1,700	S-10-1I
Xylene (total)	10,000	10,000		2,070	S-10-1I
m&p-Xylene	10,000	10,000		1,480	S-10-1I
o-Xylene	10,000	10,000		598	S-10-1I

[1] Result from sample S-88-1REDL2

[2] Result from sample S-10-1IDL by method 8270 SIM

Table 5: Wells that Exceed Benzene, 2,4-Dimethylphenol, or Naphthalene DEQ-7 Levels

	March 2011 Benzene (DEQ-7 = 5 µg/L)	March 2011 2,4-Dimethylphenol (DEQ-7 = 380 µg/L)	March 2011 Naphthalene (DEQ-7 = 100 µg/L)
Inside CGA			
S-88-1	385	17,800[1]	4,820[6]
S-88-2	69.9 J	8,320	17,900[7]
S-88-3	21.1	<380	<100
S-6R	6.7	<380	<100
S-93-2S	168	2,110[2]	103[8]
S-93-5S	331	16,600	26,300[9]
S-10-1I	580	12,700	36,300[10]
S-10-1D	11.7	<380	2,150[11]
Outside CGA			
S-91-2	54.2	3,830[3]	<100
S-10-2S	48.5	<380	<100
S-10-2I	94.2	1,810[4]	<100
S-10-2D	48.1	896	631

[1] Sample S-88-1REDL2
[2] Sample S-93-2SDL
[3] Sample S-91-2DL
[4] Sample S-10-2IDL
[5] Sample S-10-2DDL
[6] Sample S-88-1DL2 by 8270 SIM
[7] Sample S-88-2DL by 8270 SIM
[8] Sample S-93-2SDL by 8270 SIM
[9] Sample S-93-5SDL by 8270 SIM
[10] Sample S-10-1IDL by 8270 SIM
[11] Sample S-10-1DDL by 8270 SIM
[12] Sample S-102DDL by 8270 SIM

VIII. ISSUES

Issues identified by this review include the following:

- **Issue #1: Changes since the 1987 Risk Assessment and 1989 ROD.** The EPA has determined that the Risk Assessment performed in 1987 contains uncertainty, primarily with respect to derivation of cleanup standards, consideration of all contaminants of concern, and the potential for vapor intrusion. Naphthalene was not considered a carcinogen at the time of the ROD. EPA now classifies naphthalene as a Class C, possible human carcinogen. This will affect the calculation of ROD cleanup goals.

- **Issue #2: Contaminants exceed DEQ-7 ARAR.** Although the total phenolic compound concentrations are below the ROD and ESD cleanup standards at most groundwater well locations, concentrations of 2,4-dimethylphenol (a phenolic compound) exceeds the DEQ-7 standard by more than an order of magnitude in several locations; and BTEX, 1-methylnapthalene, 2-methylnapthalene, and naphthalene have also been detected at levels exceeding DEQ-7 standards.

- **Issue #3: Groundwater contaminant concentrations above the ROD levels; Evidence indicates more extensive groundwater contamination.** Recent information indicates that contaminants exist beyond previously defined plume boundaries. Separate phase creosote and dissolved phase compounds above ROD cleanup standards have been discovered beyond the proposed TI boundary and CGA. Concentrations of 2,4-dimethylphenol are increasing in downgradient wells indicating that the 2,4-dimethylphenol plume is not stable in the absence of remedy pumping. Benzene is also present at these downgradient locations, and concentrations for benzene exceed the ROD cleanup standards in multiple locations outside of the CGA.

- **Issue #4: Vapor Intrusion.** EPA has new information since the Third Five-Year Review showing the potential for a vapor intrusion pathway into the indoor air of some local residences. Initial vapor intrusion sampling is not sufficient to draw final conclusions about the human health risks from this potential exposure pathway.

- **Issue #5: Town Drinking Water Well.** The Somers town well is currently sampled for low-level concentrations of PAHs, zinc and TSS, but not for more mobile constituents such as benzene and 2,4-dimethylphenol, which have been detected outside of the CGA above the DEQ-7 standards.

- **Issue #6: Institutional Controls (ICs).** New sampling information indicates groundwater contamination extends beyond the boundaries of existing groundwater ICs, including the CGA. Enforceable soil and groundwater ICs are not in place.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The following recommendations are intended to resolve the issues listed in Section VIII.

Recommendation re: Issue #1: Changes since the 1987 Risk Assessment and 1989 ROD: Re-evaluate the assumptions and methodologies used in the 1987 Risk Assessment (done prior to issuance of the EPA Risk Assessment Guidance for Superfund) and determine if a new Risk Assessment is warranted. Specifically, the re-evaluation will need to consider derivation of cleanup standards, all contaminants of concern, and the potential for vapor intrusion. In addition, naphthalene has since been classified as a class C, possible human carcinogen. The risk associated with naphthalene needs to be re-assessed and consideration needs to be given to including 2,4-dimethylphenol as a constituent of concern.

Recommendation re: Issue #2: Contaminants exceed DEQ-7 ARAR: Evaluate constituents exceeding DEQ-7 standards (e.g., total phenolic compounds, 2,4-dimethylphenol, naphthalene, BTEX, 1-methylnapthalene, 2-methylnapthalene) and determine appropriate cleanup goals for these constituents. Fully characterize the nature and extent of groundwater contamination from constituents exceeding and potentially exceeding DEQ-7 standards.

Recommendation re: Issue #3: Groundwater contaminants have concentrations above the ROD levels; Evidence indicates more extensive groundwater contamination. Conduct environmental investigations to more fully characterize the nature and extent of Site contamination and potential risks to human health and the environment. This includes the need to more fully characterize the horizontal and vertical extent of separate phase creosote and dissolved phase compounds including benzene and 2,4-dimethylphenol and the potential for contaminant migration. Based on these environmental investigations, update conceptual Site model, update groundwater flow paths and potentiometric surfaces, and evaluate the need for a focused feasibility study on groundwater and the need for a revised risk assessment based on new information. Identify actions necessary to delineate contamination and prevent future migration of contamination, including a revised monitoring well network. Continue ongoing evaluation of impacts from the interim shut-down of the GWTS.

Recommendation re: Issue #4: Vapor Intrusion. Conduct additional vapor intrusion screening(s) to more completely evaluate the vapor intrusion pathway.

Recommendation re: Issue #5: Town Drinking Water Well. Monitor the town well for VOCs (such as benzene) and phenols (including 2,4-dimethylphenol), because these compounds migrate faster through the subsurface groundwater than PAHs and would serve as an earlier, more efficient indicator for any Site-related contamination that potentially is migrating toward the town well.

Recommendation re: Issue #6: Institutional Controls (ICs). Implement enforceable ICs, including but not limited to filing enforceable proprietary soils and groundwater ICs with the Flathead County Clerk and Recorder with signed copies to the Agencies.

Recommendations and follow-up actions are listed in Table 6.

Table 6: Recommendations and Follow-up Actions

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
					Current	Future
1	Reassess methodologies, assumptions from 1987 risk assessment and determine if new risk assessment is needed.	BNSF	USEPA, DEQ	9/30/2013	Yes	Yes
2	Evaluate DEQ-7 for possible inclusion in Site remediation levels.	BNSF	USEPA, DEQ	9/30/2013	Yes	Yes
3	Conduct environmental investigations to more fully characterize the nature and extent of Site contamination and potential risks to human health and the environment. Conduct additional work, update conceptual Site model, and provide recommended actions necessary to delineate contamination and prevent future migration of contamination.	BNSF	USEPA, DEQ	9/30/2014	Yes	Yes
4	Conduct additional vapor intrusion screening(s) to more completely evaluate the vapor intrusion pathway.	BNSF	USEPA, DEQ	9/30/2013	Yes	Yes
5	Monitor the town well for VOCs and phenols in all future quarterly monitoring events.	BNSF	USEPA, DEQ	Immediate	Yes	Yes
6	File an enforceable proprietary Soils Institutional Control with Flathead County Clerk and Recorder and provide a signed copy to the Agencies (or implement equivalent IC), and increase the size of the Controlled Groundwater Area as appropriate.	BNSF	USEPA, DEQ	9/30/2015	Yes	Yes

X. PROTECTIVENESS STATEMENT(S)

The soil remedy currently protects human health and the environment because soil was placed in a Land Treatment Unit, treated, covered with clean fill, and surrounded by a fence to prevent access. However, to be protective in the long-term, enforceable ICs for the area need to be implemented.

The groundwater remedy is not protective of human health and the environment because the plume is not stable, the vapor intrusion and drinking water pathways have not been ruled out, and the current ICs do not cover all areas where contamination is above the ROD cleanup standards for groundwater. Collection of additional information (Geoprobe and TarGOST borings for a groundwater and soils investigation) began in September 2011. In 2012, based on a review of the data collected, EPA, in consultation with DEQ, will make a decision about the appropriate next steps for this facility. The long term protectiveness will be dependent on the implementation of additional measures that are recommended in this Fourth Five-Year Review and any additional work needed following analysis of the 2011 investigation to characterize and control Site contaminants.

Based on new information obtained since the publication of the Third Five-Year Review, the Agencies conclude that the remedial action for the groundwater component on the Site cannot be considered protective of human health and the environment in the short-term and the remedy is also not protective in the long-term.

XI. NEXT REVIEW

Because contamination remains on-site above ARARs, this Site requires ongoing Five-Year Reviews. The next review will be conducted by January 31, 2017, five years after the completion of this Fourth Five-Year Review report.

XII. REFERENCES

Site documents reviewed are listed in Section VI. Other references are provided below.

EPA, 2000. Integrated Risk Information System (IRIS). Washington, D.C. http:www.epa.gov/iris/index.html

EPA, June 2001. *Comprehensive Five-Year Review Guidance* (EPA 540-R-01-007).

EPA, July 1999. *A Guide for Preparing Superfund proposed Plans, Records of Decision or Other Remedy Selection Decision Documents* (EPA EPA540-R-98-031).

EPA, May 1995. Land Use in the CERCLA Remedy Selection Process (OSWER 9355.7-04).

Montana Department of Environmental Quality, August 2010. *Circular DEQ-7, Montana Numeric Water Quality Standards.*

Montana Department of Environmental Quality, January 2004. *Circular WQB-7, Montana Numeric Water Quality Standards.*

USGS, 1994. Somers Quadrangle, Montana-Flathead County, 7.5-minute series (topographic).

ATTACHMENTS

ATTACHMENT 1

Completed Site Inspection Checklist

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Burlington Northern (Somers Plant) Superfund Site	**Date of inspection: 11/16/2010**
Location and Region: Somers, MT Region 8	**EPA ID: MTD053038386**
Agency, office, or company leading the five-year review: USEPA Region 8, Montana Office	**Weather/temperature: Cloudy, light snow, 35 degrees**

Remedy Includes: (Check all that apply)

Landfill cover/containment
Access controls
Institutional controls
Groundwater pump and treatment
Surface water collection and treatment
Other_____
_____

Monitored natural attenuation
Groundwater containment
Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Shelly Young_ _AECOM Environmental
Name Title Date
Interviewed at site at office by phone Phone no. _____

Problems, suggestions; Report attached **Shelly did not participate in the Site Inspection**

2. **O&M staff** _____Nancy Gilliland_____ _____ 11/16/2010
Name Title Date
Interviewed at site at office by phone Phone no. _____

Problems, suggestions; Report attached **Nancy will be interviewed in near future as part of the community interviews_**

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

4. **Other interviews** (optional) Report attached.

Interviews will be conducted at a later date.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual — Readily available — Up to date — N/A
   - As-built drawings — Readily available — Up to date — N/A
   - Inspection logs — Readily available — Up to date — N/A

   Remarks_____

2. **Site-Specific Health and Safety Plan** — Readily available — Up to date — N/A
   - Contingency plan/emergency response plan — Readily available — Up to date — N/A

   Remarks_____

3. **O&M and OSHA Training Records** — Readily available — Up to date — N/A

   Remarks_____

4. **Permits and Service Agreements**
   - Air discharge permit — Readily available — Up to date — N/A
   - Effluent discharge — Readily available — Up to date — N/A
   - Waste disposal, POTW — Readily available — Up to date — N/A
   - Other permits_____ — Readily available — Up to date — N/A

   Remarks_____

5. **Gas Generation Records** — Readily available — Up to date — N/A

   Remarks_____

6. **Settlement Monument Records** — Readily available — Up to date — N/A

   Remarks_____

7. **Groundwater Monitoring Records** — Readily available — Up to date — N/A

   Remarks **Monitoring data provided in quarterly and annual reports. Montana Bureau of Mines and geology will be tasked with making all groundwater data available in the state's Groundwater Information Center (GWIC). All historic annual reports were on file in hard copies and available in the water treatment plant office**

8. **Leachate Extraction Records** — Readily available — Up to date — N/A

   Remarks_____

9. **Discharge Compliance Records**
   - Air — Readily available — Up to date — N/A
   - Water (effluent) — Readily available — Up to date — N/A

   Remarks_____

10. **Daily Access/Security Logs** — Readily available — Up to date — N/A

    Remarks **All site visitors are required to sign in**

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other_____

2. **O&M Cost Records**

This Site is a PRP lead Site and cost records are not readily available to the Agencies

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: **In discussions with Site Operator during Site inspection, she could not recall any unanticipated or unusually high O&M costs during the 5 year reporting period.**

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

1. Fencing damaged — Location shown on site map — Gates secured — N/A

Remarks **There were several locations noted during the Site Inspection where the fence was in need of repair. These were considered minor repairs and did not allow for unrestricted access. These are identified on the attached map. Nancy stated that she would do routine maintenance to repair the fence where needed.**

B. Other Access Restrictions

1. **Signs and other security measures** — Location shown on site map — N/A

Remarks **There were Danger/Keep Out signs on the fence. However, residents requested they be taken down at the last public meeting in October 2009. BNSF complied, with Agency consent, and signs taken down afterwards as they were deemed to be no longer needed.**

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	**No**	N/A
Site conditions imply ICs not being fully enforced	Yes	**No**	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) **__Site visits, drive by**

Frequency **Site operator visits the Site at least every other week for routine maintenance and drive by Site several times a week. Nearby residents also call when there are issues such as a recent fence hit and run.**

Responsible party/agency **AECOM**

Contact **Nancy Gililland** (Name) **Site Operator** (Title) **11/16/2010** (Date) Phone no.

