1260553

HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Smurfit-Stone Mill

EPA ID No. MTN000802850

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Pathways, Components, or Threats Not Scored

The soil exposure, ground water, and air migration pathways were not scored as part of this Hazard Ranking System (HRS) evaluation. The soil exposure, ground water, and air migration pathways were not scored as part of this evaluation because the surface water migration pathway produces an overall site score above the minimum required for the site to qualify for inclusion on the National Priorities List (NPL).

These pathways may be of concern to EPA and may be evaluated during future investigations.

The surface water overland/flood migration component is not scored for the Smurfit-Stone Mill site. The ground water to surface water migration component, environmental threat and food chain threat produces an overall score above the minimum required for the site to qualify for the NPL.

HRS DOCUMENTATION RECORD

Name of Site:	Smurfit-Stone Mill
Date Prepared:	May 2013
EPA Region:	8
Street Address of Site*:	14377 Pulp Mill Road
City, County, State, Zip:	Missoula, Missoula County, Montana, 59808
General Location in the State:	Western-central portion of state, in the Clark Fork River watershed
Topographic Maps:	Primrose, Montana 7.5 minute topographic map, 1963 (Photorevised 1978) (Ref. 71, p.2)
Latitude:	46.957781° North
Longitude:	114.199623° West
Site Reference Point:	The coordinates above were measured from source sample location SSSO0502, collected within Source No. 1 of this HRS documentation record (Ref. 5, Figure 2 (p. 67), Figure 4 (p. 69); Figure 1 of this HRS documentation record)

*The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, disposed, or placed, or has otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA anticipates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Pathway	Pathway Score
Air Pathway	Not Scored
Ground Water Pathway	Not Scored
Soil Exposure Pathway	Not Scored
Surface Water Pathway	100.00
HRS SITE SCORE	**50.00**

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw})	Not Scored	Not Scored
2a.	Surface Water Overland/Flood Migration Component (S_{of}) (from Table 4-1, line 30)	Not Scored	Not Scored
2b.	Ground Water to Surface Water Migration Component (S_{gs}) (from Table 4-25, line 28)	100.00	10,000
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	100.00	10,000
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	Not Scored	Not Scored
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	Not Scored	Not Scored
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	50.00	

HRS TABLE 4-25 --Ground Water to Surface Water Migration Component Scoresheet

Factor Categories and Factors	Maximum Value	Value Assigned
Drinking Water Threat		
Likelihood of Release:		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release (lines 2a x [2b + 2c + 2d])	500	NS
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics:		
4. Toxicity/Mobility/Persistence	(a)	NS
5. Hazardous Waste Quantity	(a)	NS
6. Waste Characteristics	100	NS
Targets:		
7. Nearest Intake	50	NS
8. Population:		
8a. Level I Concentrations	(b)	NS
8b. Level II Concentrations	(b)	NS
8c. Potential Contamination	(b)	NS
8d. Population (lines 8a + 8b + 8c)		NS
9. Resources	5	NS
10. Targets (lines 7 + 8d + 9)	(b)	NS
Drinking Water Threat Score:		
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to a maximum of 100)	100	NS
Human Food Chain Threat		
Likelihood of Release:		
12. Likelihood of Release (same value as line 3)	550	550
Waste Characteristics:		
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	5×10^8
14. Hazardous Waste Quantity	(a)	1×10^6
15. Waste Characteristics	1,000	1,000
Targets:		
16. Food Chain Individual	50	45
17. Population:		
17a. Level I Concentrations	(b)	NS

Factor Categories and Factors	Maximum Value	Value Assigned
17b. Level II Concentrations	(b)	0.03
17c. Potential Human Food Chain Contamination	(b)	NS
17d. Population (lines 17a + 17b + 17c)	(b)	0.03
18. Targets (lines 16 + 17d)	(b)	45.03
Human Food Chain Threat Score:		
19. Human Food Chain Threat Score ([lines 12 x 15 x 18]/82,500, subject to a maximum of 100)	100	100.00
Environmental Threat		
Likelihood of Release:		
20. Likelihood of Release (same value as line 3)	550	550
Waste Characteristics:		
21. Ecosystem Toxicity/Mobility/Persistence/Bioaccumulation	(a)	5×10^7
22. Hazardous Waste Quantity	(a)	1×10^6
23. Waste Characteristics	1,000	1,000
Targets:		
24. Sensitive Environments:		
24a. Level I Concentrations	(b)	0
24b. Level II Concentrations	(b)	75
24c. Potential Contamination	(b)	NS
24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)	75
25. Targets (value from 24d)	(b)	75
Environmental Threat Score:		
26. Environmental Threat Score ([lines 20 x 23 x 25]/82,500, subject to a maximum of 60)	60	60.00
Ground water to Surface Water Migration Component Score For A Watershed		
27. Watershed Score[c] (lines 11 + 19 + 26, subject to a maximum of 100)	100	100.00
28. Component Score (S_{gs})[c], (highest score from line 27 for all watersheds evaluated, subject to a maximum of 100)	100	100.00

Notes:

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer
NS Not scored

REFERENCES

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3.	EPA. 2012. Superfund Site Information. Smurfit-Stone Mill. Data extracted September 19, 2012. Accessed online at: http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0802850 Accessed September 19, 2012. [1 page]
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Figures:

Figure 1: Facility Location Map

Figure 2: Property Details Map

Figure 3: Source and Observed Release Sample Location Map

Figure 4: Probable Points of Entry and Ground Water Segments from Sources

Figure 5: Target Distance Limit Map

SITE DESCRIPTION

The Smurfit-Stone Mill is an inactive integrated pulp and paper mill (i.e., integrated mills make pulp from wood or other raw materials, and then use this pulp to make paper) located in west-central Montana, approximately 12 miles northwest of the city of Missoula, in Missoula County. The street address of the property is 14377 Pulp Mill Road, Missoula, Montana (Ref. 3; Figure 1 of this HRS documentation record). More specifically, the geographical coordinates, as measured at sample SSSO0502, collected within Source No. 1 and south of the mill facility, are latitude 46.957781° north and longitude 114.199623° west (Ref. 4; Figure 3 of this HRS documentation record). The EPA identification number, as recorded in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, is MTN000802850 (Ref. 3).

The property, as defined by the outside perimeter of the land parcels that formerly constituted the mill property, covers approximately 3,150 acres (Ref. 4, pp. 1, 4; Figure 1 of this HRS documentation record). The core industrial footprint of the property includes the former mill, a wood chip staging area, the effluent clarifier, and the hog fuel area, and covers approximately 150 acres (Ref. 4, pp. 1, 4; Figure 2 of this HRS documentation record). Over 900 acres of the property consist of a series of unlined ponds used to store both treated (primarily through aeration) and untreated wastewater effluent from the mill, as well as primary sludge recovered from wastewater that entered the clarifier (Refs. 22, pp. 26, 27, 44; 48, p. 7; 50; Figure 2 of this HRS documentation record). The presence and amount of standing water within each pond varies. Some of these ponds were subsequently used for landfilling various solid wastes produced at the mill (e.g., pond 19 became landfill 'D'). Much of the remaining acreage of the property (approximately 1,800 acres) is currently used for agricultural purposes, with over 1,200 acres of grasslands for cattle grazing and over 600 acres irrigated for alfalfa and grain crops (Figure 2 of this HRS documentation record) (Refs. 18, p. 1; 19, p. 1).

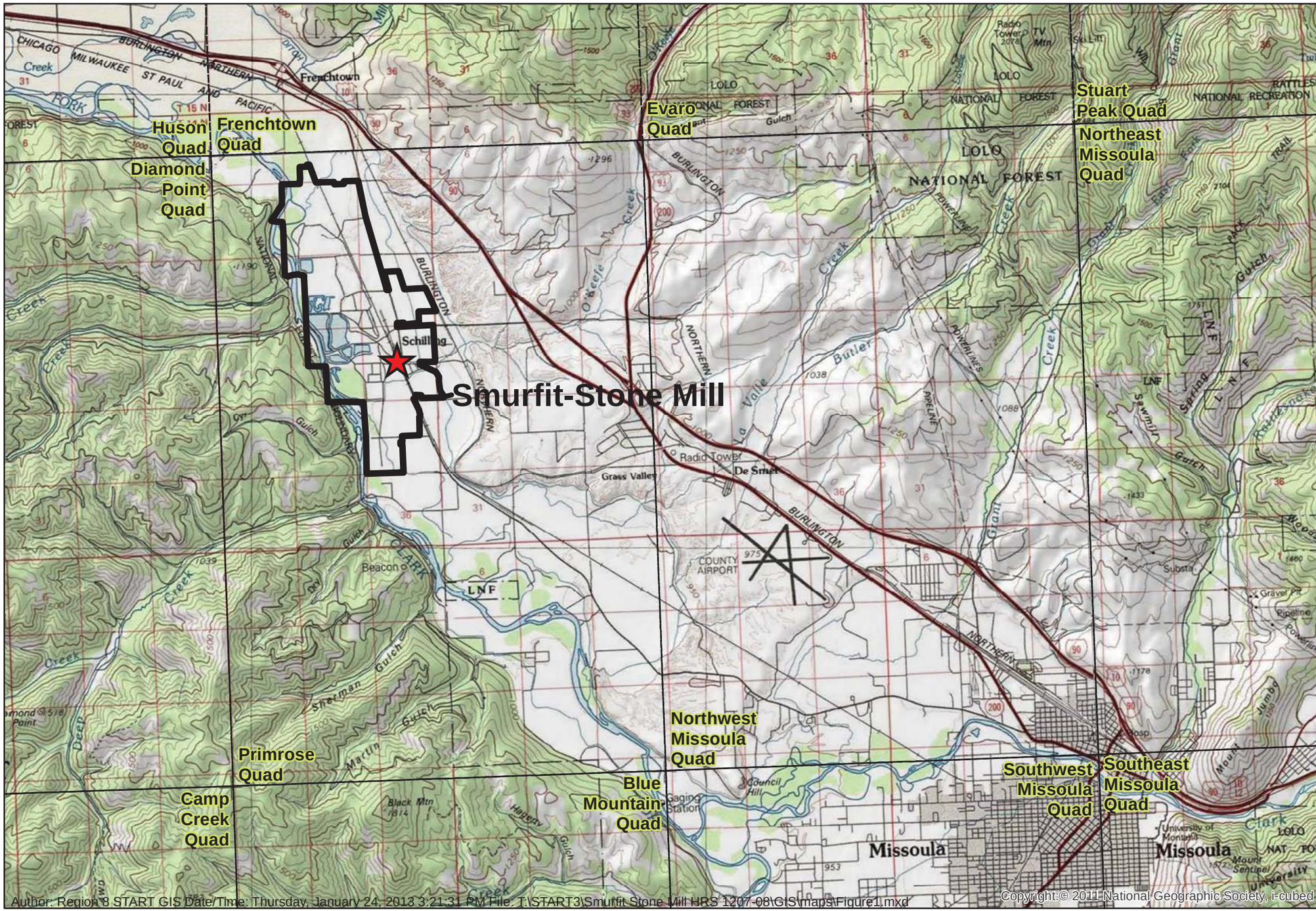
While the core industrial part of the property is fenced and has a security building, other portions of the property are not fenced. In particular, access to the property is possible from the Clark Fork River, which forms its entire western boundary (Refs. 5, pp. 48, 51, 194; 48, pp. 55-57, 59, 71; Figures 1, 2 of this HRS documentation record).

The EPA is evaluating the Surface Water Migration Pathway for the Smurfit-Stone Mill. For HRS scoring purposes, the Smurfit-Stone Mill site consists of three source areas that have been documented, through chemical analysis, to contain hazardous substances. Source No. 1 comprises sludge ponds 3, 4, 5, and 17; Source No. 2 is the emergency spill pond 8; and Source No. 3 is wastewater storage pond 2 (Refs. 5, pp. 21-22, 31; 26, p. 6; 50, p. 2; Tables 1, 2 and 3 and Figure 3 of this HRS documentation record). Source No. 1 is considered as source type 'pile', while Sources No. 2, and No. 3 are considered to be source type 'surface impoundment' under the HRS (Ref. 1, pp. 51587, 51591). Additional potential sources of various hazardous substances at the property that have not been characterized to date include 11 additional wastewater storage ponds, 3 wastewater treatment aeration basins, 2 polishing ponds, a number of landfills, and the historical discharge of wastewater directly to the Clark Fork River via three outfalls (Ref. 22, p. 44; Figure 2 of this HRS documentation record).

The hazardous substances that have been detected in at least one of the sources listed above include, but are not limited to: 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD); 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD); 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,6,7,8-HxCDD); 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD); Total Tetrachlorodibenzo-p-dioxin (Total TCDD); 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF); 2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8-PeCDF); and the metals arsenic, cadmium, lead, and manganese (Ref. 5, p. 31, section 2.2.1 of this HRS documentation record for Sources 1, 2, and 3).

Some of these hazardous substances have been released into ground water beneath the property, as well as the Clark Fork River (located directly adjacent to the property), at concentrations elevated above background (Tables 4A and 4C of this HRS documentation record).