Reporting is up-to-date	**Yes**	No	N/A
Reports are verified by the lead agency	**Yes**	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

There are currently two informational controls associated with the deed informing any prospective purchaser that waste has been left in place above levels that allow for unlimited use and unrestricted exposure. However, these need to be updated to include enforceable provisions. BNSF is currently working on a draft Notice of Institutional Control which will be shared with the Agencies in the near future. This NOIC will supercede the two existing restrictions and these existing restrictions will be voided.

2. **Adequacy** ICs are adequate ICs are inadequate N/A

Remarks

Additional investigations are ongoing to determine if the existing boundaries of the Controlled Groundwater Area need to be expanded. Also, see remark above about the need to place an enforceable control on the deed.

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident

Remarks: **No evidence of trespassing was noted in the fenced portion of the Site where the water treatment plant and former LTU are located during the Site inspection or in discussions with the Site operator. Monitoring wells outside of fenced area are secured with locks and there was no evidence of tampering during the Site inspection or in discussions with the Site operator.**

_____

2. **Land use changes on site** N/A
Remarks_____
_____

3. **Land use changes off site** N/A

Remarks **Unincorporated Somers is currently not zoned. In the past five years, there has been significant residential growth within a several mile radius of the Site and has the potential to encroach around the Site. Agencies need to contact local planning officials to discuss future land uses and zoning efforts.**

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. Roads damaged Location shown on site map Roads adequate N/A
Remarks

B. Other Site Conditions

Remarks ____ _____

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Cracks** Location shown on site map Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____
_____

3. **Erosion** Location shown on site map Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Holes** Location shown on site map Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
Trees/Shrubs (indicate size and locations on a diagram)

Remarks **Vegetation is well established and aesthetically pleasing. During the inspection, it was noted that two Russian Olive trees had sprouted on the former LTU. While it is not believed to compromise the integrity of the cap, they will be removed because they are considered noxious plants.**

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
Remarks_____
_____

7. **Bulges** Location shown on site map Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** Wet areas/water damage not evident
Wet areas Location shown on site map Areal extent_____
Ponding Location shown on site map Areal extent_____
Seeps Location shown on site map Areal extent_____
Soft subgrade Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** Slides Location shown on site map No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches Applicable N/A

C. Letdown Channels Applicable N/A

D. Cover Penetrations Applicable N/A

E. Gas Collection and Treatment Applicable N/A

F. Cover Drainage Layer Applicable N/A

G. Detention/Sedimentation Ponds Applicable N/A

H. Retaining Walls Applicable N/A

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

VIII. VERTICAL BARRIER WALLS Applicable N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
Good condition All required wells properly operating Needs Maintenance N/A

Remarks **Currently in state of interim shutdown. Maintenance conducted as required. All pumps pulled from extraction wells and are currently stored in Water Treatment Plant.**

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
Good condition Needs Maintenance
Remarks **Currently in state of interim shutdown. Maintenance conducted as required.**

3. **Spare Parts and Equipment**
Readily available Good condition Requires upgrade Needs to be provided
Remarks **Currently in state of interim shutdown. Not applicable due to interim shutdown.**

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
Metals removal Oil/water separation Bioremediation
Air stripping Carbon adsorbers
Filters_____
Additive (*e.g.*, chelation agent, flocculent)
Others_____
Good condition Needs Maintenance
Sampling ports properly marked and functional
Sampling/maintenance log displayed and up to date
Equipment properly identified
Quantity of groundwater treated annually **Currently Water treatment plant shutdown for an interim period that began in October 2007. The amount of water treated in 2006 & 2007 is reported in these two annual reports.**

2. **Electrical Enclosures and Panels** (properly rated and functional)
N/A Good condition Needs Maintenance

Remarks **Currently shutdown for an interim period.**

3. **Tanks, Vaults, Storage Vessels**
N/A Good condition Proper secondary containment Needs Maintenance

Remarks **Currently shutdown for an interim period.**

4. **Discharge Structure and Appurtenances**
N/A Good condition Needs Maintenance

Remarks **Currently shutdown for an interim period.**

5. **Treatment Building(s)**
N/A Good condition (esp. roof and doorways) Needs repair
Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
Properly secured/locked Functioning Routinely sampled Good condition
All required wells located Needs Maintenance N/A

Remarks **All monitoring wells outside of fenced area are locked. Only well inside the fenced area (S-93-5S) did not have a lock on it. S-1, which is an offsite well has been buried through new landscaping and cannot be located. It was a well that was routinely dry and had not been sampled for several years. It is recommended that the well be located and properly abandoned.**

D. Monitoring Data

1.	Monitoring Data Is routinely submitted on time Is of acceptable quality **Quarterly reports are submitted to Agencies for review.**
2.	Monitoring data suggests: **Groundwater plume is not effectively contained** **Contaminant concentrations are not declining**

D. Monitored Natural Attenuation

1.	**Monitoring Wells** (natural attenuation remedy) Properly secured/locked Functioning Routinely sampled Good condition All required wells located Needs Maintenance N/A Remarks **Have been collecting data to demonstrate that natural attenuation occurs but this has not been incorporated into the remedy through a decision document amendment.**

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Not applicable

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy as described in the decision documents has not been particularly effective as evidence by data collected in October 2010. Hence, a review of remedial options is in order and will be carried forward as a recommendation of this five year review.

A resident expressed concern about product being present on the beach when the lake is at low elevations. Site team plans to revisit the Site in late winter/early Spring to assess whether this product is present.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues identified with regard to the adequacy of the O&M other than possible IC revisions

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

Field observations from recently installed well cluster S-10-1 indicates that emulsified creosote has migrated offsite toward neighboring residences. Previous characterization documentation only showed product at 30 – 40 feet bgs, although review of wells logs S-88-1, S-88-2 and S-93-7 indicate that product was present in the vadose zone when these wells were installed. The presence of emulsified creosote at depth to groundwater and near residential properties is of serious concern because the creosote contains naphthalene and a possible indoor air pathway exists. This pathway was not considered when the decision documents were signed. Further evaluation to determine nature and extent of emulsified creosote and dissolved phase contaminants above ROD based standards is warranted in addition to the indoor air evaluation.

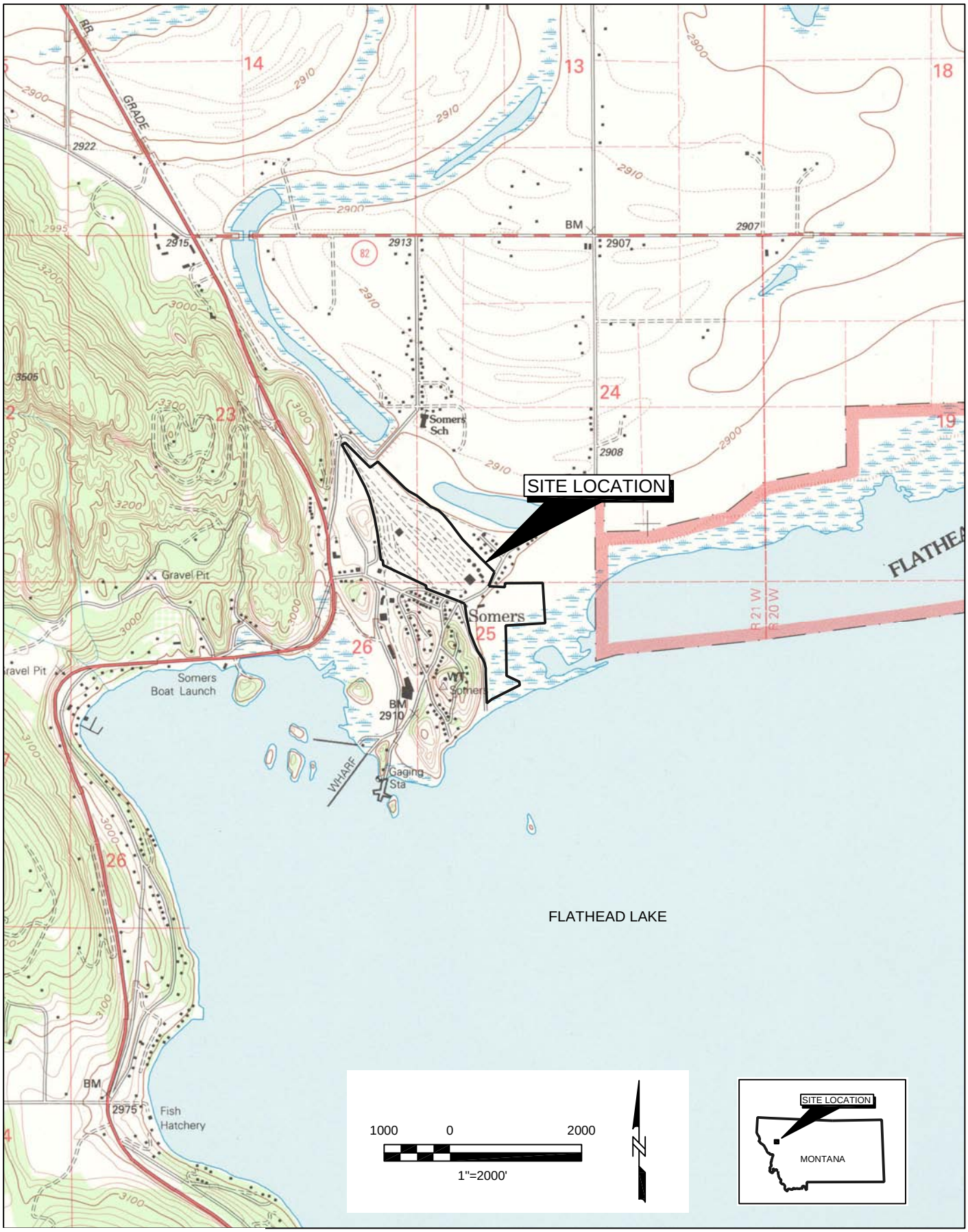
D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization are noted during the Site inspection

ATTACHMENT 2

Site Location and Maps



ENSR | AECOM

Request to Modify Groundwater Treatment System BNSF, Somers, Montana (01140176-241)			**SITE LOCATION**
DATE: 3/13/08	DRWN: E.S.S./DEN		**FIGURE 2-1**

File: J:\01140176\240\2008_GWTS_REQ\SOM-MGWTS_2-1.dwg Layout: Layout1 User: mawilliamson Plotted: Mar 13, 2008 - 9:20am Xref's:

Approximate Location of Closed RCRA Impoundment

Former RCRA Lagoons

Notations added during Fourth Five-Year Review

SLOUGH

SLOUGH BANK

FORMER LTU AREA

S-1 S-5R S-6 S-84-15 S-91-2 S-85-6a S-85-6b S-88-3 CP-3 CP-2 S-88-2 CP-9 CW-1 S-88-1 MW93-5S MW93-3 MW93-2S MW93-1 MW93-2D S-84-16 S-86-1 S-85-5a S-85-5b S-93-7 S-85-3 S-95-1 S-84-11 S-4 S-3 TIE PLANT BLDG CERCLA LAGOON DRIP TRACK S-85-7 S-85-8a S-85-8b S-88-8c DITCH FORMER SWAMP POND S-84-9 S-8 SW-1 SP-10 S-91-1 S-91-3 S-84-10 S-91-4

LEGEND

BLUE	HISTORICAL FEATURES
MW93-3	MONITORING WELL (INCLUDES WELLS STARTING WITH S AND C)
SP-11	ABANDONED WELL
	BARBEDWIRE FENCE
	CHAIN LINK FENCE

150 0 300

1"=300'

ENSR | AECOM

Request to Modify Groundwater Treatment System

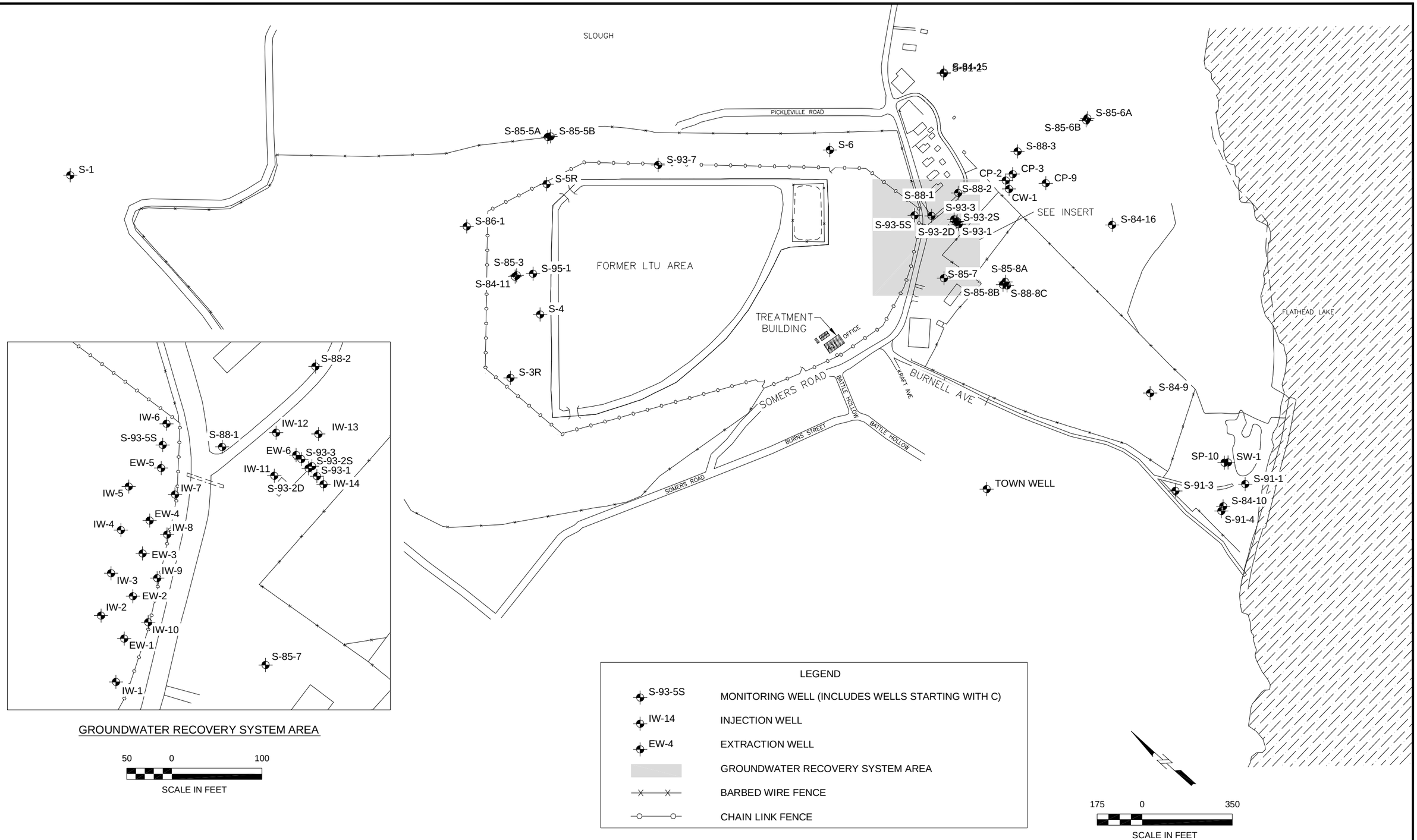
BNSF, Somers, Montana (01140176-241)

DATE: 03/13/08 | DRWN: E.S.S./DEN

HISTORICAL SITE FEATURES AND STRUCTURES

FIGURE 2-2

File: J:\01140176\240\2008_GWTS_REQ\SOM-MGWTS_2-2.dwg Layout: Layout1 User: mawilliamson Plotted: Mar 27, 2008 - 8:59am Xref's:



File: M:\BNSF Somers\Annual Interim Mont Rpt\BNSF Som - AMR-2010_1_ Site Layout.DWG Layout: FIGURE 1 User: schwartze Plotted: Feb 28, 2011 - 1:51pm Xref's:

AECOM

Annual Interim Monitoring Report			SITE LAYOUT
BNSF Railway Company, Somers, Montana (60193807-230)			
DATE: 02/28/11	DRWN: E.S.S./DEN		FIGURE 1

ATTACHMENT 3

Potentiometric Surface Maps

SLOUGH

PICKLEVILLE ROAD

S-85-5a
2889.25

S-85-5b
[2889.26]*

S-93-7
2889.25

S-6
DRY

2889.5

S-5R
2889.56

S-86-1
2889.77

FORMER LTU AREA

S-85-3
(2889.25)

2890.0

S-84-11
2890.08

S-95-1
2890.07

S-4
DRY

S-3R
DRY

SOMERS ROAD

BATTLE HOLLOW

BURNS STREET

KRAFT AVE

OFFICE

2889.0

S-84-15
2888.85

S-91-2
2889.19

S-88-1
2889.40

S-93-5S
2890.33

S-93-3
[2888.68]*

S-85-6b
[2888.86]*

S-85-6a
2888.65

S-88-3
[2888.79]*

CP-2
[2888.63]*

CP-3
[2888.62]*

S-88-2
2888.90

CW-1
[2888.57]*

CP-9
[2888.70]*

S-93-2S
2888.62

S-93-1
[2888.80]*

S-93-2D
[2888.76]*

S-84-16
2888.60

S-85-8a
(2885.96)

S-88-8c
[2885.98]*

S-85-7
[2892.47]*

S-85-8b
[2892.40]*

2889.5

2889.0

2890.0

FLATHEAD LAKE
ELEV. = 2888.94

S-84-9
2888.73

S-8
NM

SP-10
2889.16

SW-1
2889.83

S-91-1
[2891.14]*

S-91-3
[2889.55]*

S-84-10
[2888.88]*

S-91-4
[2890.54]*

150 0 300

1"=300'

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2892	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
2889.91	RECORDED ELEVATION USED TO CONTOUR
(2892.23)	RECORDED ELEVATION IS NOT USED TO CONTOUR
[2888.61]*	WELLS ARE COMPLETED IN THE CONFINED AQUIFER AND ARE NOT RELIED ON TO CONTOUR GROUNDWATER
	FLOW DIRECTION
	BARBED WIRE FENCE
	CHAIN LINK FENCE

AECOM

Annual Interim Monitoring Report

BNSF Railway Company, Somers, Montana (60193807-230)

**POTENTIOMETRIC SURFACE MAP
DECEMBER 15, 2009**

DATE: 02/28/11 | DRWN: E.S.S./DEN | **FIGURE 2a**

File: M:\BNSF_Somers\Annual_Interim_Mont_Rpt\BNSF_Som_-_AIMR-2010_2a_Pot_Map_12-15-2009.DWG Layout: FIGURE_2a User: schwartze Plotted: Feb 28, 2011 - 1:51pm Xref's:

SLOUGH

PICKLEVILLE ROAD

S-85-5a 2889.56

S-85-5b [2889.53]*

S-93-7 2891.05

S-6 2889.95

S-5R 2889.78

2890

2891

S-86-1 2890.16

FORMER LTU AREA

S-85-3 (2889.35)

S-84-11 2890.18

S-95-1 (2892.23)

S-4 2890.45

2890.5

S-3R DRY

S-84-15 2889.09

S-91-2 2889.39

S-85-6b [2888.95]*

S-85-6a 2889.28

S-88-3 [2889.27]*

CP-2 [2889.10]*

CP-3 [2889.06]*

CW-1 [2889.89]*

CP-9 [2889.22]*

2889.5

S-88-1 2889.27

S-88-2 2889.19

S-93-5S 2889.99

S-93-2S 2889.01

S-84-16 2889.47

S-93-3 [2889.00]*

S-93-1 [2889.12]*

S-93-2D [2888.98]*

S-85-8a (2886.85)

S-85-7 [2891.21]*

S-85-8b [2891.05]*

S-88-8c [2886.91]*

OFFICE

SOMERS ROAD

BATTLE HOLLOW

BURNS STREET

KRAFT AVE

FLATHEAD LAKE
ELEV. = 2893.00

S-84-9 2889.83

2890

S-8 NM

SP-10 2889.91

SW-1 2890.47

S-91-1 [2889.23]*

S-91-3 [2888.61]*

S-84-10 [2889.99]*

S-91-4 [2888.54]*

150 0 300

1"=300'

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2892	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
2889.91	RECORDED ELEVATION USED TO CONTOUR
(2892.23)	RECORDED ELEVATION IS NOT USED TO CONTOUR
[2888.61]*	WELLS ARE COMPLETED IN THE CONFINED AQUIFER AND ARE NOT RELIED ON TO CONTOUR GROUNDWATER
	FLOW DIRECTION
	BARBED WIRE FENCE
	CHAIN LINK FENCE

AECOM

Annual Interim Monitoring Report

BNSF Railway Company, Somers, Montana (60193807-230)

POTENTIOMETRIC SURFACE MAP MARCH 14, 2010

DATE: 02/28/11 | DRWN: E.S.S./DEN | **FIGURE 2b**

SLOUGH

PICKLEVILLE ROAD

S-84-15
2889.50

S-91-2
2889.67

2889.5

S-85-6b
[2889.34]*

S-85-6a
2889.52

S-85-5a
2889.76

S-85-5b
[2889.78]*

S-93-7
2889.69

S-6
DRY

2890

S-88-3
[2889.63]*

CP-2
[2889.54]*

CP-3
[2889.5]*

CP-9
[2889.65]*

S-88-2
2889.68

CW-1
[2889.3]*

S-88-1
2890.03

S-5R
(2890.92)

S-86-1
2890.27

S-93-5S
(2886.67)

S-93-2S
2889.48

S-84-16
2890.44

FORMER LTU AREA

S-93-3
[2889.35]*

S-93-1
[2889.53]*

S-93-2D
[2889.55]*

2890.5

S-85-3
(2889.41)

S-85-8a
(2887.65)

S-95-1
(2890.17)

S-84-11
2890.28

S-85-7
[2892.75]*

S-88-8c
[2887.74]*

S-85-8b
[2892.03]*

2891

S-4
2890.35

2891.5

OFFICE

S-3R
2891.71

SOMERS ROAD

BATTLE HOLLOW

KRAFT AVE

BURNS STREET

BATTLE HOLLOW

SOMERS ROAD

FLATHEAD LAKE
ELEV. = 2893.00

S-84-9
2890.26

2890

S-8
NM

SP-10
2889.93

SW-1
2890.35

S-91-1
[2890.79]*

S-91-3
[2890.02]*

S-84-10
[2890.09]*

S-91-4
[2890.07]*

150 0 300

1"=300'

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2892	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
2889.55	RECORDED ELEVATION USED TO CONTOUR
(2890.17)	RECORDED ELEVATION IS NOT USED TO CONTOUR
[2890.02]*	WELLS ARE COMPLETED IN THE CONFINED AQUIFER AND ARE NOT RELIED ON TO CONTOUR GROUNDWATER
	FLOW DIRECTION
	BARBED WIRE FENCE
	CHAIN LINK FENCE

AECOM

Annual Interim Monitoring Report

BNSF Railway Company, Somers, Montana (60193807-230)

POTENTIOMETRIC SURFACE MAP
MAY 31, 2010

DATE: 02/28/11 | DRWN: E.S.S./DEN | **FIGURE 2c**

SLOUGH

PICKLEVILLE ROAD

FORMER LTU AREA

OFFICE

SOMERS ROAD

BATTLE HOLLOW

BURNS STREET

KRAFT AVE

FLATHEAD LAKE
ELEV. = 2891.63

2886
2886.5
2887
2887.5
2888
2888.5
2889
2889.5
2890
2890.5
2891

S-84-15
2885.99

S-91-2
2886.01

S-85-5a
2889.48

S-85-5b
[2889.37]*

S-93-7
2889.81

S-6
NM

S-5R
2889.79

S-86-1
2890.25

S-85-3
2890.54

S-84-11
2890.52

S-95-1
2890.52

S-4
2890.59

S-3R
(2893.48)

S-85-6b
[2889.49]*

S-85-6a
2889.46

S-88-3
[2889.12]*

CP-2
[2889.24]*

CP-3
[2889.28]*

CW-1
[2889.07]*

CP-9
[2889.28]*

S-88-1
2890.09

S-88-2
2889.52

S-93-5S
2890.46

S-93-2S
2889.16

S-93-3
[2889.24]*

S-93-1
[2889.14]*

S-93-2D
[2889.22]*

S-84-16
2890.12

S-85-8a
(2887.06)

S-85-7
[2893.28]*

S-85-8b
[2893.05]*

S-88-8c
[2887.04]*

S-84-9
2890.51

S-8
NM

SP-10
2890.80

SW-1
2890.90

S-91-1
[2891.33]*

S-91-3
[2892.27]*

S-84-10
[2889.47]*

S-91-4
[2892.17]*

150 0 300
1"=300'

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2892	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
2894.25	RECORDED ELEVATION USED TO CONTOUR
(2893.48	RECORDED ELEVATION IS NOT USED TO CONTOUR
[2895.93]*	WELLS ARE COMPLETED IN THE CONFINED AQUIFER AND ARE NOT RELIED ON TO CONTOUR GROUNDWATER
	FLOW DIRECTION
	BARBED WIRE FENCE
	CHAIN LINK FENCE

NOTE:
1. GROUNDWATER ELEVATIONS REFLECT RESULTS OF SITE WIDE SURVEY CONDUCTED IN DECEMBER 2010. MEASURING POINT ELEVATIONS OF WELLS ADJUSTED PER SURVEY. WELLS S-3R, S-6, S-86-1, S-85-5B, S-85-6B, AND S-85-8A WERE ABANDONED NOVEMBER 2010 AND WERE NOT INCLUDED IN THE SURVEY. GROUNDWATER ELEVATIONS AT THESE WELLS ARE BASED ON PREVIOUS THE SURVEY DATA.