The Clark Fork River is a fishery that supports a variety of finfish, including the federally designated threatened bull trout, as well as other species that are harvested for human consumption (Refs.10, pp. 7, 20; 11, pp. 1, 2; 15, p. 1; 52). Significant areas of wetlands are present along the Clark Fork River, in areas adjacent to and downstream of the Smurfit-Stone Mill (Refs. 5, pp. 220-221; 27; Figures 1, 2 of this HRS documentation record). The segment of the Clark Fork River directly adjacent to the mill is listed as a Wildlife Protected Area by the Northwest Power and Conservation Council as it is a bald eagle nesting territory, a high-density bald eagle winter concentration area, a big game critical wintering/spring area, and a historical peregrine falcon nesting area (Ref. 8, p. 12). The mill property also lies within the Clark Fork River – Grass Valley Important Bird Area, so designated due to its significance to bird species of conservation concern (Ref. 17, pp. 1-4; Figures 1, 2 of this HRS documentation record). It is considered the largest and most significant wetland-water complex in the Missoula area for migratory species such as waterfowl, shorebirds, herons, and raptors (Ref. 20, p. 1).



Site Reference Point

USGS 24k Topo Map Boundaries

Smurfit-Stone Mill Property Boundary

TDD Title: **Smurfit-Stone Mill HRS**

Figure Title: Facility Location Map

Figure: 1

TDD State: MT

TDD: 1207-08

TDD County: Missoula

Date: 03/2013

Datum/Projection
NAD 1983 UTM Zone 11N

N

Page Size: 11x17

Base Data Source
Montana Cadastral Mapping Project
USGS Topographic Maps
(See reference 4 of this HRS Package for details on source Data)

Included USGS Quads
Huson, Frenchtown, Evaro, Stuart Peak, Diamond Point, Primrose, Northwest Missoula, Northeast Missoula, Camp Creek, Blue Mountain, Southwest Missoula, and Southeast Missoula

Kilometers: 0, 1, 2, 4

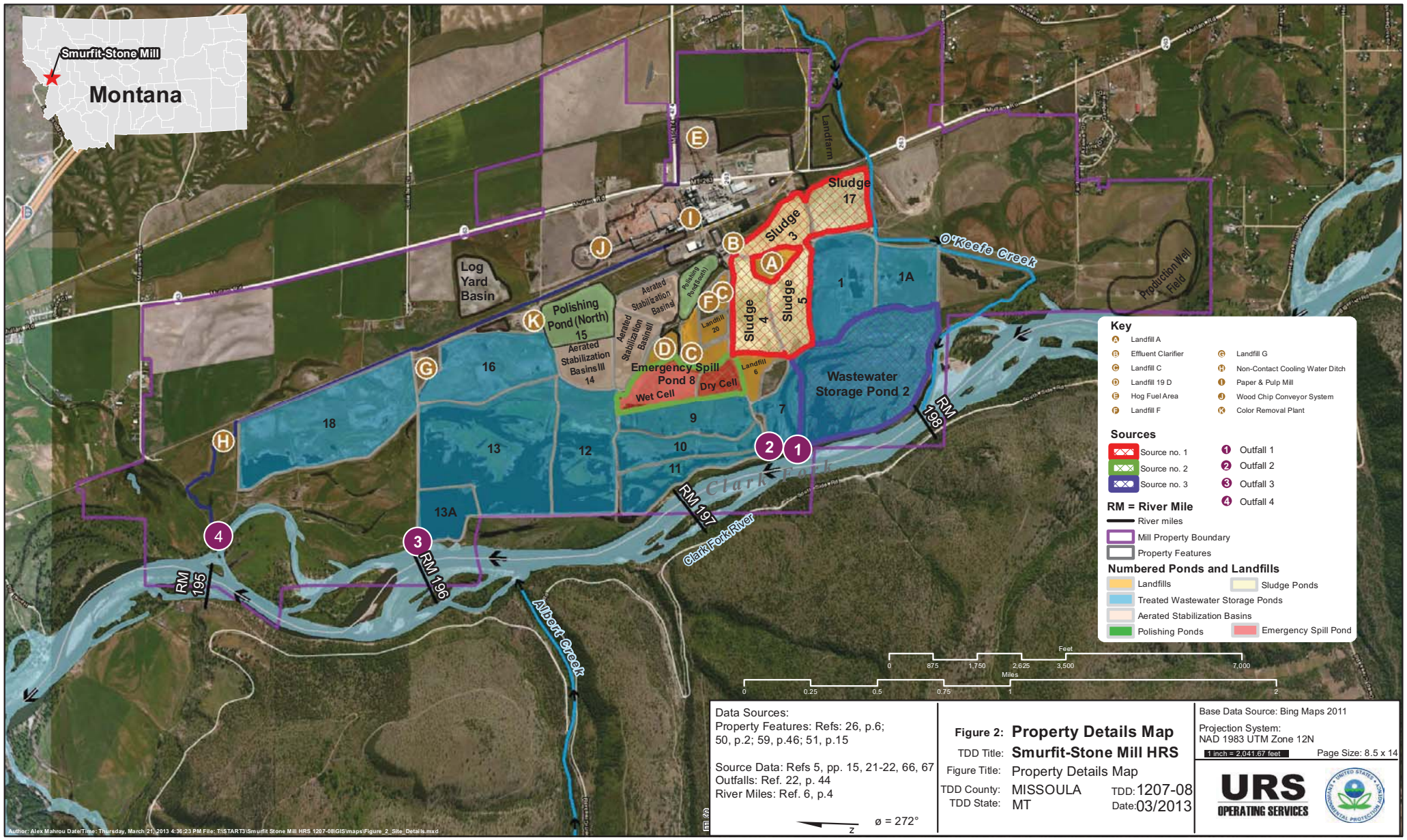
1 inch = 8,333.33 feet

Miles: 0, 0.5, 1, 1.5, 3

URS OPERATING SERVICES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Author: Region 8 START GIS Date/Time: Thursday, January 24, 2013 3:21:31 PM File: T:\START3\Smurfit Stone Mill HRS 1207-08\GIS\maps\Figure1.mxd



Data Sources:
Property Features: Refs: 26, p.6; 50, p.2; 59, p.46; 51, p.15

Source Data: Refs 5, pp. 15, 21-22, 66, 67
Outfalls: Ref. 22, p. 44
River Miles: Ref. 6, p.4

ø = 272°

Figure 2: Property Details Map

TDD Title: **Smurfit-Stone Mill HRS**
Figure Title: Property Details Map
TDD County: MISSOULA
TDD State: MT
TDD: 1207-08
Date: 03/2013

Base Data Source: Bing Maps 2011
Projection System: NAD 1983 UTM Zone 12N
1 inch = 2,041.67 feet
Page Size: 8.5 x 14

URS OPERATING SERVICES

OPERATIONAL HISTORY

The Smurfit-Stone Mill began operation as a kraft pulp mill in the fall of 1957 (Refs. 16, p. 1; 26, p. 5; 32, p. 1). The kraft process, a form of chemical pulping, has been a predominant method of fiber separation used in the U.S. paper industry, and was the method used at the Smurfit-Stone Mill (Ref. 25, p. 11). Later expansions and improvements allowed the facility to produce paper, primarily rolls of kraft linerboard that were used in the production of corrugated containers (i.e., the outside layers of cardboard boxes). Linerboard produced at the mill was shipped to box plants where it was used to make a variety of corrugated containers (Ref. 16, p. 1). The mill used only softwoods (e.g., fir, larch, pine) in its process (Ref. 25, p. 10). The mill also produced bleached pulp and paper from 1960 through 1999 (Refs. 16, p. 1; 22, p. 7, 8; 25, p. 1; 26, p. 5). The mill filed for Chapter 11 bankruptcy in December 2009 and ceased operations in January 2010 (Refs. 28, p. 1; 30, p. 2).

The following names have been associated with the ownership and/or operation of the mill throughout its operational history: Waldorf Paper Products Company, Waldorf-Hoerner, Hoerner Waldorf Corporation, Champion International Corporation, Stone Container Corporation, Smurfit-Stone Container Corporation, and Smurfit-Stone Container Enterprises Incorporated (Refs. 16, p. 1; 26, p. 5; 36, p. 5; 46, p. 1; 48, p. 8). After operations ceased, the property was purchased by MLR Investments, and then M2Green Redevelopment, LLC (M2Green) (an affiliate of Green Investment Group) (Refs. 29; 30). M2Green is the current owner of the entire property (Ref. 30).

Wastewater

The Smurfit-Stone Mill used a large volume of water as a fiber carrier and solvent, generating vast amounts of wastewater (approximately 15 to 20 million gallons per day [mgd], or up to 6.99 billion gallons per year [e.g., 1994/1995]) (Refs. 21, pp. 13, 16, 21; 22, p. 26; 25, p. 40; 26, pp. 11, 14). A portion of this total was non-contact cooling water, the volume of which varied over the life of the mill (e.g., 1.0 mgd in 1974, to 5.0-6.5 mgd in 2004) (Refs. 21, p. 16; 22, p. 28).

During its initial operation, all wastewater was apparently released directly to the Clark Fork River without treatment (Refs. 26, p. 7; 38, p. 4). Following a fish kill in the summer of 1957, ponds were constructed and wastewater was temporarily stored onsite before being discharged to the river under high flow, spring runoff conditions (e.g., March through June) (Refs. 22, p. 5; 26, pp. 7, 11; 38, p. 4). Direct discharge of stored wastewater occurred to the Clark Fork River through one of three outfalls (Outfalls 1, 2 and 3) (Refs. 22, pp. 3, 10, 27, 44; 26, p. 6). Non-contact cooling water was directed into a ditch that discharged through a fourth outfall (Outfall 4) (Ref. 22, pp. 10, 44). It should be noted that two spills from the mill pulping area that entered the non-contact cooling water ditch were reported for 2001, but details of the spills, such as content and whether or not the spills reached the river, are not known (Ref. 22, p. 30).

Seepage was one of the principal methods of discharge of wastewater from the mill since its inception (Ref. 22, p. 3). During the storage months, water seeped through the bottom of the storage ponds into the shallow, surficial alluvial aquifer (Ref. 22, pp. 3, 5; 26, p. 7, 11). By 1973, the major volume of wastewater, 10.56 mgd, was being disposed of by seepage to the shallow ground water, with another 5.28 mgd being discharged directly into the Clark Fork during high river flow periods (Ref. 21, pp. 15, 16, 26, 27).

All seepage water that entered the shallow ground water in turn reached the river, as evidenced by increased color measurements taken on the river through times of low or no direct discharge, as well as by ground water flow measurements, which showed that the ground water flow direction was from the ponds to the river (Refs. 21, pp. 16, 26, 27, 38, 39; 22, pp. 14, 30; 26, pp. 11, 13, 94; 58, pp. 5, 6, 8, 9, 10, 11;

59, pp. 8, 16, 22, 40, 41, 51, 52, 77-86). By 1974, when an Environmental Impact Statement (EIS) for a proposed expansion of the mill was completed, ground water contamination of both the shallow, surficial alluvial aquifer and the deep aquifer beneath the mill property had been detected (Ref. 21, pp. 30, 31, 39). A subsequent EIS for the mill, prepared because of a request for a discharge permit renewal, also mentions the plume of effluent-contaminated shallow ground water (Refs. 26, pp. 94, 97; 38, p. 9, 10, 14). A 2004 report related to ground water beneath the mill property notes that the ground water beneath the ponds is generally similar in quality to the wastewater in the storage ponds (Ref. 59, p. 11).

Over the years, as the mill expanded and as the seepage rates from the ponds decreased due to accumulation of biological and residual organic solids in the bottom sediments of the ponds, additional storage ponds were constructed (Refs. 21, p. 15; 22, p. 5; 26, p. 11). By 1971, 15 ponds had been constructed covering approximately 750 acres (Refs. 21, p. 15; 26, p. 11).

A primary clarifier was constructed in 1969/1970 to remove solid constituents (primarily unused pulp fiber and lime mud) from the wastewater, which was pumped into four sludge ponds (Refs. 21, p. 15; 22, pp. 5, 9, 26; 26, p. 12). A dredge had also been deployed in ponds to try to improve seepage into the ground water (Ref. 26, p. 12).

In the 1970s, the mill experimented with 'rapid-infiltration' gravel basins as a means to facilitate seepage rates into ground water (Refs. 21, p. 28; 22, p. 5; 26, pp. 6, 12). The 1985 EIS (and its shortened 'Final' version completed in 1986) for the mill shows at least nine rapid infiltration basins scattered through the Smurfit-Stone property with a total area of approximately 120 acres (Refs. 26, pp. 6, 12; 38, p. 9). This process largely ended by 1983 due to clogging of the basins by organic matter (Refs. 22, p. 5; 26, pp. 12, 14, 15).

Secondary treatment, through the use of two aeration basins, also began at the mill in 1974 (Refs. 22, p. 5; 26, p. 12). A third basin was added in 1990 (Ref. 22, p. 9). 'Secondary' sludge was generated from the biological treatment of water in the aeration basins and consisted of biological solids. Secondary sludge accumulated over time in the basins and was periodically removed by being pumped to the sludge ponds (Ref. 25, p. 50).