AECOM

Annual Interim Monitoring Report

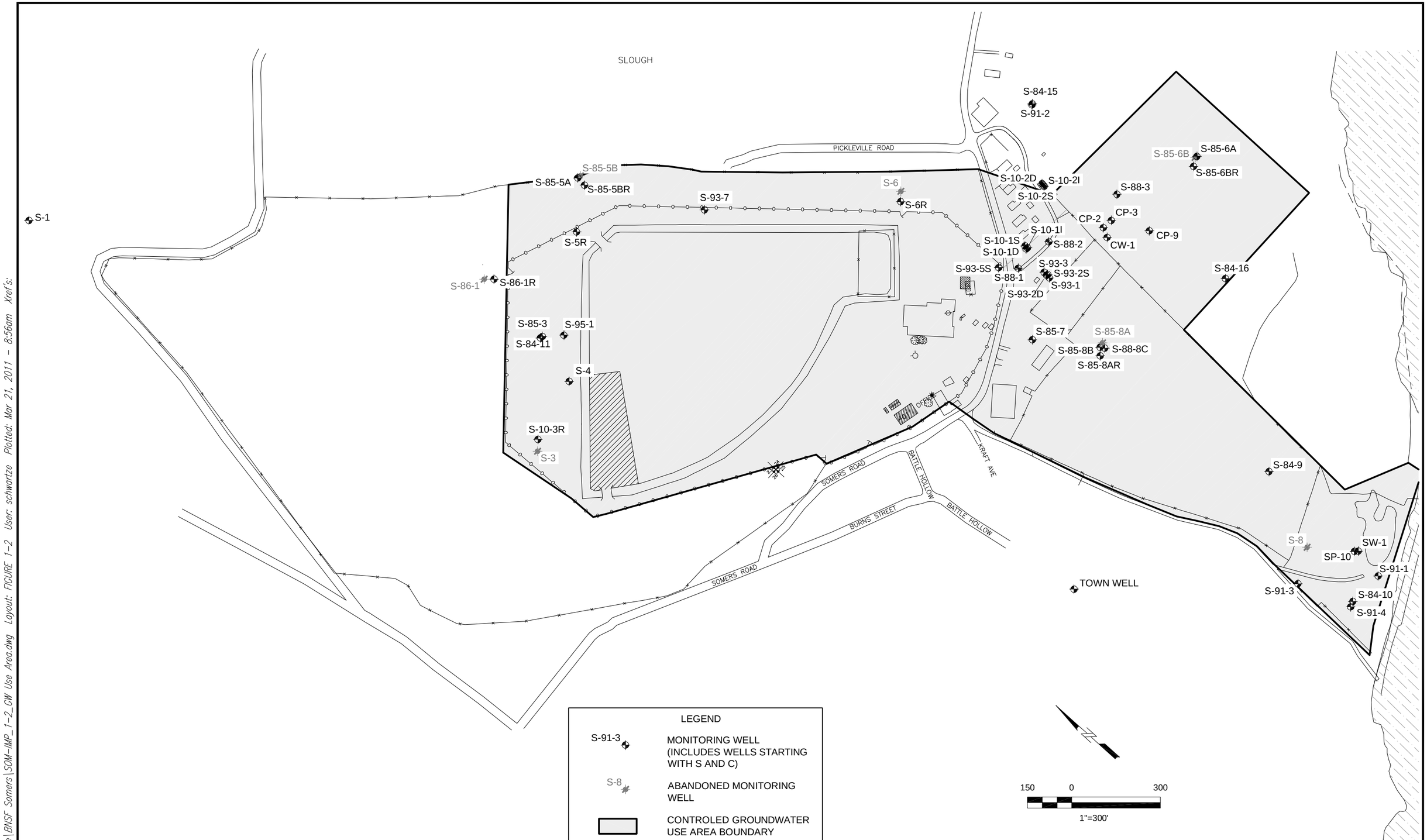
BNSF Railway Company, Somers, Montana (60193807-230)

POTENTIOMETRIC SURFACE MAP
OCTOBER 4, 2010

DATE: 02/28/11 | DRWN: E.S.S./DEN | **FIGURE 2d**

ATTACHMENT 4

Controlled Groundwater Area



AECOM

GROUNDWATER TREATMENT SYSTEM
INTERIM MONITORING PLAN
BNSF Railroad Company, Somers, Montana (60193807-240)

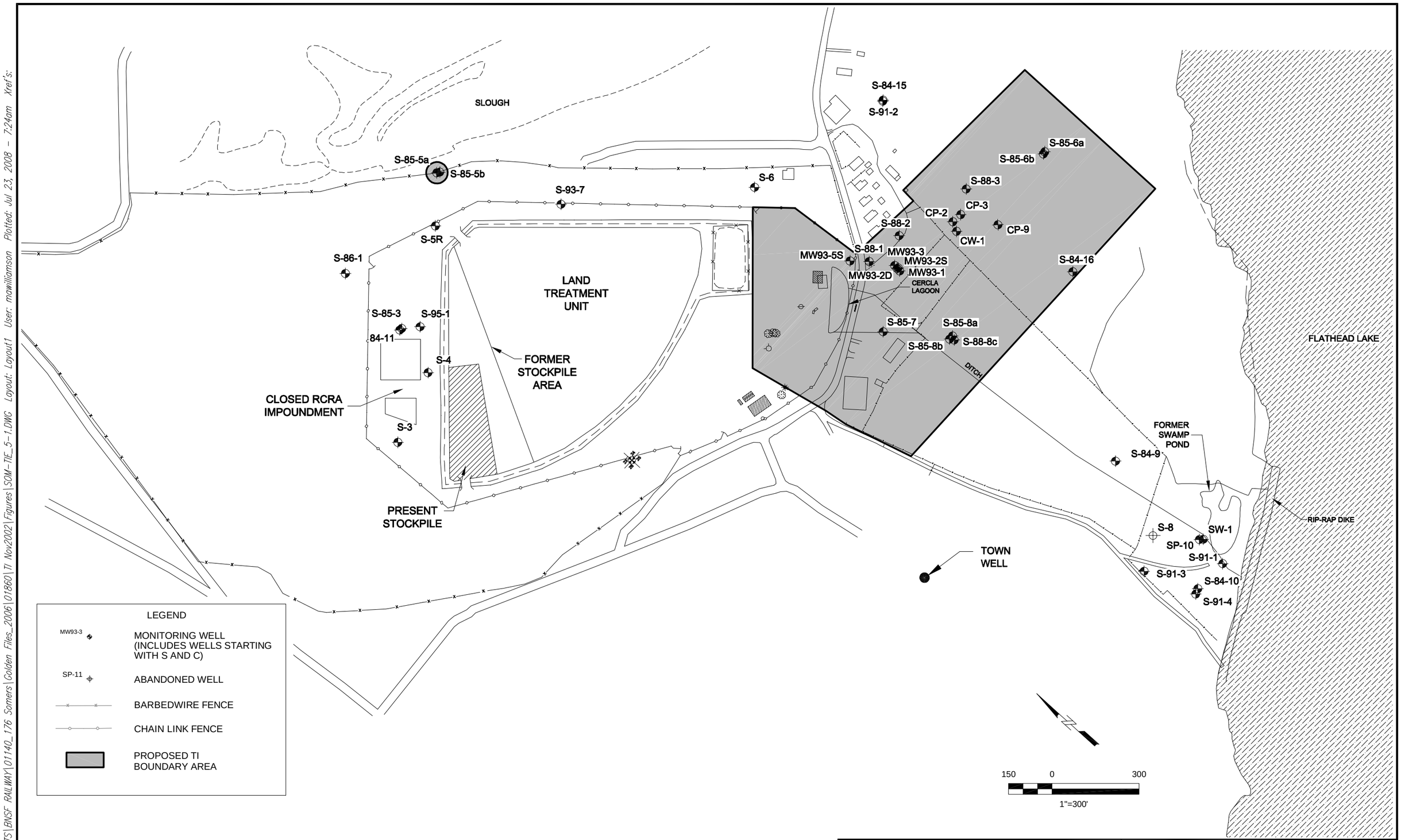
CONTROLLED GROUNDWATER USE AREA BOUNDARY

DATE: 03/16/11 | DRWN: E.S.S. | **FIGURE 1-2**

File: W:\BNSFSecure\BNSF_Somers\SOM-IMP_1-2_GW Use Area.dwg Layout: FIGURE 1-2 User: schwartze Plotted: Mar 21, 2011 - 8:56am Xref's:

ATTACHMENT 5

Proposed TI Boundary



RETEC

Burlington Northern Santa Fe Railway

Technical Impracticability Evaluation for Groundwater Restoration BNSF, Somers, Montana (BN080-01860-240)				**PROPOSED TI BOUNDARY**
DATE: 02/07/03	DRWN: RLL / E.S.S.			**FIGURE 5-1**

File: F:\PROJECTS\BNSF RAILWAY\01140_176 Somers\Golden Files_2006\01860\TI Nov2002\Figures\SOM-TIE_5-1.DWG Layout: Layout1 User: mowilliamson Plotted: Jul 23, 2008 - 7:24am Xref's:

ATTACHMENT 6

Property Transfer Letters

- **Public Notice in The Daily Inter Lake, November 14, 2010**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Montana Department of
ENVIRONMENTAL QUALITY

March 30, 2009

Ref: 8MO

Michael L. Hart, Senior Claims Representative
Burlington Northern Santa Fe (BNSF) Railway Company
1555 Campus Way, Suite 202
Billings, MT 59102

Dear Michael,

In mid-February, several residents in Somers, Montana contacted the United States Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (DEQ) about meetings that BNSF Railway Company requested to discuss purchase of their property. If the property owner was not interested in selling their property, BNSF Railway Company offered financial incentive for right of first refusal, access to the property as well as waiver for any damage that may result from BNSF Railway Company personnel or representative from BNSF Railway Company property access.

The property owners are asking the Agencies for assistance in determining BNSF Railway Company's rationale in their purchase requests and for information to determine whether their properties are contaminated or if their health is at risk. Because the Agencies were not consulted on the property acquisitions, the Agencies cannot assure the property owners that they are safe.

The timing of these property acquisitions in conjunction with the interim shutdown of the BN Somers Groundwater Treatment System and the recent sampling event where contaminants were identified in an offsite well leads the agencies to question the reasoning for acquiring properties in Somers, particularly at this late stage of remedial actions at the BN Somers site.

Please provide DEQ with a list of all properties in or near the facility that BNSF Railway Company has identified for purchase, inquired about purchase, entered into negotiations to purchase, or begun processing for purchase. In addition, please submit the rationale for the

properties selected, and any environmental or other sampling data BNSF Railway Company has collected regarding all properties referenced in the foregoing sentence.

Thank you for your time and attention in this matter. Please provide a response no later than two weeks of receipt of this letter.

Sincerely,

Roger Hoogerheide
EPA

Lisa DeWitt
DEQ

cc: Dave Smith, BNSF
Joe Vranka, EPA
Larry Scusa, DEQ
Jim Stearns, EPA
Brad Smith, DEQ
File

Michael L. Hart
Manager Claims

BNSF Railway Company
1555 Campus Way, Suite 202
Billings, MT 59102
406-256-4023 Office
406-256-4018 Facsimile
Michael.hart@bnsf.com

April 13, 2009

Roger Hoogerheide
Environmental Protection Agency
Region 8, Montana Office
Federal Building, 10 W. 15th Street, Suite 3200
Helena, MT 59626

Lisa DeWitt
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

RE: Somers, MT

Dear Mr. Hoogerheide and Ms. DeWitt:

I am responding to your letter, dated March 30, 2009 regarding Somers, Montana.