From the aeration basins, wastewater flowed to polishing ponds, and then to the remaining storage ponds before discharge to the Clark Fork through one of the three outfalls (Refs. 21, pp. 15, 16; 22, pp. 27, 44; 26, p. 6; 50). As storage ponds and the rapid-infiltrations basins became progressively plugged by organics, the mill became more reliant on the direct discharge of wastewater to the river (Refs. 22, p. 5; 26, p. 7). In 1983, the mill applied for a permit that would allow it to directly discharge a portion of the wastewater into the river throughout the year, not solely during the high flows of spring (Refs. 22, p. 6; 26, p. 7). A 2-year permit for this was granted by the Montana Department of Health and Environmental Sciences (MDHES, now the MDEQ) in 1984, allowing year-round discharge of treated wastewater to the Clark Fork River at any time when river flows exceeded 1,900 cfs (Refs. 22, p. 6). New permits with similar conditions allowing for year-round discharge were issued in December 1986 and September 2000 (Refs. 22, p. 6; 35, pp. 1, 6).

Beginning in 1997, a sludge dewatering facility processed the sludge to remove additional liquid (reducing volume being sent to the ponds) and to provide a fuel source for the multi-fuel boiler (Ref. 22, p. 10).

Hazardous Substances in Wastewater, Sludge and Pulp

Pollutants of concern in pulp and paper mill effluent include acetone, ketones, catechols, guaiacols, aldehydes, chloroform, methylene chloride, chlorinated phenols, polychlorinated dibenzo-p-dioxins (PCDDs) (dioxins) and polychlorinated dibenzofurans (PCDFs) (furans), metals, and polycyclic aromatic compounds (PACs) (Refs. 39, p. 13; 44, pp. 1-1, 1-5). The EPA has found that three groups of pollutants drive the toxic and nonconventional pollutant loadings for the Pulp and Paper industry: dioxin and dioxin-like compounds, PACs, and metals (Ref. 44, pp. 3-1, 3-2, 3-3, 3-4, 3-10, 4-7, 5-1).

Bleaching pulp mills in particular are responsible for the formation of dioxins and furans (Refs. 37, pp. 2, 4, 5; 44, p. 1-5; 45, p. 3). In 1990, the EPA published a report summarizing analytical results from the sampling of 104 pulp and paper mills across the U.S. that practiced chlorine bleaching of chemically produced pulps (Ref. 45, p. 3). Samples were collected from three 'export matrices': bleached pulp, wastewater sludge, and wastewater effluent (Ref. 45, p. 3). The results of chemical analysis of the samples showed that, for kraft mills with bleaching operations, 2,3,7,8-TCDD was detected in 90 percent of overall samples, and 2,3,7,8-TCDF was detected in 97 percent of overall samples (Ref. 45, p. 4).

Specifically for wastewater effluent samples from bleaching kraft mills, 90 of 107 samples (84 percent) contained detectable amounts of 2,3,7,8-TCDD, and 104 of 111 samples (94 percent) contained detectable quantities of 2,3,7,8-TCDF (Ref. 45, p. 5). In the same study, 94 of 97 sludge samples (97 percent) collected from bleaching kraft mills contained detectable amounts of 2,3,7,8-TCDD and 100 percent of the 97 samples contained detectable amounts of 2,3,7,8-TCDF (Ref. 45, pp. 5, 7, 8). Pulp samples yielded similar results, with 98 of 104 (94 percent) samples of bleached kraft softwood pulp showing detectable levels of 2,3,7,8,-TCDD, and 99 of 102 (97 percent) samples showing detectable levels of 2,3,7,8-TCDF (Ref. 45, p. 5).

None of the mills sampled were free of either compound (Ref. 45, p. 4). A subset of samples from nine mills were also analyzed for 2,3,7,8-substituted CDDs and CDFs. The most common 2,3,7,8-substituted CDDs and CDFs found across all matrices sampled were 1,2,3,4,6,7,8-HpCDD; OCDD; 1,2,3,7,8-PeCDF; 2,3,4,7,8-PeCDF; and OCDF (Ref. 45, pp. 24-27).

The Smurfit-Stone mill produced bleached pulp and paper from 1960 through 1999 (Refs. 16, p. 1; 21, pp. 7, 13, 16; 22, pp. 7, 9; 25, p. 9; 26, p. 5). For example, the mill produced an average of 159 tons of bleached product in 1973 (Ref. 21, pp. 7, 13). For this year, the mill reported that 30,000 gallons of water were needed per ton of bleached product; therefore, the wastewater discharge from the bleach plant was computed to average 4.8 million gallons per day (Ref. 21, p. 13).

Analytical results from the sampling of four sludge ponds, an emergency spill pond, and a wastewater storage pond on the Smurfit-Stone Mill property show that a number of dioxin and furan compounds are present in the ponds (Ref. 5, pp. 67, 69, 72-73, 403-404, 416-418; Tables 1, 2 and 3 of this HRS documentation record).

Sources of metals in kraft pulp and paper mill waste streams include wood (calcium, potassium, manganese), spent pulping solutions that dissolve metals from wood, papermaking additives such as alum and kaolin clay, soils on logs and wood chips, green liquor dregs (particularly for manganese), and make-up lime used in the causticizing reaction (Ref. 44, pp. 6-20, 6-22, 6-23).

The EPA published a report in November 2006 that, in part, reported on the releases of metals reported by pulp and paper mills through the Toxics Release Inventory (TRI) database (Ref. 44, pp. xvi, 1-1, 4-8). Manganese was the metal with the highest toxic-weighted pound equivalents (TWPE) reported for both

types of mills (Ref. 44, p. 4-8). Additionally, wood is noted to be a major source of manganese in the kraft process (Ref. 44, p. 6-20). The Smurfit-Stone Mill (known at that time as Stone Container Corporation) was one of the mills for which TRI data was compiled (Ref. 44, p. A-6).

At the Smurfit-Stone Mill, the dregs from the recausticizing operation and fly ash from the multi-fuel boiler were both disposed of into the sludge ponds (Ref. 22, pp. 8, 9). After passing through the clarifier and/or sludge ponds, wastewater discharge from all portions of the paper and pulp mill, including from the recausticizing plant, was sent to the aeration basins and then the wastewater storage ponds (Ref. 22, pp. 26, 27). These discharges could also bypass the clarifier and report directly to the emergency spill pond 8 (Ref. 22, p. 26). The presence of metals in wastewater discharge from the mill was noted in the EIS for the mill, and total manganese was detected at a concentration of 0.219 milligrams per liter (mg/L) within a representative wastewater sample collected by the Smurfit-Stone Mill as part of MPDES permit requirements (Refs. 22, pp. 56, 61, 81).

Analytical results from the sampling of four sludge ponds, an emergency spill pond, and a wastewater storage pond on the Smurfit-Stone Mill property show that a number of metals, including arsenic, cadmium, manganese, and lead are present in the ponds (Ref. 5, pp. 67, 69, 72-73, 1006-1011, 1036-1050; Tables 1, 2 and 3 of this HRS documentation record).

PREVIOUS INVESTIGATIONS

Most environmental investigations conducted at the Smurfit-Stone Mill appear to have been limited to those undertaken by the mill or by the MDHES in relation to the MPDES permitting process (including environmental compliance monitoring performed by the mill) (Refs. 22, p. 6; 26, pp. 7, 16, 20-21; 36, p. 14, 15, 17; 42, p. 3). A few of these investigations will be discussed in more detail in later sections of this HRS documentation record.

Site assessments have apparently been performed at six of eight petroleum storage tank locations at the Smurfit-Stone Mill. The assessments found evidence of releases at all six locations. The remediation of at least two of these releases is currently being overseen by the Petroleum Release Section of the MDEQ (Ref. 47).

Investigations performed by the EPA prior to 2011 appear to be limited to a chemical safety audit conducted by the Region 8 Technical Assistance Team from February 9 through 12, 1993. The purpose of the audit was to document facility processes, chemical hazards, accidental release prevention practices, and emergency response preparedness and planning (Ref. 25, pp. 18, 19).

In 2011, URS Operating Services (UOS), on behalf of the EPA Superfund Technical Assessment and Response Team (EPA-START) program, was tasked with conducting a Preliminary Assessment of the Smurfit-Stone Mill property (Ref. 48, p. 6). During this assessment, EPA-START identified numerous potential sources of contamination at the property, including sludge ponds, aeration basins and treated water ponds, an emergency spill pond, landfills and other dumping locations, various process areas within the industrial footprint, a former landfarming area, and ASTs and USTs (Ref. 48, pp. 13-15, 19-25, 33, 52-72). The assessment also identified targets potentially at risk from contaminant migration, including surface water users (e.g., fisherman), wetlands, game fish populations, and ground water users (Ref. 48, pp. 27-34).

In October 2011, EPA-START conducted a combined site inspection and removal assessment at the Smurfit-Stone Mill property (Ref. 5, p. 7). Field activities included the collection of soil/source, surface water, sediment, and ground water samples (collected from existing monitoring and domestic wells, as well as newly installed monitoring wells) (Refs. 5, pp. 7, 20-23, 67-68, 72-78, 200-212; 72, pp. 3-17). The

source/soil and ground water samples collected from the surficial alluvial aquifer beneath the property contained dioxins and furans, and metals (Ref. 5, pp. 30-34, 60, 69, 71; Tables 1, 2, 3, and 4C of this HRS documentation record). Sediment samples collected from the Clark Fork River were also noted to contain dioxins and furans above background levels, while surface water samples from the Clark Fork River contained dissolved manganese above background levels (Ref. 5, pp. 34, 35, 68, 73-74, 199, 210-211, 397; Ref. 78, p. 21; Tables 4A and 4B of this HRS documentation record).

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of source: Source No. 1

Name of source: Sludge ponds 3, 4, 5, 17

Source Type: Pile

Location of Source (with reference to a map of the site): The four sludge ponds (piles) that constitute Source No. 1 are located in the south-central portion of the Smurfit-Stone Mill property, to the west and southwest of the industrial core area, as can be seen in Figure 2 of this HRS documentation record.

For HRS scoring purposes, these four piles will be aggregated and considered one source, as they were utilized by the mill for the same purpose, have identical containment characteristics, contain similar contaminants, and are located adjacent to each other. Since the closing of the mill, sludge pond 3 has been covered with a layer of wood chips, but this covering layer is not complete and water is able to penetrate this covering material (Refs. 5, pp. 37, 48, 189, 202; 48, p. 61; 79, p. 10).

As a result of (and to prevent additional) accumulation of sludge in the wastewater storage ponds, a primary clarifier was constructed at the Smurfit-Stone Mill in 1969-1970 (Ref. 22, p. 5). The clarifier removed solid constituents (primarily unusable wood pulp fibers from the pulp and papermaking process and calcium carbonate from the recausticizing operation) from the mill wastewater (Ref. 22, pp. 8, 9). Fly ash (aka hog fuel ash) and unburned green liquor dregs (unburned carbon from the recovery boilers) was also a component of sludge, or was pumped into the sludge ponds (Refs. 22, pp. 4, 8, 9). In addition to process wastewater flows from the pulp mill, paper mill, and recausticizing plant, the primary clarifier also received excess white water and stock tank overflow (excess water derived from the drying of paper), as well as wastewater from the power and recovery area, the old corrugated cardboard (OCC) plant and the bleach plant (Refs. 21, p. 16; 22, pp. 4, 26; 25, pp. 15, 48, 50). A component of this wastewater would have been incorporated into the sludge.

This sludge was pumped from the clarifier into four sludge ponds numbered 3, 4, 5, and 17 (Refs. 21, pp. 15, 16; 22, pp. 5, 9, 25; 50). Ponds 3, 4 and 5 were originally wastewater storage ponds and, therefore, would not have been lined, as the disposal of a majority of liquid effluent was into the ground water system via percolation through pond bottoms (Refs. 21, pp. 15, 16, 26, 27; 22, p. 3; 26, p. 6; 38, p. 5). Sludge pond 17 was constructed at some point after 1974 (it is not shown on a map of the facility within a report dated 1974) (Ref. 21, p. 17). During the combined SI and RA in October 2011, soil bores were placed into all four of these sludge ponds to depths where native in situ material was encountered beneath the sludge. No liner was encountered in any of these borings (Ref. 77, pp. 2, 3, 5, 10-13). In 1992, it was estimated that 54 tons of sludge were generated each day (Ref. 51, p. 11). Prior to the operation of the clarifier, wastewater containing sludge was temporarily held in wastewater storage ponds (as well as directly discharged to the Clark Fork River) (Ref. 22, p. 5).

During the time of both the PA in June 2011 and the combined SI and RA in October 2011, all four ponds were mostly dry but had areas of standing water (Refs. 5, pp. 47, 48, 185, 186, 189, 190; 48, p. 53, 54, 61-63). No evidence of a liner or functioning leachate collection and removal system above a liner was observed at any of the four ponds (Ref. 77, pp. 2, 3, 5, 10-13). None of the four ponds had a maintained engineered cover (Refs. 5, pp. 48, 185, 186, 189, 190; 48, pp. 53, 54, 61-63; 79, p. 4). The four surface

piles have a combined surface area of 91 acres, and combined volume of 899 acre-feet or approximately 1,450,087 cubic yards (yd^3) (Ref. 50).

In October 2011, EPA-START conducted a combined site inspection and removal assessment at the Smurfit-Stone Mill (Ref. 5, p. 7). Field activities included the collection of 14 samples from directly within the four sludge ponds (Ref. 5, pp. 20, 21, 72, 73; Figure 3 of this HRS documentation record). Eight of these samples were collected from 0 to 2 feet below ground surface (bgs) and six of these samples were collected from below 2 feet bgs (Ref. 5, pp. 21, 72, 73). Samples collected from the sludge ponds were generally moist, organic-rich, dark grey to black, and non-cohesive, and most had a strong sulfur odor. Most samples were also noticeably fibrous. Occasional grey layers of ash and lime were also observed (Refs. 5, p. 212; 77, pp. 2, 3, 5, 10-13).