BNSF claims representatives have contacted some neighboring property owners in Somers in order to discuss confidential economic options that BNSF may make available to them. However, these discussions between BNSF and the landowners are not "remedial actions" under either the Montana Code or the Comprehensive Environmental Response, Compensation and Liability Act. All data in BNSF's possession regarding the remediation project at Somers, has of course previously been submitted to EPA. BNSF has not conducted any other environmental investigation or sampling regarding the nature and extent of contamination. If any of BNSF's discussions result in a change of ownership, we will let you know.

If you have any further questions, please contact me directly or have your counsel contact Mark Etchart of the Browning firm in Helena.

Sincerely,

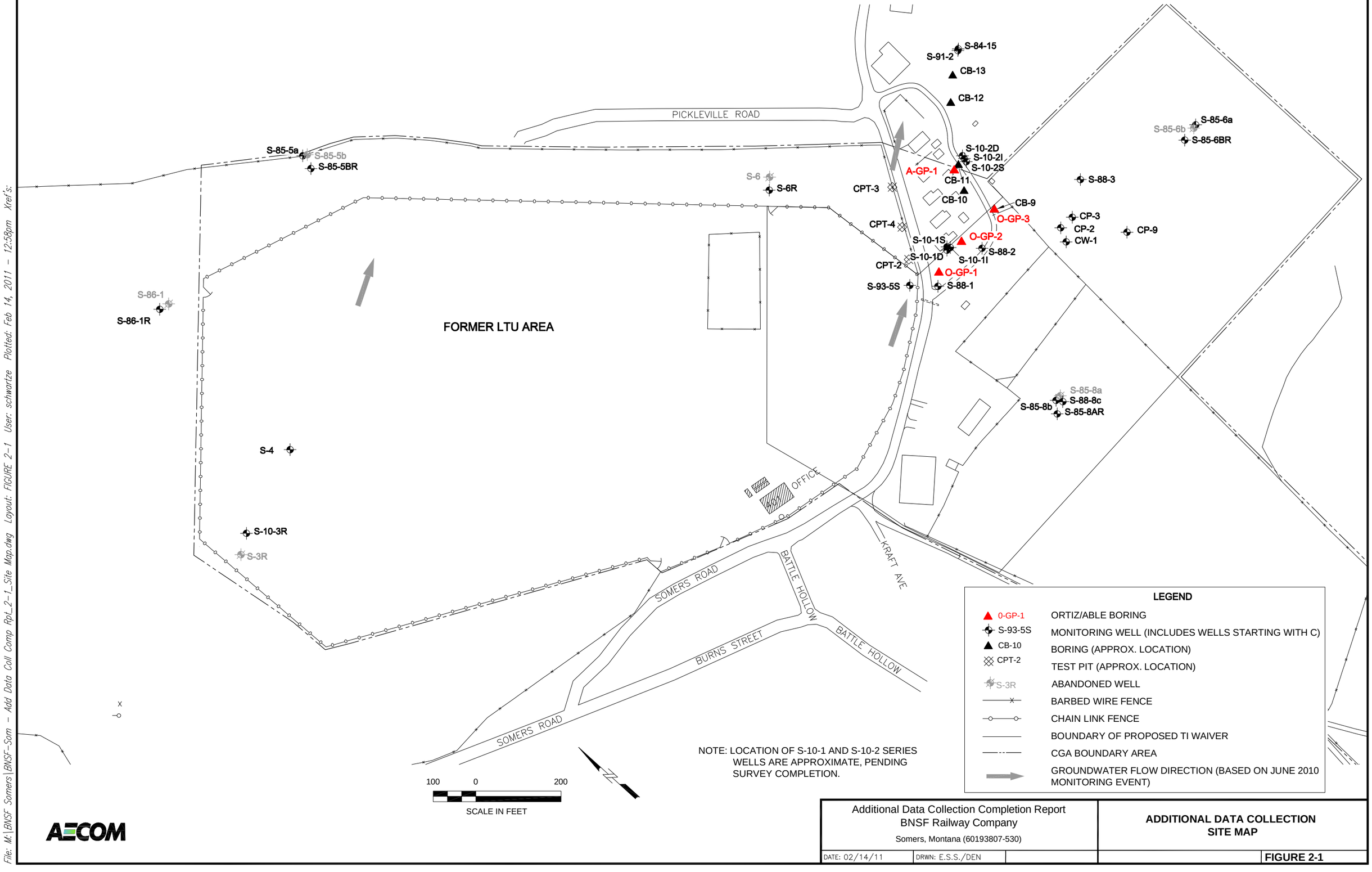
Michael L. Hart

cc: Mark Etchart

ATTACHMENT 7

Location of Additional Wells Installed October 2010

S-10-1S, S-10-1I, S-10-1D, S-10-2S, S-10-2I, S-10-2D
and Replacement Wells ending with "R"



NOTE: LOCATION OF S-10-1 AND S-10-2 SERIES WELLS ARE APPROXIMATE, PENDING SURVEY COMPLETION.

LEGEND

0-GP-1	ORTIZ/ABLE BORING
S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
CB-10	BORING (APPROX. LOCATION)
CPT-2	TEST PIT (APPROX. LOCATION)
S-3R	ABANDONED WELL
	BARBED WIRE FENCE
	CHAIN LINK FENCE
	BOUNDARY OF PROPOSED TI WAIVER
	CGA BOUNDARY AREA
	GROUNDWATER FLOW DIRECTION (BASED ON JUNE 2010 MONITORING EVENT)

AECOM

Additional Data Collection Completion Report
BNSF Railway Company
Somers, Montana (60193807-530)

ADDITIONAL DATA COLLECTION SITE MAP

DATE: 02/14/11 | DRWN: E.S.S./DEN | **FIGURE 2-1**

File: M:\BNSF Somers\BNSF-Som - Add Data Coll Comp Rpt_2-1_Site Map.dwg Layout: FIGURE 2-1 User: schwartze Plotted: Feb 14, 2011 - 12:58pm Xref's:

ATTACHMENT 8

Notice of Fourth Five-Year Review

Public Notice in The Daily Inter Lake, November 14, 2010

STATE OF MONTANA

FLATHEAD COUNTY

AFFIDAVIT OF PUBLICATION

KAREN BAKER BEING DULY SWORN, DEPOSES AND SAYS: THAT SHE IS AN ADVERTISING AGENT OF THE **DAILY INTER LAKE,** A DAILY NEWSPAPER OF GENERAL CIRCULATION, PRINTED AND PUBLISHED IN THE CITY OF KALISPELL, IN THE COUNTY OF FLATHEAD, STATE OF MONTANA AND THAT BLOCK DISPLAY ADVERTISING FOR **MONTANA EPA** FEATURING A PUBLIC **NOTICE - BURLINGTON NORTHERN - WHICH** WAS RUN ON **NOVEMBER 14, 2010**.

Karen Baker

KAREN BAKER

Subscribed and sworn to before me this day

December 21, 2010

Dorothy I. Glencross

Notary Public for the State of Montana

Residing in Kalispell

My Commission expires Sept. 11, 2013

DOROTHY I GLENCROSS NOTARIAL SEAL State of Montana

DOROTHY I GLENCROSS
NOTARY PUBLIC for the
State of Montana
Residing at Kalispell, Montana
My Commission Expires
September 11, 2013

...ship working for ...m-based Afren PLC. ...o represents the first ...al acknowledgment ...government-spon... ...d amnesty program ...d to end violence in ...estive Niger Delta. ...tinrin said no one ...ld be living in ...ant camps after the ...esty program, which ...red cash payouts and ...the promise of job train... ...ing. While satisfying many former militant commanders, rank-and-file fighters have grown increasingly upset over the prospect of no jobs in a region beset by endemic poverty despite 50 years of oil production.

Petinrin warned civilians to leave so soldiers and the navy could "avoid any collateral damage."

"I want to repeat that these people are criminals and will be treated as such," he said. "Many of these criminals are known to be hiding in camps within the creeks of Niger Delta. These camps will no longer be tolerated."

Nigeria, an OPEC member nation, is a top crude oil supplier to the U.S.

...ghs in results

...ion among Americans. ...The most reaction... ...sectors in the United ...tes are sharpening ...ir teeth," Castro said, ...dicting that "all power ...ll fall) to the extreme ...t in the United ...tes."

...his latest missive, he ...criticized the Fed's ...nouncement that it ...uld buy $600 billion in ...asury bonds over the ...t eight months to try ...nergize the world's ...gest economy.

...he plan raised alarm ...apitals from Berlin ...Beijing, with critics ...ing it will drive down ...dollar's value and ...U.S. goods an unfair ...petitive edge in world ...kets.

Five-Year Review of Cleanup at the Burlington Northern Somers Tie Treatment Plant

The U.S. Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (DEQ) are conducting a Five-Year Review on the Burlington Northern Somers Former Tie Treatment Plant. A Five-Year Review is a regular checkup on a Superfund site to ensure that cleanup decisions continue to protect people and the environment. The Five-Year Review at the Somers Site will be completed in 2011. The Site is located in the unincorporated town of Somers, Flathead County. This will be the Site's fourth five-year review.

The review team is composed of an EPA Remedial Project Manager, DEQ Project Officer and their consultants. The consultants are neutral parties. The team will address the status of the cleanup at the Site. The soil component of the remedy has achieved the cleanup levels specified in the 1989 Record of Decision. The ground water continues to be evaluated. A Controlled Groundwater Use Area was created in 2003 under State law.

The review team members collect information about Site cleanup activities. They talk with people who have been working at the Site over the past five years, as well as local officials, to see if changes in resources, working conditions, local policy or zoning might affect the original cleanup plan. The team will visit the Somer's Site in November to conduct a site inspection. They have also required additional samples be taken to help make a protectiveness statement for the Site and they will review records of activities during the past five years. The DEQ and EPA will also be meeting with citizens individually or as a group about the cleanup.

If you know anything about unusual activities at the Site, such as trespassing or odors, or have other concerns, please let the team know. You may submit written comments and mail them to:

Lisa DeWitt, Project Officer
DEQ Remediation Division, P.O. Box 200901, Helena, MT 59620-0901

If you would like to learn more about the Site or the review you may visit:

- DEQ's Remediation Division office at 1100 North Last Chance Gulch in Helena.
- EPA's Montana Office at 10 W. 15th St. in Helena
- Online at http://deq.mt.gov/fedsuperfund/BNSomers.mcpx

For more information about the review:

Lisa DeWitt, DEQ Project Officer, (406) 841-5037, ldewitt@mt.gov
Roger Hoogerheide, EPA Project Manager (406) 457-5031, hoogerheide.roger@epa.gov

ATTACHMENT 9

Interview Form

BN Somers Former Tie Treating Plant 5-Year Review Community Interview Questions
2011

Person interviewed:_____

1. **What is your overall impression of the BN Somers Former Tie Treating Plant project?**

2. **What effects have site activities/operations had on the surrounding community?**

3. **Are you aware of any community concerns regarding the BN Somers Site?**
   YES NO

   If yes, what are they?

   Do you feel the remedy at BN Somers is effective? YES NO

   If no, why not?

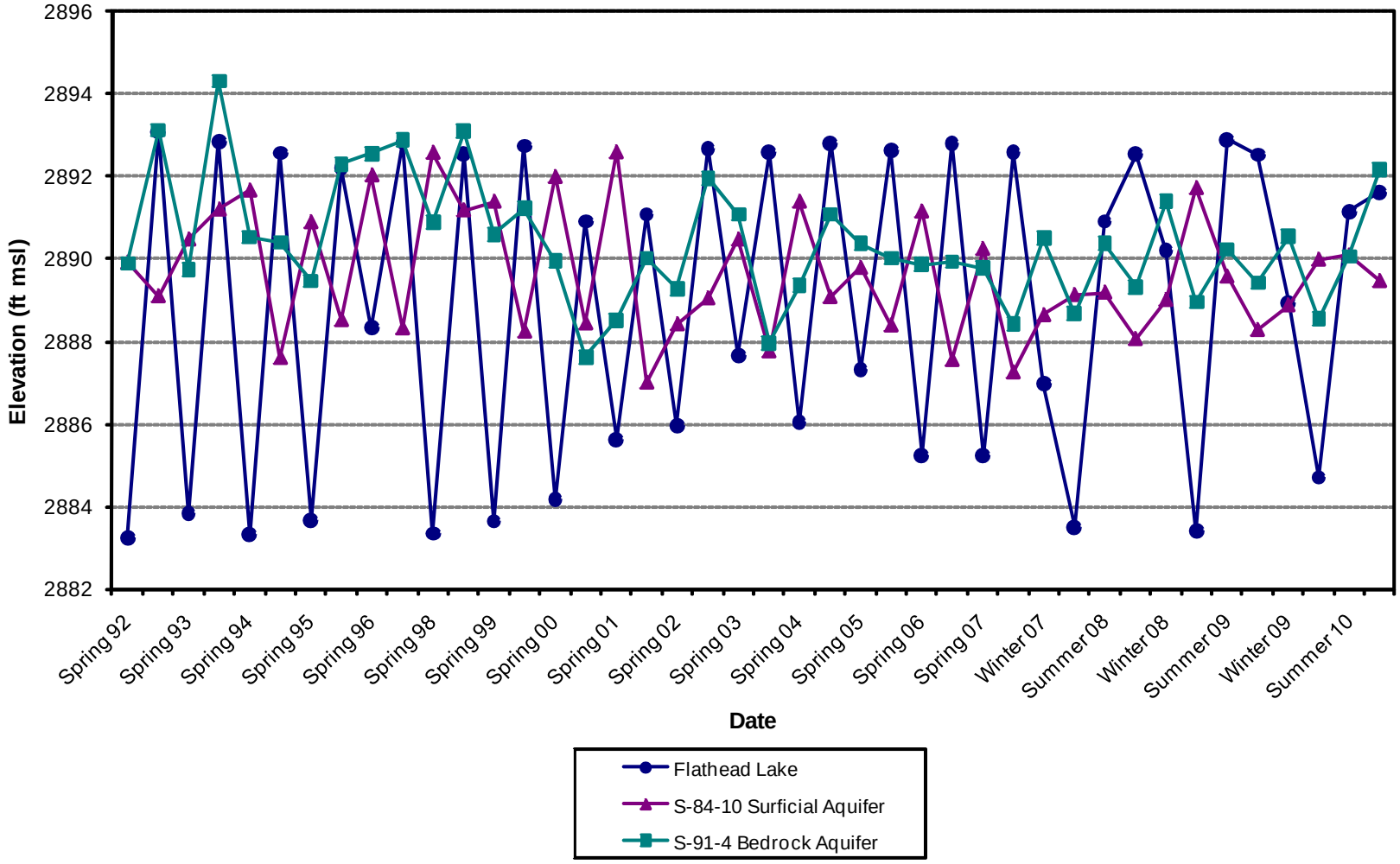
   Do you feel well informed about site progress and activities? YES NO

   If no, how would you like to receive information?