All 14 samples are used to characterize Source No. 1 (Ref. 5, pp. 20, 21, 72, 73). These samples contained hazardous substances, including: 2,3,7,8-TCDD; 1,2,3,7,8-PeCDD; 1,2,3,6,7,8-HxCDD; 1,2,3,4,6,7,8-HpCDD; Total-TCDD; 2,3,7,8-TCDF; 2,3,4,7,8-PeCDF; arsenic; cadmium; lead; and manganese (Ref. 5, pp. 30-32, 60, 67, 69, 72, 403-404, 416-418, 1006-1011, 1038-1045; Table 1 of this HRS documentation record).

2.2.2 Hazardous Substances

EPA-START collected the source samples listed in Table 1 during the October 2011 combined site inspection and removal assessment at the Smurfit-Stone Mill property (Ref. 5, p. 7). Fourteen samples were collected from Source No. 1 during the sampling event (Ref. 5, pp. 21, 72, 73; Figure 3 of this HRS documentation record). Eight of these samples were collected from 0 to 2 feet bgs and six of these samples were collected from below 2 feet bgs (Ref. 5, pp. 20, 21, 72, 73). All 14 samples will be used to characterize Source No. 1 (Ref. 5, pp. 20-21, 72, 73).

All of the samples for Source No. 1 were collected during the same sampling event and in accordance with the same sampling procedures, which are described in the EPA-START Quality Program Plans, Standard Operating Procedures, Volume 4: Technical Standard Operating Procedures (TSOPs) 4.16 “Surface and Shallow Depth Soil Sampling” and 4.27 “Basic Geoprobe® Operations” (Ref. 53, pp. 7-18).

All Source No. 1 samples were collected with disposable plastic scoops either from a plastic core sleeve emplaced into the source material with a hydraulic-push machine or, in places that the machine could not safely access, directly from the surface of the source being sampled (Ref. 5, pp. 21, 25, 186, 189). All plastic sleeves and scoops used during the project were new, certified clean, single-use disposable sleeves and scoops that were used once (Ref. 5, pp. 25, 57, 202-205, 210).

A steel shovel was used at some locations to break up the surface material (e.g., if it was frozen) to ease the collection of the samples with plastic scoops (Ref. 5, p. 25). The shovel was decontaminated prior to its initial use and then between sampling locations where it was used as per EPA-START TSOP 4.11 “Equipment Decontamination” (Ref. 53, pp. 13, 14). A rinsate blank was collected from the shovel to document thoroughness of the decontamination procedures and to determine if any cross-contamination occurred (Ref. 5, pp. 25, 54, 78, 187). Results from the rinsate sample show that cross-contamination did not occur (Ref. 5, pp. 114, 121, 122, 125-126, 130-132, 134).

For the deeper locations where a hydraulic-push machine was used to first collect source material into a plastic sleeve, the same stainless steel cutting shoe was used for each location. The cutting shoe is the only reusable part of the sampling system that makes contact with in situ soils. The drilling subcontractor decontaminated the cutting shoe prior to its initial use and then between sampling locations using a method equivalent to that in TSOP 4.11. A rinsate blank (sample SSSW89) was collected from both the

shovel and the cutting shoe to assess the quality and thoroughness of the decontaminating procedures used (Ref. 5, pp. 25, 54, 78, 187). The analytical results from this rinsate sample showed no concentrations of contaminants of concern (Ref. 5, pp. 114, 121, 122, 125-126, 130-132, 134)

All samples from Source No. 1 were analyzed for dioxins and furans using EPA Method 8290A by the private laboratory ALS Laboratory Group in Burlington, Ontario, Canada, and for total target analyte list (TAL) metals using ICP-AES using method CLP-ISM01.3 by the EPA CLP RAS laboratory, Chemtech Consulting Group, Inc., in Mountainside, New Jersey. EPA-START contractor TechLaw, Inc. reviewed all dioxin and furan data according to the "National Functional Guidelines for Chlorinated Dibenzo-p-dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review September 2011" and reviewed all metals data in accordance with "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," January 2010 (Ref. 5, pp. 7-9, 52, 53, 394-395, 397, 408, 410, 989-990, 992, 1022, 1024).

Sample-specific quantitation limits have been calculated for each Source No. 1 analytical result and are listed in Table 1 of this HRS documentation record (Refs. 1, p. 51586; 78, pp. 3-9, 11-13, 40-65). Logbook notes regarding sample collection details, including sample collection dates, are provided in Reference 5 (pp. 195-215). The chain-of-custody records are provided in Reference 76 (pp. 1-39) and Reference 67 (pp. 148-149, 153). The locations of all samples are depicted in Figure 3 of this HRS documentation record, and are described in Reference 5 (pp. 72, 73).

Bleaching pulp mills in particular are responsible for the formation of dioxins and furans (Refs. 37, pp. 2, 4, 5; 44, pp. 1-5; 45, pp. 3). The Smurfit-Stone mill produced bleached pulp and paper from 1960 through 1999 (Refs. 16, p. 1; 21, pp. 7, 13, 16; 22, pp. 7, 9; 25, p. 9; 26, p. 5). Sludges recovered from wastewater clarifying of bleached pulp typically contain dioxins and furans (Refs. 25, p. 50; 45, pp. 3, 5, 6, 14, 15, 22, 24, 26). In one EPA study where sludge from 104 bleaching pulp and paper mills was sampled and analyzed, 94 of 97 sludge samples (97 percent) collected from bleaching kraft mills contained detectable amounts of 2,3,7,8-TCDD, and 100 percent of the 97 samples contained detectable amounts of 2,3,7,8-TCDF (Ref. 45, pp. 5, 8).

None of the mills sampled were free of either compound (Ref. 45, p. 4). A subset of samples from nine mills were also analyzed for 2,3,7,8-substituted CDDs and CDFs. The most common 2,3,7,8-substituted CDDs and CDFs found across all matrices sampled were 1,2,3,4,6,7,8-HpCDD; OCDD; 1,2,3,7,8-PeCDF; 2,3,4,7,8-PeCDF; and OCDF (Ref. 45, pp. 24-27).

Analytical results from the sampling of four sludge ponds on the Smurfit-Stone Mill property show that a number of dioxin and furan compounds are present in the ponds (Refs. 5, pp. 67, 69, 72-73, 403-404, 416-418; Table 1 of this HRS documentation record).

The EPA published a report in November 2006 that, in part, reported on the releases of metals reported by pulp and paper mills through the TRI database (Ref. 44, pp. xvi, 1-1, 4-8). Manganese was the metal with the highest TWPE reported for both types of mills (Ref. 44, p. 4-8). Additionally, wood has been identified as a major source of manganese in the kraft process (Ref. 44, p. 6-20). The Smurfit-Stone Mill (known at that time as Stone Container Corporation) was one of the mills for which TRI data was compiled (Ref. 44, p. A-6).

The presence of metals in wastewater discharge from the mill was noted in the EIS for the mill, and total manganese was detected at a concentration of 0.219 mg/L within a representative wastewater sample collected by the Smurfit-Stone Mill as part of MPDES permit requirements (Refs. 22, pp. 56, 61, 81).

Analytical results from the sampling of four sludge ponds on the Smurfit-Stone Mill property show that a number of metals including arsenic, cadmium, manganese and lead are present in the ponds (Ref. 5, pp. 67, 69, 72-73, 1006-1011, 1038-1045; Table 1 of this HRS documentation record).

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
SSSO0502	10/25/11	sludge pond 17	2,3,7,8-TCDD	4.72	0.14	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 40
"	"	"	1,2,3,7,8-PeCDD	13.4	0.19	5, pp. 67, 72, 212, 403; 67, p. 153;78, p. 41
"	"	"	1,2,3,6,7,8-HxCDD	11.4	0.26	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 41
"	"	"	1,2,3,4,6,7,8-HpCDD	48.5	0.31	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 41
"	"	"	Total-TCDD	278	0.14	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 42
"	"	"	2,3,7,8-TCDF	34.4	0.69	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 42
"	"	"	2,3,4,7,8-PeCDF	29.7	0.18	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 42
(MH30Q4)	"	"	Arsenic	10.7	0.30	5, pp. 67, 72, 212, 1006, 1065; 76, p. 29; 78, p. 3
"	"	"	Lead	23.3	0.16	5, pp. 67, 72, 212, 1006, 1065; 76, p. 29; 78, p. 3
"	"	"	Manganese	1,590	0.05	5, pp. 67, 72, 212, 1006, 1065; 76, p. 29; 78, p. 4
SSSO0514	10/27/11	"	2,3,7,8-TCDD	0.823	0.58	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 49
"	"	"	1,2,3,6,7,8-HxCDD	8.89	1.75	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 50
"	"	"	1,2,3,4,6,7,8-HpCDD	24.6	2.92	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 50

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
"	"	"	Total-TCDD	1.93	0.58	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 50
"	"	"	2,3,7,8-TCDF	6.23	0.98	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 51
(MH3BB7)	"	"	Manganese	870	0.19	5, p. pp. 67, 72, 203, 1038; 76, pp. 28, 30; 78, p. 9; 82, p. 3
SSSO0602	10/25/11	"	2,3,7,8-TCDD	22.4	1.02	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 43
"	"	"	1,2,3,7,8-PeCDD	73.4	0.68	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 43
"	"	"	1,2,3,6,7,8-HxCDD	67.7	0.83	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 43
"	"	"	1,2,3,4,6,7,8-HpCDD	311	1.64	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 44
"	"	"	Total-TCDD	2,320	1.02	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 44
"	"	"	2,3,7,8-TCDF	164	2.49	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 44
"	"	"	2,3,4,7,8-PeCDF	148	0.98	5, pp. 67, 72, 212, 403; 67, p. 153; 78, p. 45
(MH30Q6)	"	"	Arsenic	26.9	0.41	5, pp. 67, 72, 212, 1007, 1065; 76, p. 29; 78, p. 4
"	"	"	Cadmium	12.5	0.02	5, pp. 67, 72, 212, 1007, 1065; 76, p. 29; 78, p. 4
"	"	"	Lead	61.4	0.21	5, pp. 67, 72, 212, 1007, 1065; 76, p. 29; 78, p. 5

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
"	"	"	Manganese	4,020	0.06	5, pp. 67, 72, 212, 1007, 1065; 76, p. 29; 78, p. 5
SSSO0612	10/27/11	"	1,2,3,6,7,8-HxCDD	6.5	2.60	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 51
"	"	"	1,2,3,4,6,7,8-HpCDD	31.0	3.51	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 52
"	"	"	Total-TCDD	2.28	1.90	5, pp. 67, 72, 203, 416; 67, p. 148; 78, p. 52
(MH3BB8)	"	"	Manganese	1,220	0.21	5, pp. 67, 72, 203, 1039; 76, p. 30; 78, p. 9; 82, p. 3
SSSO0702	10/26/11	sludge pond 3	2,3,7,8-TCDD	34.3	1.31	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 45
"	"	"	1,2,3,7,8-PeCDD	92.7	1.78	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 45
"	"	"	1,2,3,6,7,8-HxCDD	78.1	2.08	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 46
"	"	"	1,2,3,4,6,7,8-HpCDD	299	3.36	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 46
"	"	"	Total-TCDD	1,450	1.31	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 46
"	"	"	2,3,7,8-TCDF	317	6.38	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 47
"	"	"	2,3,4,7,8-PeCDF	237	3.36	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 47
(MH30Q8)	"	"	Arsenic	71.4	0.19	5, pp. 67, 72, 202, 1008, 1065; 76, p. 29; 78, p. 5

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
“	“	“	Cadmium	17.9	0.01	5, pp. 67, 72, 202, 1008, 1065; 78, p. 6
“	“	“	Lead	108	0.10	5, pp. 67, 72, 202, 1008, 1065; 76, p. 29; 78, p. 6
“	“	“	Manganese	6,840	0.03	5, pp. 67, 72, 202, 1008, 1065; 76, p. 29; 78, p. 6
SSSO0716	10/26/11	“	2,3,7,8-TCDD	11.8	0.99	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 53
“	“	“	1,2,3,6,7,8-HxCDD	11.5	1.79	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 53
“	“	“	1,2,3,4,6,7,8-HpCDD	81.7	2.83	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 53
“	“	“	Total-TCDD	11.8	0.99	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 54
“	“	“	2,3,7,8-TCDF	25.7	1.67	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 54
“	“	“	2,3,4,7,8-PeCDF	1.70	0.92	5, pp. 67, 72, 202, 404; 67, p. 153; 78, p. 54
(MH30Q9)	“	“	Lead	7.9	0.17	5, pp. 67, 72, 202, 1009, 1065; 76, p. 29; 78, p. 7
“	“	“	Manganese	89.7	0.05	5, pp. 67, 72, 202, 1009, 1065; 76, p. 29; 78, p. 7
SSSO0802	10/26/11	“	1,2,3,7,8-PeCDD	5.51	0.71	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 47
“	“	“	1,2,3,6,7,8-HxCDD	95.5	1.61	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 48

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
"	"	"	1,2,3,4,6,7,8-HpCDD	54.4	1.32	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 48
"	"	"	Total-TCDD	39.4	0.68	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 48
"	"	"	2,3,7,8-TCDF	19.7	0.76	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 49
"	"	"	2,3,4,7,8-PeCDF	6.25	0.34	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 49
(MH30R0)	"	"	Lead	18.5	0.37	5, pp. 67, 72, 203, 1010, 1065; 76, p. 29; 78, p. 7
"	"	"	Manganese	2,090	0.11	5, pp. 67, 72, 203, 1010, 1065; 76, p. 29; 78, p. 7
SSSO0816	10/26/11	"	2,3,7,8-TCDD	11.6	2.96	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 55
"	"	"	1,2,3,6,7,8-HxCDD	24.9	6.21	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 55
"	"	"	1,2,3,4,6,7,8-HpCDD	148	8.28	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 55
"	"	"	Total-TCDD	11.6	2.96	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 56
"	"	"	2,3,7,8-TCDF	33.8	9.17	5, pp. 67, 72, 203, 404; 67, p. 153; 78, p. 56
(MH30R1)	"	"	Lead	7.2	0.31	5, pp. 67, 72, 203, 1011, 1065; 76, p. 29; 78, p. 8
"	"	"	Manganese	514	0.09	5, pp. 67, 72, 203, 1011, 1065; 76, p. 29; 78, p. 8

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
SSSO1102	10/27/11	sludge pond 4	2,3,7,8-TCDD	1.50	1.40	5, pp. 67, 73, 204, 417; 67, p. 148; 78, p. 57
"	"	"	1,2,3,6,7,8-HxCDD	5.58	4.01	5, pp. 67, 73, 204, 417; 67, p. 148; 78, p. 57
"	"	"	1,2,3,4,6,7,8-HpCDD	58.0	5.16	5, pp. 67, 73, 204, 417; 67, p. 148; 78, p. 57
"	"	"	Total-TCDD	3.87	1.40	5, pp. 67, 73, 204, 417; 67, p. 148; 78, p. 58
"	"	"	2,3,7,8-TCDF	9.51	1.63	5, pp. 67, 73, 204, 417; 67, p. 148; 78, p. 58
(MH3BC2)	"	"	Cadmium	12.7	0.04	5, pp. 67, 73, 204, 1043; 76, p. 30; 78, p. 9; 82, p. 3
"	"	"	Manganese	797	0.15	5, pp. 67, 73, 204, 1043; 76, p. 30; 78, p. 10; 82, p. 3
SSSO1110	10/27/11	"	2,3,7,8-TCDD	13.6	0.46	5, pp. 67, 73, 417; 67, p. 148; 77, p. 13; 78, p. 58
"	"	"	1,2,3,6,7,8-HxCDD	15.8	1.14	5, pp. 67, 73, 417; 67, p. 148; 77, p. 13; 78, p. 59
"	"	"	1,2,3,4,6,7,8-HpCDD	115	2.48	5, pp. 67, 73, 417; 67, p. 148; 77, p. 13; 78, p. 59
"	"	"	Total-TCDD	15.7	0.46	5, pp. 67, 73, 417; 67, p. 148; 77, p. 13; 78, p. 59
"	"	"	2,3,7,8-TCDF	41.3	2.28	5, pp. 67, 73, 417; 67, p. 148; 77, p. 13; 78, p. 60
"	"	"	2,3,4,7,8-PeCDF	1.90	1.04	5, pp. 67, 73, 417; 67, p. 148; 77, p. 13; 78, p. 60

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
(MH3BC3)	"	"	Manganese	1,180	0.07	5, pp. 67, 73, 1044; 76, p. 30; 77, p. 13; 78, p. 11; 82, p. 3
SSSO1202	10/27/11	"	1,2,3,4,6,7,8-HpCDD	52.9	4.37	5, pp. 67, 73, 204, 418; 67, p. 149; 78, p. 61
"	"	"	Total-TCDD	4.59	1.31	5, pp. 67, 73, 204, 418; 67, p. 149; 78, p. 61
"	"	"	2,3,7,8-TCDF	3.91	1.01	5, pp. 67, 73, 204, 418; 67, p. 149; 78, p. 61
(MH3BC4)	"	"	Cadmium	12.1	0.02	5, pp. 67, 73, 204, 1045; 76, p. 23; 78, p. 13; 82, p. 3
"	"	"	Manganese	1,990	0.07	5, pp. 67, 73, 204, 1045; 76, p. 23; 78, p. 13; 82, p. 3
SSSO0902	10/27/11	sludge pond 5	1,2,3,6,7,8-HxCDD	0.756	0.24	5, pp. 67, 72, 204, 416; 67, p. 148; 78, p. 62
"	"	"	1,2,3,4,6,7,8-HpCDD	9.61	0.74	5, pp. 67, 72, 204, 416; 67, p. 148; 78, p. 62
"	"	"	Total-TCDD	2.17	0.09	5, pp. 67, 72, 204, 416; 67, p. 148; 78, p. 62
"	"	"	2,3,7,8-TCDF	0.992	0.10	5, pp. 67, 72, 204, 416; 67, p. 148; 78, p. 63
(MH3BB9)	"	"	Manganese	598	0.05	5 pp. 67, 72, 204, 1040; 76, p. 23; 78, p. 11; 82, p. 3
SSSO0916	10/27/11	"	1,2,3,6,7,8-HxCDD	7.03	4.01	5, pp. 67, 72, 204, 417; 67, p. 148; 78, p. 63
"	"	"	1,2,3,4,6,7,8-HpCDD	46.7	4.28	5, pp. 67, 72, 204, 417; 67, p. 148; 78, p. 63

TABLE 1: Source Samples - Source No. 1 (Sludge Ponds) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
"	"	"	2,3,7,8-TCDF	18.7	1.60	5, pp. 67, 72, 204, 417; 67, p. 148; 78, p. 64
"	"	"	2,3,4,7,8-PeCDF	79.2	1.26	5, pp. 67, 72, 204, 417; 67, p. 148; 78, p. 64
(MH3BC0)	"	"	Manganese	717	0.07	5, pp. 67, 72, 204, 1041; 76, p. 23; 78, p. 12; 82, p. 3
SSSO1002	10/27/11	"	2,3,7,8-TCDF	3.25	1.79	5, pp. 67, 72, 204, 417; 67, p. 148; 78, p. 65
"	"	"	1,2,3,4,6,7,8-HpCDD	31.4	6.55	5, pp. 67, 72, 204, 417; 67, p. 148; 78, p. 65
(MH3BC1)	"	"	Manganese	1,050	0.03	5, pp. 67, 72, 204, 1042; 76, p. 23; 78, p. 12; 82, p. 3

Notes:

Sample ID	Smurfit-Stone, Source/Soil, Sequential sample number (e.g., 01), 0 to 2 feet below ground surface (Ref. 5, p. 20).
ID	Identification
SQL	Sample Quantitation Limit: for metals = (IDL or MDL x (Final volume/(sample weight x % solids) x dilution factor; for dioxins/furans = (CRQL/% solids) x dilution factor (Ref. 78)
CRQL	Contract required quantitation limit
IDL	Instrument Detection Limit
MDL	Method Detection Limit
CLP	Contract Laboratory Program
pg/g	picograms per gram (equivalent to parts per trillion)
mg/kg	milligrams per kilogram (equivalent to parts per million)
TCDD	Tetrachlorodibenzo-p-dioxin
PeCDD	Pentachlorodibenzo-p-dioxin
HxCDD	Hexachlorodibenzo-p-dioxin
HpCDD	Heptachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran
PeCDF	Pentachlorodibenzofuran

Hazardous Substances Associated with Source No. 1 through Chemical Analysis:

2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,6,7,8-HxCDD
1,2,3,4,6,7,8-HpCDD
Total-TCDD
2,3,7,8-TCDF
2,3,4,7,8-PeCDF
Arsenic
Cadmium
Lead
Manganese

2.2.3 Hazardous Substances Available to a Pathway

Source No. 1 comprises four piles at the Smurfit-Stone Mill property. Source No. 1 samples contain 2,3,7,8-TCDD; 1,2,3,7,8-PeCDD; 1,2,3,6,7,8-HxCDD; 1,2,3,4,6,7,8-HpCDD; Total-TCDD; 2,3,7,8-TCDF; 2,3,4,7,8-PeCDF; arsenic; cadmium; lead; and manganese (Ref. 5, pp. 403, 404, 416-418, 1006-1011, 1038-1045; Table 1 of this HRS documentation record).

None of the ponds constituting Source No. 1 were found to be lined during soil boring activities performed during the combined SI and RA conducted in October 2011 (Ref. 77, pp. 2, 3, 5, 10-13).

Ground water wells were installed into the surficial alluvial aquifer at a few of these boring locations (e.g., SSGW03, SSGW04 and SSGW07) and ground water samples from these wells reveal the presence of many of these same hazardous substances in the ground water beneath, or just downgradient of the source, evidence that hazardous substances have migrated from the source area (Ref. 5, pp. 33, 68, 71, 74-76, 193, 390, 882, 911; Table 4C of this HRS documentation record).

Containment:

Release to ground water:

The sludge ponds were unlined; therefore, a ground water containment factor of 10 is assigned for Source No. 1 (Refs. 1, pp. 51595-51596, Table 3-2, 51629, Section 4.2.2.1.2; 22, p. 44; 77, pp. 2, 3, 5, 10-13).

Containment Description	Containment Factor Value	References
Gas release to air:	NS	NS
Particulate release to air:	NS	NS
Release to ground water: source unlined	10	5, pp. 33, 68, 71, 75, 193; 21, pp. 15-16, 21, 25-27; 22, pp. 3, 44; 77, pp. 2, 3, 5, 10-13.
Release to surface water via overland migration and/or flood:	NS	NS
Release to surface water via ground water to surface water:	10	5, pp. 33, 68, 71, 75, 193; 21, pp. 15-16, 21, 25-27; 22, p. 3; 77, pp. 2, 3, 5, 10-13.

Notes:
NS Not Scored

2.4.2 Hazardous Waste Quantity (HWQ)

2.4.2.1.1 Hazardous Constituent Quantity (Tier A)

The hazardous constituent quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source is not known and cannot be estimated with reasonable confidence (Ref. 1, p. 51591 [Section 2.4.2.1.2]). There are insufficient historical and current data (e.g., manifests, State records, waste concentration sampling data, etc.) available to adequately calculate the total mass of all CERCLA hazardous substances in the source and the associated releases from the source.

Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous constituent quantity for Source No. 1 with reasonable confidence. Scoring, therefore, proceeds to the evaluation of Tier B, hazardous wastestream quantity.

Hazardous Constituent Quantity Assigned Value: Not evaluated.

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

For the reasons stated in Section 2.4.2.1.1 above, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 1 with reasonable confidence, as required by Reference 1, Section 2.4.2.1.2, p. 51591. Scoring, therefore, proceeds to the evaluation of Tier C, volume.

Hazardous Wastestream Quantity Assigned Value: Not Evaluated.

2.4.2.1.3 Volume (Tier C)

The volume of each of the four sludge ponds was determined from a document entitled “Pond Statistics” produced by the Smurfit-Stone Mill, as well as information gathered during the 2011 combined SI and RA (Refs. 5, p. 37; 50, p. 1).

Reference 50 contains pond dimensions that were supplied to the Missoula City-County Health Department by the former Smurfit-Stone Mill. The volume data from Reference 50 will be used to assign the HRS Volume Assigned Value below.

Source Type	Description - dimensions	Units (yd^3)	References
pile	**sludge pond 3** volume in acre-feet: 160 volume in yd^3: 160 x 1613* = 258,080	Volume: 258,080	50, p. 1
pile	**sludge pond 4** volume in acre-feet: 230 volume in yd^3: 230 x 1613* = 370,990	Volume: 370,990	50, p. 1
pile	**sludge pond 5** volume in acre-feet: 336 volume in yd^3: 336 x 1613* = 541,968	Volume: 541,968	50, p. 1
pile	**sludge pond 17** volume in acre-feet: 173 volume in yd^3: 173 x 1613* = 279,049	Volume: 279,049	50, p. 1

* 1 acre foot = 1,613 cubic yards (yd^3)

The sum of the volume of the four sludge ponds at the Smurfit-Stone Mill is:

$$(258{,}080\ yd^3) + (370{,}990\ yd^3) + (541{,}968\ yd^3) + (279{,}049\ yd^3) = 1{,}450{,}087\ yd^3$$

Sum: 1,450,087 yd^3

Equation for Assigning Value (Ref. 1, Table 2-5): Volume/2.5

1,450,087 / 2.5 = 580,034.8

Volume Assigned Value: 580,034.8

2.4.2.1.4 Area (Tier D)

Area (Tier D) is assigned a value of zero when the volume of the source can be determined (Ref. 1, p. 51591, Section 2.4.2.1.3).

Area Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 1 is 580,034.8 for Tier C – Volume (Ref. 1, Table 2-5, p. 51591, Section 2.4.2.1.5).

Source No. 1 HWQ Value: 580,034.8

2.2.1 Source Identification (Continued)

Number of source: Source No. 2

Name of source: Emergency spill pond 8

Source Type: Surface Impoundment

Location of Source (with reference to a map of the site): The emergency spill pond 8 (surface impoundment) is located in the central portion of the Smurfit-Stone Mill property, to the west of the industrial core area, as can be seen in Figure 2 of this HRS documentation record.