4. **What other comments or suggestions do you h**ave?

ATTACHMENT 10

Variation in Water Elevation of Flathead Lake



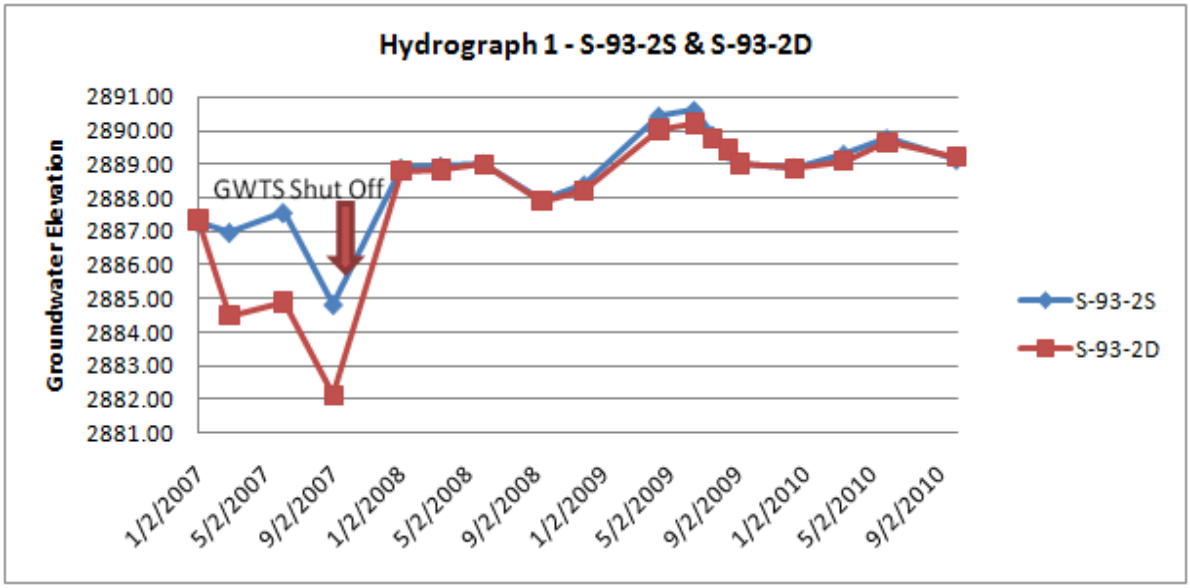
Notes = Elevations not measured in Spring and Fall 1997, due to ice and overflowing wells. Wells were resurveyed December 2010. Groundwater elevations for October 2010 are based on the new survey.

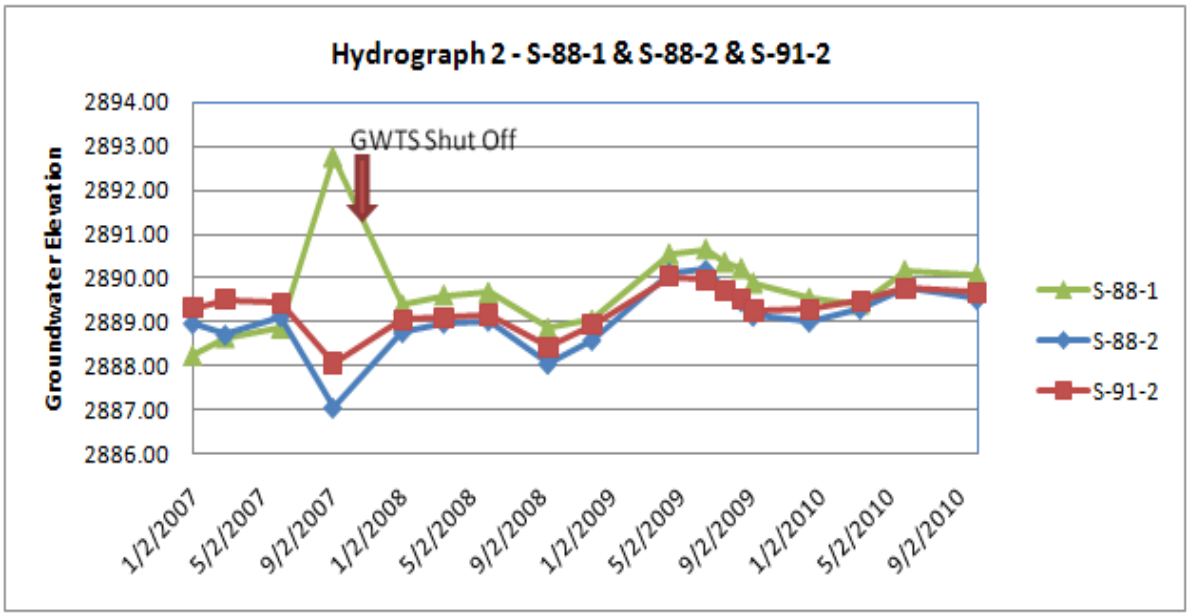
AECOM

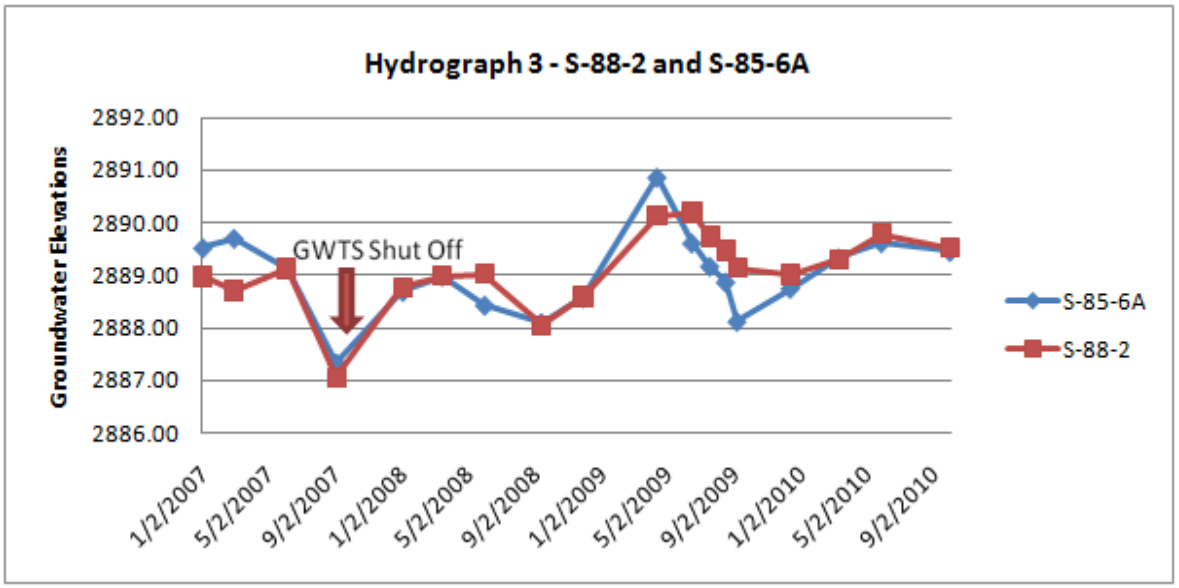
Annual Interim Monitoring Report BNSF Railway Company, Somers, Montana (60193807-230)		**FLATHEAD LAKE ELEVATION SURFICIAL AND BEDROCK AQUIFER HYDROGRAPH**
DATE: 02/28/11	DRWN: E.S.S./DEN	**FIGURE 4**

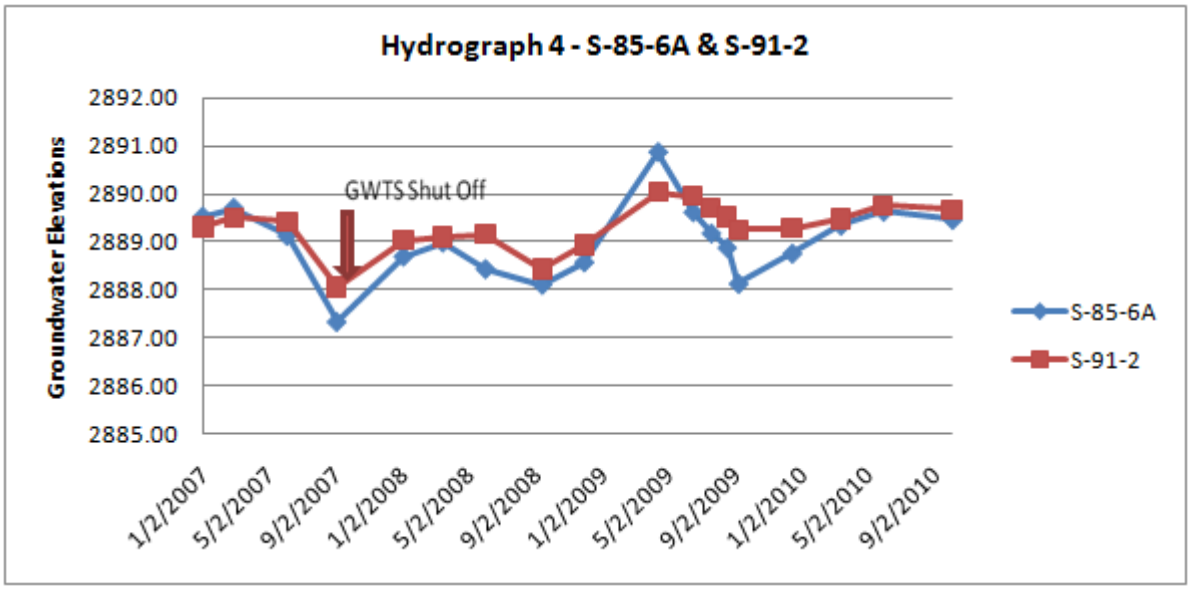
ATTACHMENT 11

Hydrographs


Hydrograph 1 - S-93-2S & S-93-2D
Groundwater Elevation
2891.00
2890.00
2889.00
2888.00
2887.00
2886.00
2885.00
2884.00
2883.00
2882.00
2881.00
GWTS Shut Off
1/2/2007
5/2/2007
9/2/2007
1/2/2008
5/2/2008
9/2/2008
1/2/2009
5/2/2009
9/2/2009
1/2/2010
5/2/2010
9/2/2010
S-93-2S
S-93-2D


Hydrograph 2 - S-88-1 & S-88-2 & S-91-2
Groundwater Elevation
2894.00
2893.00
2892.00
2891.00
2890.00
2889.00
2888.00
2887.00
2886.00
GWTS Shut Off
1/2/2007
5/2/2007
9/2/2007
1/2/2008
5/2/2008
9/2/2008
1/2/2009
5/2/2009
9/2/2009
1/2/2010
5/2/2010
9/2/2010
S-88-1
S-88-2
S-91-2


Hydrograph 3 - S-88-2 and S-85-6A
Groundwater Elevations
2892.00
2891.00
2890.00
2889.00
2888.00
2887.00
2886.00
GWTS Shut Off
1/2/2007
5/2/2007
9/2/2007
1/2/2008
5/2/2008
9/2/2008
1/2/2009
5/2/2009
9/2/2009
1/2/2010
5/2/2010
9/2/2010
S-85-6A
S-88-2