Pond 8 was originally one of the wastewater ponds at the Smurfit-Stone Mill and is shown as such in the EIS reports for the expansion of the mill published in 1974, 1985, and 1986 (Refs. 21, pp. 17, 21; 26, p. 6; 38, pp. 2, 5). When pond 8 became formally designated the 'emergency spill pond', and began to capture spills, is not clear from available documents. In 1974 all discharges (or 'sewers') from the three main process areas of the mill (e.g., pulp mill and recovery, paper mill, and the bleach plant) are shown to report directly to the clarifier, with no discrete flow to a spill pond being depicted (Ref. 21, p. 16). However, the presence of a spill pond (for accidental spills of petroleum or chemicals) was noted during a 1993 EPA inspection (Ref. 25, p. 49), and is also shown in the flow diagram for the MPDES permit application in 2004 (Ref. 22, p. 26) and in a wastewater system overview from 2009 (Ref. 50, pp. 1-2).

In approximately 1992, pond 8 was divided into two 'cells': a larger, active 'wet' cell on the north and a smaller 'dry' cell on the south (Refs. 48, p. 21; 51, pp. 11, 15; Figure 2 of this HRS documentation record). The two cells were shown as being connected between 1974 and 1985 (Refs. 21, p. 17; 26, p. 6). The two cells have a combined surface area of approximately 24 acres, an average depth of 5 feet, and a capacity of approximately 120 acre-feet (Ref. 50).

The 'sewers' leading from the pulp mill and the paper mill were both continuously monitored for flow rate and conductivity to identify process upsets or spills (Ref. 22, p. 8). The 1993 EPA inspection report listed a single accidental release of sulfuric acid that had occurred at the mill in March 1991 (Ref. 25, p. 52). Records concerning the dates, quantities, and constituents of any other spills that may have occurred, and been directed to the emergency spill pond, have not been identified.

The first storage ponds that processed wastewater also acted as clarifiers, providing treatment for the wastewater (Ref. 22, p. 5). As a result of (and to prevent additional) accumulation of sludge in the storage ponds, a primary clarifier was constructed at the Smurfit-Stone Mill in 1969-1970 (Ref. 22, p. 5). Prior to the construction and operation of the clarifier, wastewater containing sludge was temporarily held in wastewater storage ponds (as well as directly discharged to the Clark Fork River) (Ref. 22, p. 5). Pond 8 is shown as a wastewater storage pond in the EIS reports for the expansion of the mill published in 1974, 1985, and 1986, and therefore would have accumulated sludge in its bottom during its use (Refs. 21, pp. 17, 21; 26, p. 6). The presence of sludge in the emergency spill pond was confirmed by a subsurface boring (SSSO13) placed within the 'dry cell' of the emergency spill pond during the combined SI and RA conducted in October 2011 (Refs. 77, p. 14; 79, p. 11). This boring revealed that no liner existed between the sludge and the underlying, in situ alluvial material (Refs. 77, p. 14; 79, p. 11).

At the time of the EPA-START PA investigation of June 2011, the 'wet' cell of pond 8 had free liquids present (Ref. 48, pp. 21, 64, 65, 66). No evidence of a liner, or functioning leachate collection and removal system above a liner was observed at the emergency spill pond during either the June 2011 PA investigation, or during the combined SI and RA investigation conducted in October 2011 (Ref. 77, pp. 14). No cover over the pond was present (Refs. 48, pp. 64-68; 79, p. 3). A breach through the dike (into

pond 9) was noted in the northwest corner of the 'wet' cell, showing that the diking was unsound (Ref. 48, pp. 21, 66; Figure 2 of this HRS documentation record).

In October 2011, EPA-START conducted a combined site inspection and removal assessment at the Smurfit-Stone Mill property (Ref. 5, p. 7). Field activities included the collection of five samples from directly within the emergency spill pond 8, with samples being collected from each cell (Ref. 5, pp. 21-22, 73, 78; Figure 3 of this HRS documentation record). Two of the samples were replicates collected for QA/QC purposes. Four of these samples were collected from 0 to 2 feet bgs and one was collected from below 2 feet bgs (Ref. 5, pp. 20-22, 73, 78). Samples collected from the emergency spill pond were moist, organic-rich, dark grey to black, non-cohesive, fibrous and with a sulfur odor (Refs. 5, p. 186; 77, p. 14; 79, p. 11).

Five of these samples will be used to characterize Source No. 2 (Ref. 5, pp. 406, 417, 418, 1046-1048, 1050-1051). These samples contained hazardous substances, including: 2,3,7,8-TCDD; 1,2,3,7,8-PeCDD; 1,2,3,6,7,8-HxCDD; 1,2,3,4,6,7,8-HpCDD; Total-TCDD; 2,3,7,8-TCDF; 2,3,4,7,8-PeCDF; and manganese (Ref. 5, pp. 30-32, 60; Table 2 of this HRS documentation record).

2.2.2 Hazardous Substances

EPA-START collected the source samples listed in Table 2 during the October 2011 combined SI and RA at the Smurfit-Stone Mill property (Ref. 5, p. 7). Five samples were collected from Source No. 2 during the same sampling event (Ref. 5, pp. 21-22, 72-73, 78; Figure 3 of this HRS documentation record). Four of these samples were collected from 0 to 2 feet bgs and the remaining sample was collected from below 2 feet bgs (Ref. 5, pp. 20, 21, 72, 73, 78). All five samples will be used to characterize Source No. 2.

All Source No. 2 samples were collected with disposable plastic scoops either from a plastic core sleeve emplaced into the source material with a hydraulic-push machine or, in places that the machine could not safely access, directly from the surface of the source being sampled (Ref. 5, pp. 21, 25, 186, 189). All plastic sleeves and scoops used during the project were new, certified clean, single-use disposable sleeves and scoops that were used once (Ref. 5, pp. 25, 57, 205, 210).

A steel shovel was used at some locations to break up the surface material (e.g., if it was frozen) to ease the collection of the samples with plastic scoops (Ref. 5, p. 25). The shovel was decontaminated prior to its initial use and then between sampling locations where it was used as per EPA-START TSOP 4.11 "Equipment Decontamination" (Ref. 53, pp. 13, 14). A rinsate blank was collected from the shovel to document thoroughness of the decontamination procedures and to determine if any cross-contamination occurred (Ref. 5, pp. 25, 187). Results from the rinsate sample show that cross-contamination did not occur (Ref. 5, pp. 114, 121, 122, 125-126, 130-132, 134).

For the deeper location where a hydraulic-push machine was used to first collect source material into a plastic sleeve, the same stainless steel cutting shoe was used for each location. The cutting shoe is the only reusable part of the sampling system that makes contact with in situ soils. The drilling subcontractor decontaminated the cutting shoe prior to its initial use and then between sampling locations using a method equivalent to that in TSOP 4.11. A rinsate blank (sample SSSW89) was collected from both the shovel and the cutting shoe to assess the quality and thoroughness of the decontaminating procedures used (Ref. 5, pp. 25, 54, 78, 187). The analytical results from this rinsate sample showed no concentrations of contaminants of concern (Ref. 5, pp. 114, 121, 122, 125-126, 130-132, 134).

All samples from Source No. 2 were analyzed for dioxins and furans using EPA Method 8290A by the private laboratory ALS Laboratory Group in Burlington, Ontario, Canada, and for total TAL metals using ICP-AES using method CLP-ISM01.3 by the EPA CLP RAS laboratory, Chemtech Consulting Group,

Inc., in Mountainside, New Jersey. EPA-START contractor TechLaw, Inc. reviewed all dioxin and furan data according to the "National Functional Guidelines for Chlorinated Dibenzo-p-dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review September 2011" and reviewed all metals data in accordance with "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," January 2010 (Ref. 5, pp. 7-9, 27, 52, 53, 408, 410, 1022, 1024).

Sample-specific quantitation limits have been calculated for each Source No. 2 analytical result and are listed in Table 2 of this HRS documentation record (Refs. 1, p. 51586; 78, pp. 14-17, 31, 33, 35-40). Logbook notes regarding sample collection details, including sample collection dates, are provided in Reference 5 (pp. 195-215). The chain-of-custody records are provided in Reference 76 (pp. 1-39) and Reference 67 (pp. 148-149). The locations of all samples are depicted in Figure 3 of this HRS documentation record, and are described in Reference 5 (pp. 73, 78).

Bleaching pulp mills in particular are responsible for the formation of dioxins and furans (Refs. 37, pp. 2, 4, 5; 44, p. 1-5; 45, p. 3). The Smurfit-Stone Mill produced bleached pulp and paper from 1960 through 1999 (Refs. 16, p. 1; 21, pp. 7, 13, 16; 22, pp. 7, 9; 25, p. 9; 26, p. 5). In a study performed by the EPA where wastewater effluent from bleaching kraft mills was sampled, 90 of 107 samples (84 percent) contained detectable amounts of 2,3,7,8-TCDD and 104 of 111 samples (94 percent) contained detectable quantities of 2,3,7,8-TCDF (Ref. 45, p. 5). In the same study, 94 of 97 sludge samples (97 percent) collected from bleaching kraft mills contained detectable amounts of 2,3,7,8-TCDD and 100 percent of the 97 samples contained detectable amounts of 2,3,7,8-TCDF (Ref. 45, pp. 5, 8).

None of the mills sampled were free of either compound (Ref. 45, p. 4). A subset of samples from nine mills were also analyzed for 2,3,7,8-substituted CDDs and CDFs. The most common 2,3,7,8-substituted CDDs and CDFs found across all matrices sampled were 1,2,3,4,6,7,8-HpCDD; OCDD; 1,2,3,7,8-PeCDF; 2,3,4,7,8-PeCDF; and OCDF (Ref. 45, pp. 24-27).

Analytical results from the sampling of the emergency spill pond on the Smurfit-Stone Mill property show that a number of dioxin and furan compounds are present (Ref. 5, pp. 67, 69, 73, 78, 406, 417-418; Table 2 of this HRS documentation record).

The EPA published a report in November 2006 that, in part, reported on the releases of metals reported by pulp and paper mills through the TRI database (Ref. 44, pp. xvi, 1-1, 4-8). Manganese was the metal with the highest TWPE reported for both types of mills (Ref. 44, p. 4-8). Wood is a major source of manganese in the kraft process (Ref. 44, p. 6-20). The Smurfit-Stone Mill (known at that time as Stone Container Corporation) was one of the mills for which TRI data was compiled (Ref. 44, p. A-6).

The presence of metals in wastewater discharge from the mill was noted in the EIS for the mill, and total manganese was detected at a concentration of 0.219 mg/L within a representative wastewater sample collected by the Smurfit-Stone Mill as part of MPDES permit requirements (Ref. 22, pp. 56, 61, 81).

Analytical results from the sampling of the emergency spill pond on the Smurfit-Stone Mill property show that manganese is present in the pond (Refs. 5, pp. 67, 69, 73, 78, 1047-1048, 1050-1051; Table 2 of this HRS documentation record).

TABLE 2: Source Samples - Source No. 2 (Emergency Spill Pond 8) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (SQL) (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
SSSO1402	10/28/11	wet cell	1,2,3,4,6,7,8-HpCDD	157	101.05	5, pp. 67, 73, 205, 417; 67, p. 149; 78, p. 31
(MH3BC7)	"	"	Manganese	1,470	0.03	5, pp. 67, 73, 205, 1048; 76, p. 23; 78, p. 14; 82, p. 3
SSSO8902 (replicate of SSSO1402)	"	"	1,2,3,4,6,7,8-HpCDD	128	105.77	5, pp. 67, 78, 205, 418; 67, p. 149; 78, p. 33
(MH3BC9)	"	"	Manganese	1,580	0.03	5, pp. 67, 78, 205, 1050; 76, p. 23; 78, p. 15; 82, p. 3
SSSO1302	10/28/11	dry cell	2,3,7,8-TCDD	1.22	0.97	5, pp. 67, 73, 205, 406; 67, p. 148; 78, p. 35
"	"	"	1,2,3,6,7,8-HxCDD	4.24	2.50	5, pp. 67, 73, 205, 406; 67, p. 148; 78, p. 35
"	"	"	1,2,3,4,6,7,8-HpCDD	72.7	2.86	5, pp. 67, 73, 205, 406; 67, p. 148; 78, p. 35
"	"	"	Total-TCDD	6.84	0.97	5, pp. 67, 73, 205, 406; 67, p. 148; 78, p. 36
"	"	"	2,3,7,8-TCDF	5.58	1.20	5, pp. 67, 73, 205, 406; 67, p. 148; 78, p. 36
"	"	"	2,3,4,7,8-PeCDF	2.18	0.45	5, pp. 67, 73, 205, 406; 67, p. 148; 78, p. 36
(MH3BC5)		"	Manganese	1,870	0.07	5, pp. 67, 73, 205, 1046; 76, p. 23; 78, p. 16; 82, p. 3
SSSO9902 (replicate of SSSO1302)	10/28/11	"	1,2,3,7,8-PeCDD	1.12	0.65	5, pp. 67, 78, 205, 418; 67, p. 149; 78, p. 37
"	"	"	1,2,3,6,7,8-HxCDD	6.05	1.19	5, pp. 67, 78, 205, 418; 67, p. 149; 78, p. 37