Hydrograph 4 - S-85-6A & S-91-2
Groundwater Elevations
2892.00
2891.00
2890.00
2889.00
2888.00
2887.00
2886.00
2885.00
GWTS Shut Off
1/2/2007
5/2/2007
9/2/2007
1/2/2008
5/2/2008
9/2/2008
1/2/2009
5/2/2009
9/2/2009
1/2/2010
5/2/2010
9/2/2010
S-85-6A
S-91-2

ATTACHMENT 12

Contaminant Trend Charts

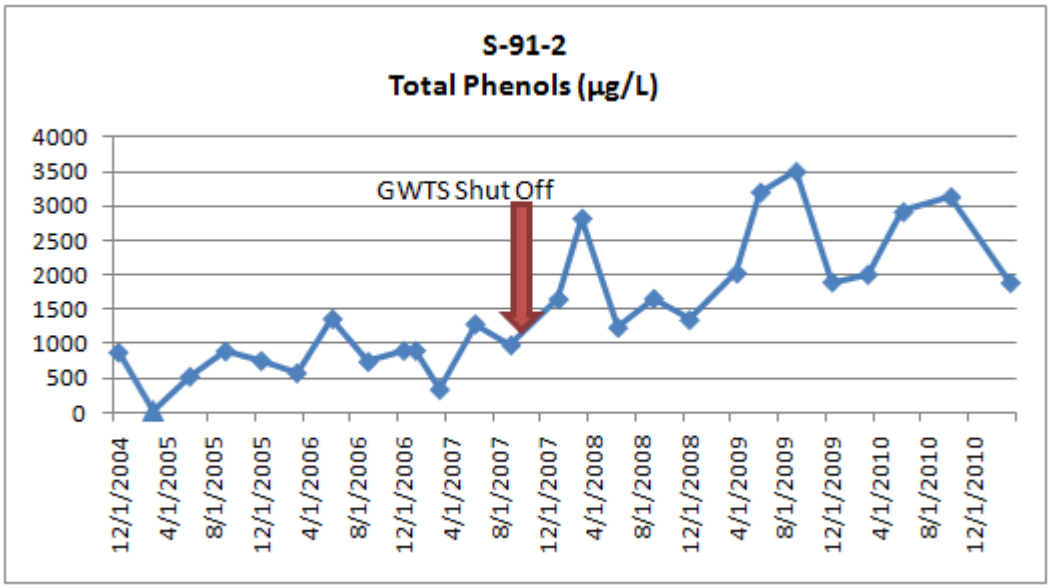


Chart 1

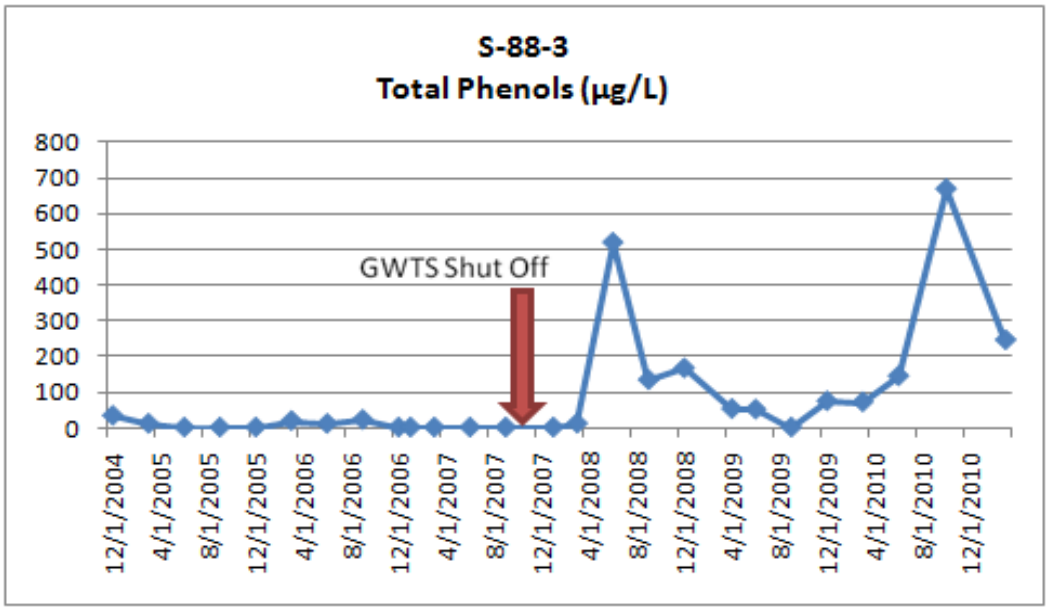


Chart 2

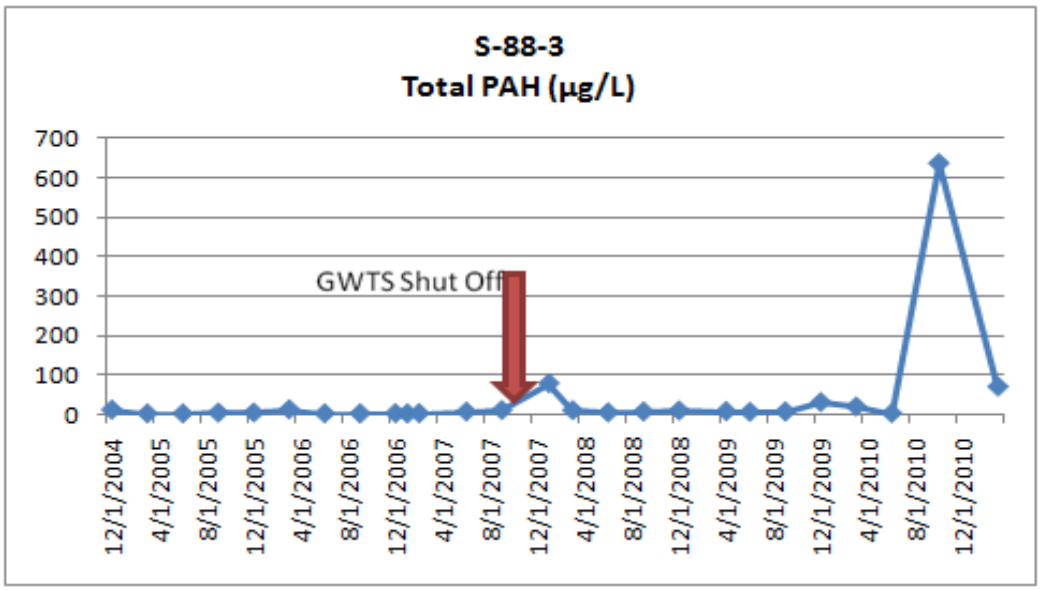


Chart 3

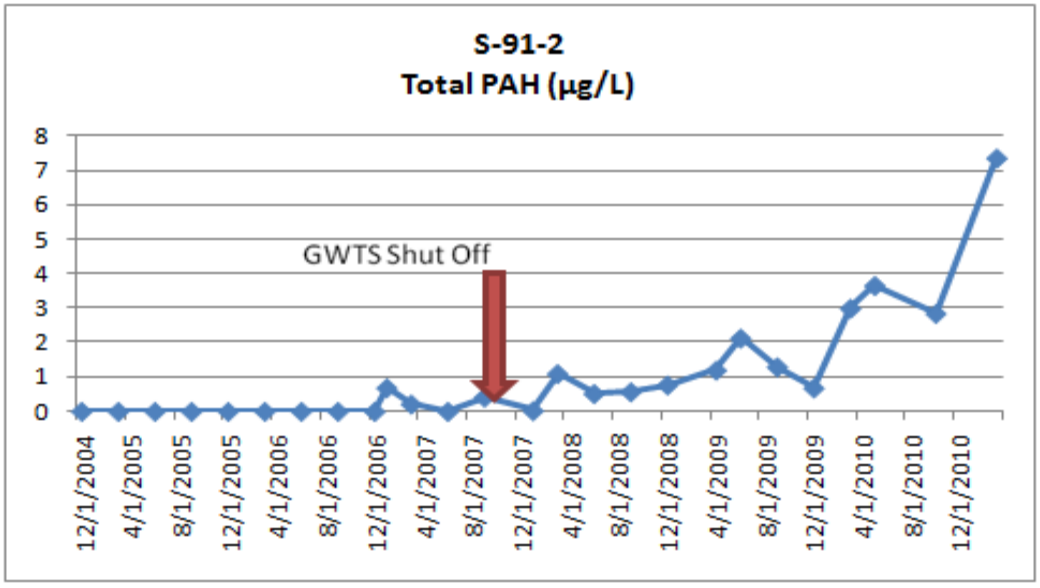


Chart 4

ATTACHMENT 13

March 2011 Detected Contaminant Table

Detected Compounds from March 2011 Sampling Event

	ROD/ESD Human Health Cleanup Level (µg/L)	Montana DEQ Groundwater Quality Standards (µg/L)	Town Well	Swamp Pond	S-6R	S-6R RE	S-31	S-32	S-41	S-42	SP-10	ER-311	S-84-10	S-84-15	S-84-16	S-85-5A	S-85-5BR	S-85-6A	S-85-6A RE	S-85-6BR	S-85-7	S-85-8	S-85-8AR	S-85-8B	S-85-29
Zinc	5,000	2,000	6.6	14.0	804			158		1.3J	15.5		50.2	1.6J	4.3J	247	4.3J	82		130	178			455	264
2,4-Dimethylphenol		380			20.8	32																			
2-Methylphenol(o-Cresol)																									
3&4-Methylphenol																									
Phenol	3,500	300																							
PAH																									
1-Methylnaphthalene								0.21						0.2				0.024J		0.20			0.73		
2-Chloronaphthalene		1000																							
2-Methylnaphthalene								0.34	0.02J					0.31				0.036J		0.33			0.77		
Acenaphthene	20	670			0.045			0.59						0.31	0.49			0.062		0.52			0.72		
Acenaphthylene																									
Anthracene		2100												0.038J	0.026J										
Benzo(a)anthracene		0.5																							
Benzo(a)pyrene		0.050																							
Benzo(b)fluoranthene		0.5			0.087																				
Benzo(e)pyrene																									
Benzo(g,h,i)perylene																									
Benzo(k)fluoranthene		5			0.083																				
Chrysene		50																							
Dibenz(a,h)anthracene		0.05																							
Dibenzofuran		0.00000200						0.44						0.18				0.035J		0.37			0.36		
Fluoranthene	42	130												0.047	0.023										
Fluorene		1100			0.022J			0.39						0.18	0.90			0.039J		0.3			0.18		
Indeno(1,2,3-cd)pyrene		0.5																							
Naphthalene		100		0.026J	0.17		0.041	0.5	0.031J			0.48J		1.1	0.11			0.085		0.54	0.034J	0.024J	0.33	0.029J	0.021J
Phenanthrene								0.091						0.24	0.42			0.029J		0.078			0.066		
Pyrene		830												0.03J											
VOC	-																								
Benzene	5	5			6.7																				
2-Butanone																					2J				
2-Chlorotoluene																									
4-Chlorotoluene																									
1,1-Dichloroethene		0.60																							
Ethylbenzene		700		5.9	0.36J					6.9	9.9		8.9												
Isopropylbenzene																									
p-Isopropyltoluene																									
Methylene Chloride		5																							
Naphthalene		100			1.3J			0.81J												0.95J			0.88J		
n-Propylbenzene																									
Styrene		100																							
Toluene		1000			0.3J		0.12J					0.13J									0.92J	0.11J			
1,2,4-Trimethylbenzene					0.32J																				
1,3,5-Trimethylbenzene																									
Xylene (total)		10000			0.84J																				
m&p-Xylene		10000			0.62J																				
o-Xylene		10000																							