TABLE 2: Source Samples - Source No. 2 (Emergency Spill Pond 8) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (SQL) (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
"	"	"	1,2,3,4,6,7,8-HpCDD	92.8	2.44	5, pp. 67, 78, 205, 418; 67, p. 149; 78, p. 37
"	"	"	Total-TCDD	8.12	0.66	5, pp. 67, 78, 205, 418; 67, p. 149; 78, p. 38
"	"	"	2,3,7,8-TCDF	5.67	0.94	5, pp. 67, 78, 205, 418; 67, p. 149; 78, p. 38
"	"	"	2,3,4,7,8-PeCDF	0.938	0.30	5, pp. 67, 78, 205, 418; 67, p. 149; 78, p. 38
(MH3BD0)	"	"	Manganese	1,560	0.05	5, pp. 67, 78, 205, 1051; 76, p. 23; 78, p. 16; 82, p. 3
SSSO1306	10/28/11	"	1,2,3,4,6,7,8-HpCDD	8.46	0.40	5, pp. 67, 73, 205, 417; 67, p. 149; 78, p. 39
"	"	"	Total-TCDD	0.405	0.08	5, pp. 67, 73, 205, 417; 67, p. 149; 78, p. 40
(MH3BC6)	"	"	Manganese	104	0.04	5, pp. 67, 73, 205, 1047; 76, p. 23; 78, p. 17; 82, p. 3

Notes:

Sample ID	Smurfit-Stone, Source/Soil, Sequential sample number (e.g., 01), 0 to 2 feet below ground surface (Ref. 5, p. 20).
ID	Identification
SQL	Sample Quantitation Limit: for metals = IDL or MDL x (final volume/(sample weight x % solids) x dilution factor; for dioxins/furans = (CRQL/% solids) x dilution factor (Ref. 78)
CRDL	Contract required detection limit
IDL	Instrument detection limit
MDL	Method detection limit
CLP	Contract Laboratory Program
pg/g	picograms per gram (equivalent to parts per trillion)
mg/kg	milligrams per kilogram (equivalent to parts per million)
TCDD	Tetrachlorodibenzo-p-dioxin
PeCDD	Pentachlorodibenzo-p-dioxin

HxCDD	Hexachlorodibenzo-p-dioxin
HpCDD	Heptachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran
PeCDF	Pentachlorodibenzofuran

Hazardous Substances Associated with Source No. 2 through Chemical Analysis:

2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,6,7,8-HxCDD
1,2,3,4,6,7,8-HpCDD
Total-TCDD
2,3,7,8-TCDF
2,3,4,7,8-PeCDF
Manganese

2.2.3 Hazardous Substances Available to a Pathway

Source No. 2 consists of one surface impoundment (emergency spill pond 8) at the Smurfit-Stone Mill property (see Figure 2 of this HRS documentation record). Source No. 2 samples contain 2,3,7,8-TCDD; 1,2,3,7,8-PeCDD; 1,2,3,6,7,8-HxCDD; 1,2,3,4,6,7,8-HpCDD; Total-TCDD; 2,3,7,8-TCDF; 2,3,4,7,8-PeCDF; and manganese (Ref. 5, pp. 406, 417, 418, 1046, 1047, 1048, 1050-1051) (See Table 2 of this HRS documentation record).

As seepage was one of the principal methods of discharge of wastewater from the mill since its inception (Ref. 22, p. 3), it follows that none of the wastewater storage ponds, including the emergency spill pond 8, would have been lined (Ref. 21, pp. 15, 16, 21, 25, 27). A soil boring (SSSO13) was placed through the sludge and into the underlying in situ alluvial material in the dry cell of the emergency spill pond 8 during the combined SI and RA conducted in October 2011 (Ref. 5, pp. 21, 67, 69, 73). No liner was identified in the soil boring (Ref. 77, p. 14).

Ground water samples collected from two wells (SSGW11 and SSGW15) completed in the surficial alluvial aquifer immediately adjacent to and downgradient of Source No. 2 reveal the presence of manganese in the ground water (Ref. 5, pp. 75-76, 917, 953; Table 4C of this HRS documentation record).

Containment:

Release to ground water:

The emergency spill pond 8 was unlined; therefore, a ground water containment factor of 10 is assigned for Source No. 2 (Refs. 1, pp. 51595-51596 (Table 3-2), 51629, Section 4.2.2.1.2; 21, pp. 15-16, 21, 25-27; 22, pp. 3, 44; 77, p. 14).

Containment Description	Containment Factor Value	References
Gas release to air:	NS	NS
Particulate release to air:	NS	NS
Release to ground water: Source unlined	10	5, pp. 21, 67, 69, 73, 75-76, 78, ; 21, pp. 15-16, 21, 25-27; 22, pp. 3, 44; 77, p. 14
Release to surface water via overland migration and/or flood:	NS	NS
Release to surface water via ground water to surface water:	10	5, pp. 21, 67, 69, 73, 75-76, 78, ; 21, pp. 15-16, 21, 25-27; 22, p. 3; 77, p. 14

Notes:
NS Not Scored

2.4.2 Hazardous Waste Quantity (HWQ)

2.4.2.1.1 Hazardous Constituent Quantity (Tier A)

The hazardous constituent quantity for Source No. 2 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source is not known and cannot be estimated with reasonable confidence (Ref. 1, pp. 51590-51591 [Section 2.4.2.1.1]). There are insufficient historical and current data (e.g., manifests, state records, waste concentration sampling data, etc.) available to adequately calculate the total mass of all CERCLA hazardous substances in the source and the associated releases from the source.

Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous constituent quantity for Source No. 2 with reasonable confidence. Scoring, therefore, proceeds to the evaluation of Tier B, hazardous wastestream quantity.

Hazardous Constituent Quantity Assigned Value: Not evaluated.

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

For the reasons stated in Section 2.4.2.1.1 above, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 2 with reasonable confidence, as required by Reference 1, Section 2.4.2.1.2, p. 51591. Scoring, therefore, proceeds to the evaluation of Tier C, volume.

Hazardous Wastestream Quantity Assigned Value: Not Evaluated.

2.4.2.1.3 Volume (Tier C)

The volume of the emergency spill pond 8 was determined from a document entitled “Pond Statistics” produced by the Smurfit-Stone Mill, as well as information gathered during the 2011 combined SI and RA (Refs. 5, p. 37; 50).

Reference 50 contains pond dimensions that were supplied to the Missoula City-County Health Department by the former Smurfit-Stone Mill. The volume data from Reference 50 will be used to assign the HRS Volume Assigned Value below.

Source Type	Description - dimensions	Units (yd^3)	References
surface impoundment	**emergency spill pond 8** volume in acre-feet: 120 volume in yd^3: 120 x 1613* = 193,560	Volume: 193,560	50, p. 1

* 1 acre foot = 1,613 cubic yards (yd^3)

Equation for Assigning Value (Ref. 1, Table 2-5): Volume/2.5

193,560 / 2.5 = 77,424

Volume Assigned Value: 77,424

2.4.2.1.4 Area (Tier D)

Area (Tier D) in assigned a value of zero when the volume of a source can be determined, as required by Reference 1, Section 2.4.2.1.3, p. 51591.

Area Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 2 is 77,424 for Tier C – Volume (Ref. 1, Table 2-5, p. 51591, Section 2.4.2.1.5).

Source HWQ Value: 77,424

2.2.1 Source Identification (Continued)

Number of source: Source No. 3

Name of source: Wastewater storage pond 2

Source Type: Surface Impoundment

Location of Source (with reference to a map of the site): Wastewater storage pond 2 (surface impoundment) is located in the southwest corner of the Smurfit-Stone Mill property, to the southwest of the industrial core area, adjacent to the Clark Fork River, as can be seen in Figure 2 of this HRS documentation record.

Wastewater storage pond 2 was one of the wastewater ponds at the Smurfit-Stone Mill and is shown as such in the EIS reports for the mill published in 1974, 1985, and 1986 (Refs. 21, pp. 17, 21; 26, p. 6; 38, p. 5). The first storage ponds that processed wastewater also acted as clarifiers, providing treatment for the wastewater (Ref. 22, p. 5). As a result of (and to prevent additional) accumulation of sludge in the storage ponds, a primary clarifier was constructed at the Smurfit-Stone Mill in 1969-1970 (Ref. 22, p. 5). Prior to the construction and operation of the clarifier, wastewater containing sludge was temporarily held in wastewater storage ponds (as well as directly discharged to the Clark Fork River) (Ref. 22, p. 5). Wastewater pond 2, therefore, would have accumulated sludge during its use (Refs. 21, pp. 17, 21; 26, p. 6).

At the time of the EPA-START PA investigation of June 2011 and the combined SI and RA conducted in October 2011, wastewater storage pond 2 was mostly dry, with standing water present in a few places and large areas of vegetation (Refs. 5, p. 191; 48, p. 53). No evidence of a liner or functioning leachate collection and removal system above a liner was observed at the pond, and the pond did not have a maintained engineered cover (Refs. 5, p. 191; 48, p. 53; 79, p. 6).

The pond has a surface area of approximately 121 acres, an average depth of 11.7 feet, and a capacity of approximately 1,414 acre-feet (Refs. 5, p. 37; 50). Standing water was present on the surface of the pond in a photo dated June 10, 2011 (Ref. 48, p. 53. Pond is present along bottom of photo).

In October 2011, EPA-START, conducted a combined SI and RA at the Smurfit-Stone Mill property (Ref. 5, p. 7). Field activities included the collection of two samples from directly within pond 2 (Ref. 5, pp. 22, 67, 69, 73; Figure 3 of this HRS documentation record). Both samples were collected from 0 to 2 feet bgs (Ref. 5, pp. 25, 73). The samples collected from the wastewater pond 2 were primarily sandy and clayey silt with blebs of dark, organic material and pieces of wood (Refs. 5, p. 200; 79, p. 6).

Both of these samples will be used to characterize Source No. 3. These samples contained hazardous substances, including: 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD); 1,2,3,7,8-pentachlorodibenzo-p-dioxin (PeCDD); 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin (HxCDD); 2,3,7,8-tetrachlorodibenzofuran (TCDF); 2,3,4,7,8-pentachlorodibenzofuran (PeCDF); and manganese (Ref. 5, pp. 30-34, 60, 67, 69, 200, 404, 1036-1037; Table 3 of this HRS documentation record).

2.2.2 Hazardous Substances

EPA-START collected the source samples listed in Table 3 during the October 2011 combined SI and RA at the Smurfit-Stone Mill property (Ref. 5, p. 7). Two samples were collected from Source No. 3 during the same sampling event (Ref. 5, pp. 22, 73; Figure 3 of this HRS documentation record). Both of these

samples were collected from 0 to 2 feet bgs and both will be used to characterize Source No. 3 (Ref. 5, pp. 20, 22, 73).

Both Source No. 3 samples were collected with disposable plastic scoops directly from the surface of the source being sampled (Ref. 5, pp. 21-22, 25; Ref. 79, p. 6). All plastic scoops used during the project were new, certified clean, single-use disposable scoops that were used once (Ref. 5, pp. 25, 57, 200, 210).

A steel shovel was used at some locations to break up the surface material (e.g., if it was frozen) to ease the collection of the samples with plastic scoops (Ref. 5, p. 25). The shovel was decontaminated prior to its initial use and then between sampling locations where it was used as per EPA-START TSOP 4.11 "Equipment Decontamination" (Ref. 53, pp. 13, 14). A rinsate blank was collected from the shovel to document thoroughness of the decontamination procedures and to determine if any cross-contamination occurred (Ref. 5, pp. 25, 54, 78, 187). Results from the rinsate sample show that cross-contamination did not occur (Ref. 5, pp. 114, 121, 122, 125-126, 130-132, 134).

Both samples from Source No. 3 were analyzed for dioxins and furans using EPA Method 8290A by the private laboratory ALS Laboratory Group in Burlington, Ontario, Canada, and for total TAL metals using ICP-AES using method CLP-ISM01.3 by the EPA CLP RAS laboratory, Chemtech Consulting Group, Inc., in Mountainside, New Jersey. EPA-START contractor TechLaw, Inc. reviewed all dioxin and furan data according to the "National Functional Guidelines for Chlorinated Dibenzo-p-dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review September 2011" and reviewed all metals data in accordance with "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," January 2010 (Ref. 5, pp. 7, 8, 9, 52, 53, 394, 395, 397, 1022, 1024).

Sample-specific quantitation limits have been calculated for each Source No. 3 analytical result and are listed in Table 3 of this HRS documentation record (Refs. 1, p. 51586; 78, pp. 17-18, 26-30). Logbook notes regarding sample collection details, including sample collection dates, are provided in Reference 5 (pp. 195-215). The chain-of-custody records are provided in Reference 76 (pp. 1-39) and Reference 67 (p. 154). The locations of all samples are depicted in Figure 3 of this HRS documentation record, and are described in Reference 5 (pp. 72, 73).

Bleaching pulp mills in particular are responsible for the formation of dioxins and furans (Refs. 37, pp. 2, 4, 5; 44, p. 1-5; 45, p. 3). The Smurfit-Stone mill produced bleached pulp and paper from 1960 through 1999 (Refs. 16, p. 1; 21, p. 34; 22, pp. 7, 9; 25, p. 9; 26, p. 5). In a study performed by the EPA where wastewater effluent from bleaching kraft mills was sampled, 90 of 107 samples (84 percent) contained detectable amounts of 2,3,7,8-TCDD and 104 of 111 samples (94 percent) contained detectable quantities of 2,3,7,8-TCDF (Ref. 45, p. 5). In the same study, 94 of 97 sludge samples (97 percent) collected from bleaching kraft mills contained detectable amounts of 2,3,7,8-TCDD and 100 percent of the 97 samples contained detectable amounts of 2,3,7,8-TCDF (Ref. 45, pp. 5, 8).