Detected Compounds from March 2011 Sampling Event

	ROD/ESD Human Health Cleanup Level (µg/L)	Montana DEQ Groundwater Quality Standards (µg/L)	S-86-1R	S-86-1R RE	S-88-1	S-88-1 DL	S-88-1 DL2	S-88-1 RE	S-88-1 RE DL	S-88-1 RE DL2	S-88-2	S-88-2 DL	S-88-3	S-88-3 DL	S-88-3 RE	S-88-3 RE DL	S-91-2	S-91-2 DL	S-91-4	S-93-2S	S-93-2S DL	S-93-2D	S-93-2D DL	S-93-5 S	S-93-5 S DL
Zinc	5,000	2,000	186		5.5						20.1		7.5				5.2		1.9J	1.6J		50.5		66.8	
2,4-Dimethylphenol		380			5860	14600	17100	6560	15500	17800	8320		245	286	204	203	1890	3830		2580	2110	29.4		16600	
2-Methylphenol(o-Cresol)					90.3			65.2																9910	
3&4-Methylphenol					3290	5060	5590	3880	4250	4710J														14000	
Phenol	3,500	300			32.8			26.6																10300	
PAH																									
1-Methylnaphthalene					13.8	188	232				1680	1730	0.75	0.66J			0.54			16.4	15.7	3.5	3.3	3600	4500
2-Chloronaphthalene		1000			0.27								0.028J				0.1								
2-Methylnaphthalene			0.039J		24.9	353	435				3760	3750	0.81	0.73J			1			16.4	15.8	0.42	0.41	7800	9660
Acenaphthene	20	670	0.022J		147	130	146				1830	1710	0.95	1			1			16.4	15.9	10.5	10.2	3890	3700
Acenaphthylene					4.9	3.8					62.6	66J	0.035J				0.042			0.3		0.078		54.7	
Anthracene		2100			5.4	4.9					514	599					0.057			1.2	0.99	1.7	1.6	938	915
Benzo(a)anthracene		0.5			1.7	2.1J					210	222								0.1		0.18	0.21	237	246
Benzo(a)pyrene		0.050			1						90.9	79.4J										0.029J		71	
Benzo(b)fluoranthene		0.5			0.98						139	135										0.041		110	
Benzo(e)pyrene					0.55						63.7	60.3J										0.023J		53.7	
Benzo(g,h,i)perylene					0.18						26.9													17.4	
Benzo(k)fluoranthene		5			0.44						42.9	55.7J												45	
Chrysene		50			1.6						190	177								0.098		0.17	0.16J	227	230
Dibenz(a,h)anthracene		0.05			0.062						10.2													6.8	
Dibenzofuran		0.00000200			59.3	53.4	56.0				1130	1080	0.51	0.51J			0.61			3.5	3.4	6.6	5.9	2340	2260
Fluoranthene	42	130			11.5	9					1120	973					0.067			2.1	1.7	2.6	2.2	1680	1440
Fluorene		1100			44.6	35.9	40.6				1200	1110	0.62	0.58J						6.1	5.6	8.6	7.9	2300	2080
Indeno(1,2,3-cd)pyrene		0.5			0.19						27.9						3.5							17.6	
Naphthalene		100	0.093		62.9	4070	4820				17800	17900	65.3	62.1J			0.41			109	103	0.13	0.15J	16700	26300
Phenanthrene			0.024J		43.8	36.9	43.5				2390	2160	0.096				0.046			3	3	5.8	5.7	4370	3570
Pyrene		830			7.40	6.6					721									1.2	1.1	1.4	1.4	1050	1020
VOC	-																								
Benzene	5	5			385						69.9J		21.1				54.2	136		168	146	2.3		331	331
2-Butanone																									
2-Chlorotoluene																				2.5					
4-Chlorotoluene																				0.14J					
1,1-Dichloroethene		0.60																							
Ethylbenzene		700			113						59.8J		3.9				5	32.6J	7.9	36.7	33.1	1.1		331	
Isopropylbenzene																				1.7	1.2J			18.1J	24.9J
p-Isopropyltoluene																	0.39J			13.7	13.4	0.29J			
Methylene Chloride		5																							
Naphthalene		100			6630						19400		107				3.7J	862		533	1250	79.2		27200	15500
n-Propylbenzene																				0.23J					
Styrene		100			16.6J						24.1J									1.1	0.63J			139	169J
Toluene		1000			358						129		1.80				1.8	54.6		50.7	52.8	0.44J		874	824
1,2,4-Trimethylbenzene					39.6J						92.4J		1.9				0.27J	16.9J		28.1	24.3	2.1		373	404
1,3,5-Trimethylbenzene					17.8J						43.2J		0.62J							10	7.9	0.65J		154	175J
Xylene (total)		10000			364						192J		10.9				34.2	149J		206	199	4.2		1150	1270
m&p-Xylene		10000			235						136J		3.0				16.5	88J		120	114	1.1J		788	840
o-Xylene		10000			129						56J		7.90				17.7	61		86.1	84.6	3.1		358	434

Detected Compounds from March 2011 Sampling Event

	ROD/ESD Human Health Cleanup Level (µg/L)	Montana DEQ Groundwater Quality Standards (µg/L)	S-93-7	S-93-7 RE	S-10-1 D	S-10-1 D DL	S-10-1 I	S-10-1 I DL	S-10-2D	S-10-2D DL	S-10-2I	S-10-2I DL	S-10-2S	S-10-2S DL
Zinc	5,000	2,000	14.5		303		121		634		20.2J		2.6J	
2,4-Dimethylphenol		380			178	178	12700		746	896	1140	1810	231	241
2-Methylphenol(o-Cresol)					12.8	13.2J					21.2			
3&4-Methylphenol					18.7		3280J							
Phenol	3,500	300												
PAH														
1-Methylnaphthalene			0.031		115	110	4010	4230						
2-Chloronaphthalene		1000												
2-Methylnaphthalene			0.054		241	223	9180	9510						
Acenaphthene	20	670	0.095		105	88.9	4560	3990	0.98		0.40		0.26	0.31
Acenaphthylene					2.2		83.2		0.083		0.82		0.028J	
Anthracene		2100			9.0	6.2	1390	1200	0.039J		0.050		0.053	
Benzo(a)anthracene		0.5			0.16		401							
Benzo(a)pyrene		0.050					135							
Benzo(b)fluoranthene		0.5					207	195J						
Benzo(e)pyrene							98.2							
Benzo(g,h,i)perylene							36.4							
Benzo(k)fluoranthene		5					87.9							
Chrysene		50			0.15		369	330						
Dibenz(a,h)anthracene		0.05					14.0							
Dibenzofuran		0.00000200	0.1		50.5	43.4	2690	2430						
Fluoranthene	42	130			3.8	2.8J	2820	2000					0.036J	
Fluorene		1100	0.068		49.6	38.8	2960	2340	0.25		0.17		0.14	0.16J
Indeno(1,2,3-cd)pyrene		0.5					38.0							
Naphthalene		100	0.069		521	1900	22100	36300	450	631	91.2	94.1	18.1	22
Phenanthrene			0.033J		46.5	36.7	6880	4940	0.14		0.092		0.21	
Pyrene		830			2.3	2.1J	1600	1390					0.028J	
VOC	-													
Benzene	5	5			11.7	15.5J	580	534	48.1		94.2		48.5	
2-Butanone														
2-Chlorotoluene														
4-Chlorotoluene														
1,1-Dichloroethene		0.60											0.22J	
Ethylbenzene		700			36.2	44.7	616	619	25.8		50.4		11.7	
Isopropylbenzene					1.6J	3J	34.3J				1.7J		0.29J	
p-Isopropyltoluene							33J				4.3			
Methylene Chloride		5					205J							
Naphthalene		100			2650	1660	54100	19900	1820		421		40.7	
n-Propylbenzene														
Styrene		100			16.8	20.8J	292	292J	1.4J		4.8			
Toluene		1000			80.2	82.2	1700	1530	27.4		86.4		4.1	
1,2,4-Trimethylbenzene					20.8	29.3	667	486J	9.7J		17.0		4.5	
1,3,5-Trimethylbenzene					8.8J	12.1J	278	225J			4.8			
Xylene (total)		10000			123	151	2070	1970J	46.3		226		57.8	
m&p-Xylene		10000			82.4	99.8	1480	1340	20.5		136		16.9	
o-Xylene		10000			40.7	51.7	598	625	25.8		90.5		40.9	

ATTACHMENT 14

Map of March 2011 Exceedances for Benzene, Naphthalene, and 2,4-Dimethylphenol

S-6R	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	6.7
Naphthalene	100	<100
2,4-Dimethylphenol	380	<380

S-91-2	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	54.2
Naphthalene	100	<100
2,4-Dimethylphenol	380	3,830

S-88-3	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	21.1
Naphthalene	100	<100
2,4-Dimethylphenol	380	<380

S-10-2S	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	48.5
Naphthalene	100	<100
2,4-Dimethylphenol	380	<380

S-88-2	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	69.9
Naphthalene	100	17,900
2,4-Dimethylphenol	380	8,320

S-10-2I	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	94.2
Naphthalene	100	<100
2,4-Dimethylphenol	380	1,810

S-93-2S	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	168
Naphthalene	100	103
2,4-Dimethylphenol	380	2,110

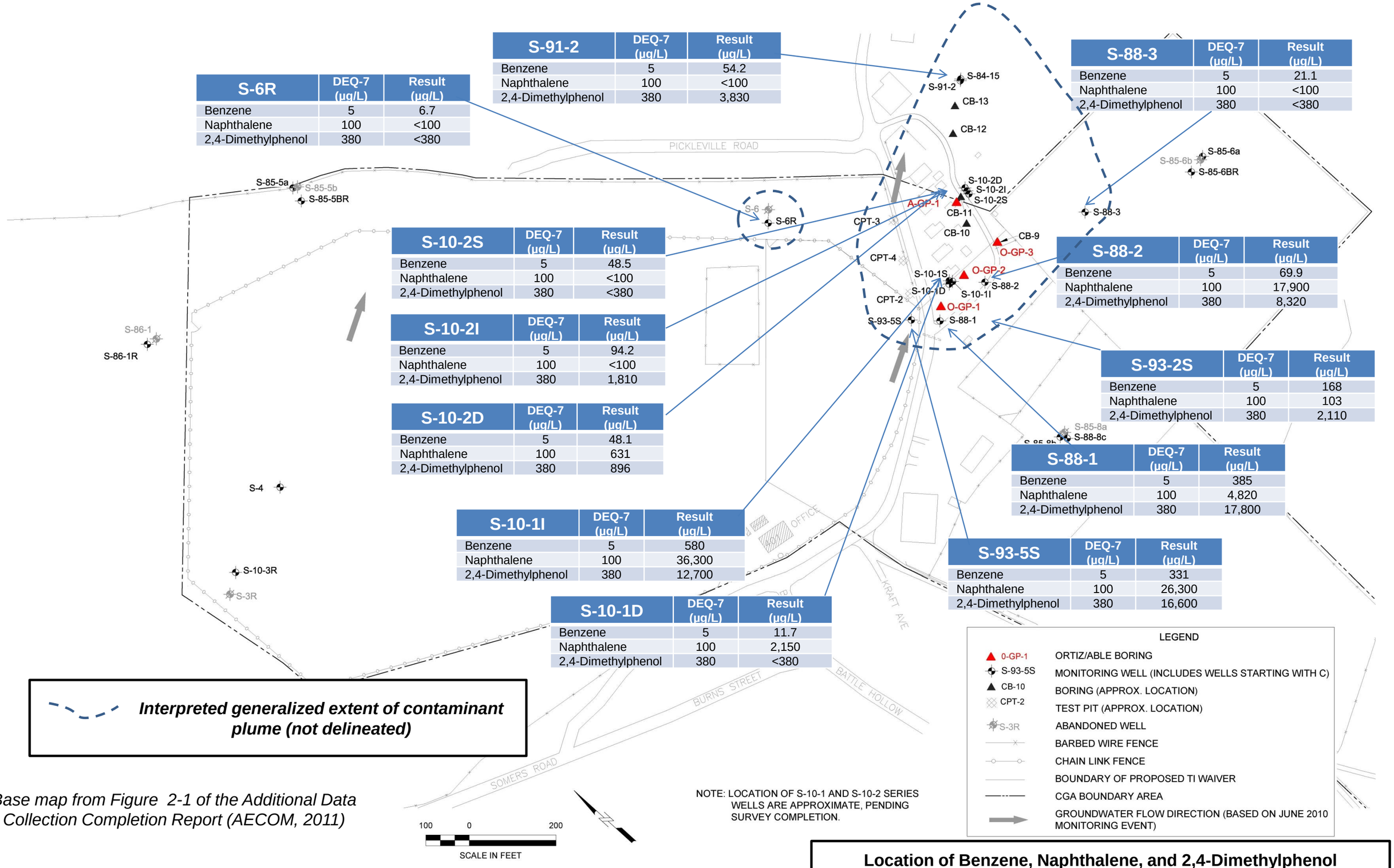
S-10-2D	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	48.1
Naphthalene	100	631
2,4-Dimethylphenol	380	896

S-88-1	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	385
Naphthalene	100	4,820
2,4-Dimethylphenol	380	17,800

S-10-1I	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	580
Naphthalene	100	36,300
2,4-Dimethylphenol	380	12,700

S-93-5S	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	331
Naphthalene	100	26,300
2,4-Dimethylphenol	380	16,600

S-10-1D	DEQ-7 (µg/L)	Result (µg/L)
Benzene	5	11.7
Naphthalene	100	2,150
2,4-Dimethylphenol	380	<380



Interpreted generalized extent of contaminant plume (not delineated)

NOTE: LOCATION OF S-10-1 AND S-10-2 SERIES WELLS ARE APPROXIMATE, PENDING SURVEY COMPLETION.

LEGEND

0-GP-1	ORTIZ/ABLE BORING
S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
CB-10	BORING (APPROX. LOCATION)
CPT-2	TEST PIT (APPROX. LOCATION)
S-3R	ABANDONED WELL
	BARBED WIRE FENCE
	CHAIN LINK FENCE
	BOUNDARY OF PROPOSED TI WAIVER
	CGA BOUNDARY AREA
	GROUNDWATER FLOW DIRECTION (BASED ON JUNE 2010 MONITORING EVENT)

Base map from Figure 2-1 of the Additional Data Collection Completion Report (AECOM, 2011)

Location of Benzene, Naphthalene, and 2,4-Dimethylphenol Exceedances of DEQ-7 Criteria from March 2011 Sampling Event