None of the mills sampled were free of either compound (Ref. 45, p. 4). A subset of samples from nine mills were also analyzed for 2,3,7,8-substituted CDDs and CDFs. The most common 2,3,7,8-substituted CDDs and CDFs found across all matrices sampled were 1,2,3,4,6,7,8-HpCDD; OCDD; 1,2,3,7,8-PeCDF; 2,3,4,7,8-PeCDF; and OCDF (Ref. 45, pp. 24-27).

Analytical results from the sampling of wastewater storage pond 2 on the Smurfit-Stone Mill property show that a number of dioxin and furan compounds are present (Ref. 5, pp. 67, 69, 73, 404; Table 3 of this HRS documentation record).

The EPA published a report in November 2006 that, in part, reported on the releases of metals reported by pulp and paper mills through the TRI database (Ref. 44, pp. xvi, 1-1, 4-8). Manganese was the metal with

the highest TWPE reported for both types of mills (Ref. 44, pp. xvi, 4-8). Additionally, wood has been noted as a major source of manganese in the kraft process (Ref. 44, p. 6-20). The Smurfit-Stone Mill (known at that time as Stone Container Corporation) was one of the mills for which TRI data was compiled (Ref. 44, p. A-6).

The presence of metals in wastewater discharge from the mill was noted in the EIS for the mill, and total manganese was detected at a concentration of 0.219 mg/L within a representative wastewater sample collected by the Smurfit-Stone Mill as part of MPDES permit requirements (Refs. 22, pp. 61, 81).

Analytical results from the sampling of wastewater storage pond 2 on the Smurfit-Stone Mill property show that manganese is present in the pond (Ref. 5, pp. 67, 69, 73, 1036, 1037; Table 3 of this HRS documentation record).

TABLE 3: Source Samples - Source No. 3 (Wastewater Storage Pond 2) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (SQL) (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
SSSO1502	10/25/11	wastewater storage pond 2	2,3,7,8-TCDD	4.76	0.15	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 26
“	“	“	1,2,3,7,8-PeCDD	3.61	0.37	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 27
“	“	“	1,2,3,6,7,8-HxCDD	15.0	0.86	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 27
“	“	“	1,2,3,4,6,7,8-HpCDD	67.4	0.91	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 27
“	“	“	Total-TCDD	10.3	0.14	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 28
“	“	“	2,3,7,8-TCDF	7.98	0.38	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 28
“	“	“	2,3,4,7,8-PeCDF	0.756	0.24	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 28
(MH30S4)	“	“	Manganese	238	0.04	5, pp. 67, 73, 200, 1036, 1065; 76, p. 36; 78, p. 17
SSSO1602	10/25/11	“	2,3,7,8-TCDD	1.14	0.09	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 29
“	“	“	1,2,3,6,7,8-HxCDD	2.88	0.27	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 29
“	“	“	1,2,3,4,6,7,8-HpCDD	13.2	0.47	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 29
“	“	“	Total-TCDD	1.32	0.08	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 30
“	“	“	2,3,7,8-TCDF	2.84	0.14	5, pp. 67, 73, 200, 404; 67, p. 154; 78, p. 30

TABLE 3: Source Samples - Source No. 3 (Wastewater Storage Pond 2) (Collected October 2011)						
Sample Location and private lab ID (CLP Sample ID for metals)	**Sample Collection Date**	**Location**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/g) (metals-mg/kg)**	**Sample Quantitation Limit (SQL) (dioxins/furans-pg/g) (metals-mg/kg)**	**References**
(MH30S5)	"	"	Manganese	98.2	0.04	5 pp. 67, 73, 200, 1037, 1065; 76, p. 36; 78, p. 18

Notes:

Sample ID	Smurfit-Stone, Source/Soil, Sequential sample number (e.g., 01), 0 to 2 feet below ground surface (Ref. 5, p. 20).
ID	Identification
SQL	Sample Quantitation Limit: for metals = IDL x (final volume/(sample weight x % solids)) x dilution factor; for dioxins/furans = (CRQL/% solids) x dilution factor (Ref. 78)
CRQL	Contract Required Quantitation Limit
IDL	Instrument Detection Limit
CLP	Contract Laboratory Program
pg/g	picograms per gram (equivalent to parts per trillion)
mg/kg	milligrams per kilogram (equivalent to parts per million)
TCDD	Tetrachlorodibenzo-p-dioxin
PeCDD	Pentachlorodibenzo-p-dioxin
HxCDD	Hexachlorodibenzo-p-dioxin
HpCDD	Heptachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran
PeCDF	Pentachlorodibenzofuran

Hazardous Substances Associated with Source No. 3 through Chemical Analysis:

2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,6,7,8-HxCDD
1,2,3,4,6,7,8-HpCDD
Total-TCDD
2,3,7,8-TCDF
2,3,4,7,8-PeCDF
Manganese

2.2.3 Hazardous Substances Available to a Pathway

Source No. 3 consists of one surface impoundment (wastewater storage pond 2) at the Smurfit-Stone Mill property (see Figure 2 of this HRS documentation record). Source No. 3 samples contain 2,3,7,8-TCDD; 1,2,3,7,8-PeCDD; 1,2,3,6,7,8-HxCDD; 1,2,3,4,6,7,8-HpCDD; Total-TCDD; 2,3,7,8-TCDF; 2,3,4,7,8-PeCDF; and manganese (Ref. 5, pp. 404, 1036, 1037) (see Table 2 of this HRS documentation record).

As seepage was one of the principal methods of discharge of wastewater from the mill since its inception (Ref. 22, pp. 3, 5), it follows that none of the ponds, including wastewater pond 2, would have been lined (Ref. 21, pp. 15, 16, 21, 25-27).

Contamination of ground water caused by the disposal of wastewater through storage ponds was formally recognized by 1974 and has been acknowledged by the mill (Refs. 21, pp. 36, 37, 39; 38, p. 10; 51, pp. 1, 18). A 2004 report related to ground water beneath the property notes that the ground water beneath the ponds is generally similar in quality to the treated process wastewater in the storage ponds (Ref. 59, p. 11).

A ground water sample collected from a well (SSGW13) completed in the surficial alluvial aquifer immediately adjacent to and downgradient of Source No. 3 reveals the presence of manganese in the ground water (Ref. 5, pp. 76, 951; 59, p. 52; Table 4C and Figure 3 of this HRS documentation record). This indicates that the hazardous substance manganese has migrated from this source.

Containment:

Release to ground water:

The wastewater ponds, including wastewater storage pond 2, were unlined; therefore, a ground water containment factor of 10 is assigned for Source No. 3 (Refs. 1, pp. 51595-51596 (Table 3-2), 51629, Section 4.2.2.1.2); 21, pp. 15-16, 21, 25-27; 22, pp. 3, 44).

Containment Description	Containment Factor Value	References
Gas release to air:	NS	NS
Particulate release to air:	NS	NS
Release to ground water: Source unlined	10	21, pp. 15-16, 21, 25-27, 36-37, 39; 22, pp. 3, 44; 38, p. 10; 51, pp. 1, 18
Release to surface water via overland migration and/or flood:	NS	NS
Release to surface water via ground water to surface water:	10	21, pp. 15-16, 21, 25-27, 36-37, 39; 22, p. 3; 38, p. 10; 51, pp. 1, 18

Notes:
NS Not Scored

2.4.2 Hazardous Waste Quantity (HWQ)

2.4.2.1.1 Hazardous Constituent Quantity (Tier A)

The hazardous constituent quantity for Source No. 3 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source is not known and cannot be estimated with reasonable confidence (Ref. 1, pp. 51590-51591 [Section 2.4.2.1.1]). There are insufficient historical and current data (e.g., manifests, state records, waste concentration sampling data, etc.) available to adequately calculate the total mass of all CERCLA hazardous substances in the source and the associated releases from the source.

Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous constituent quantity for Source No. 3 with reasonable confidence. Scoring, therefore, proceeds to the evaluation of Tier B, hazardous wastestream quantity.

Hazardous Constituent Quantity Assigned Value: Not evaluated.

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

For the reasons stated in Section 2.4.2.1.1 above, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 3 with reasonable confidence, as required by Reference 1, Section 2.4.2.1.2, p. 51591. Scoring, therefore, proceeds to the evaluation of Tier C, volume.

Hazardous Wastestream Quantity Assigned Value: Not Evaluated.

2.4.2.1.3 Volume (Tier C)

The volume of wastewater pond 2 was determined from a document entitled “Pond Statistics” produced by the Smurfit-Stone Mill (Ref. 50).

Reference 50 contains pond dimensions that were supplied to the Missoula City-County Health Department by the former Smurfit-Stone Mill. The volume data from Reference 50 will be used to assign the HRS Volume Assigned Value below.

Source Type	Description - dimensions	Units (yd^3)	References
surface impoundment	**wastewater storage pond 2** volume in acre-feet: 1,414 volume in yd^3: 1,414 x 1613* = 2,280,782	Volume: 2,280,782	50, p. 1

* 1 acre foot = 1,613 cubic yards (yd^3)

Equation for Assigning Value (Ref. 1, Table 2-5): Volume/2.5

2,280,782 / 2.5 = 912,312.8

Volume Assigned Value: 912,312.8

2.4.2.1.4 Area (Tier D)

Area (Tier D) is assigned a value of zero when volume of a source can be determined, as required by Reference 1, Section 2.4.2.1.3, p. 51591.

Area Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source HWQ value for Source No. 3 is 912,312.8 for Tier C – Volume (Ref. 1, Table 2-5, p. 51591, Section 2.4.2.1.5).

Source HWQ Value: 912,312.8

SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Y/N)	Containment Factor Value by Pathway				
			Ground-water (GW) (Ref. 1, Table 3-2)	Surface Water (SW)		Air	
				Overland/ flood (Ref. 1, Table 4-2)	GW to SW (Ref. 1, Table 3-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	580,034.8	No	10	NE	10	NE	NE
2	77,424	No	10	NE	10	NE	NE
3	912,312.8	No	10	NE	10	NE	NE
Sum of values*	1,569,772						

Notes:
NE Not evaluated
* In accordance with Section 2.4.2.2 of the HRS (Ref. 1, p. 51591), the sum of the factor values is rounded to the nearest integer.

2.5 Other Possible On-Site Sources

Wastewater Aeration Basins (I, II, and III), Polishing Ponds (North and South), and Additional Wastewater Storage Ponds (1, 1A, 7, 9, 10, 11, 12, 13, 13A, 16, 18)

Given the interconnected nature of the wastewater flow paths at the facility (particularly prior to the installation of the primary clarifier) and the hazardous substances already identified within the sludge ponds, the emergency spill pond 8, and the wastewater storage pond 2 (Sources 1, 2 and 3); it is possible that the three aeration basins, two polishing ponds, and the remaining wastewater storage ponds at the mill would have similar types and concentrations of hazardous substances to those identified in Sources 1, 2 and 3 through chemical analysis (e.g., dioxins, furans, and metals including manganese) (Refs. 5, pp. 30-32, 67, 69, 72-73, 78, 403, 404, 416-418, 1006-1011, 1036-1050; 21, p. 16; 22, pp. 5-10, 25-30; 26, p. 13; Tables 1, 2 and 3 of this HRS documentation record).

Aeration basins I and II were constructed in 1974-1975, while aeration basin III (formerly pond 14) was constructed in 1990 (Refs. 22, p. 9; 26, pp. 6, 12; 48, p. 21; 50, pp. 1-2). In addition to aeration, supplemental nutrients (nitrates and phosphates) were added to the basins to enhance and maintain bacterial populations to assist with water treatment (Refs. 22, p. 9; 26, p. 12). The three basins have a combined surface area of 56 acres, an average depth of 12 feet, and a total capacity of approximately 670 acre-feet (Ref. 50).

The north polishing pond (formerly wastewater storage pond 15) and south polishing pond (formerly part of wastewater storage pond 14) were used for further settling of biological solids after aeration of the wastewater (Refs. 21, p. 17; 22, p. 9; 26, p. 6; Ref. 50, pp. 1-2). The two polishing ponds have a combined surface area of 43 acres, an average depth of 7.6 feet, and a total capacity of 328 acre-feet (Ref. 50).

After polishing, treated wastewater was diverted to additional storage ponds prior to discharge from 3 outfalls to the Clark Fork River (Ponds 1, 1A, 2, 7, 9, 10, 11, 12, 13, 13A, 16, 18) (Ref. 22, pp. 9, 27, 44). The 12 ponds have a combined surface area of 707 acres, an average depth of approximately 8 feet, and a total capacity of 5,772 acre-feet (Ref. 50). Surface materials within one of these ponds (wastewater storage pond 2) were sampled as part of the combined SI and RA conducted at the property in October 2011, and this pond is considered Source No. 3 within this HRS documentation record.

In total, the above basins and ponds have a combined surface area of approximately 806 acres and total capacity of approximately 6,770 acre-feet (Ref. 50).

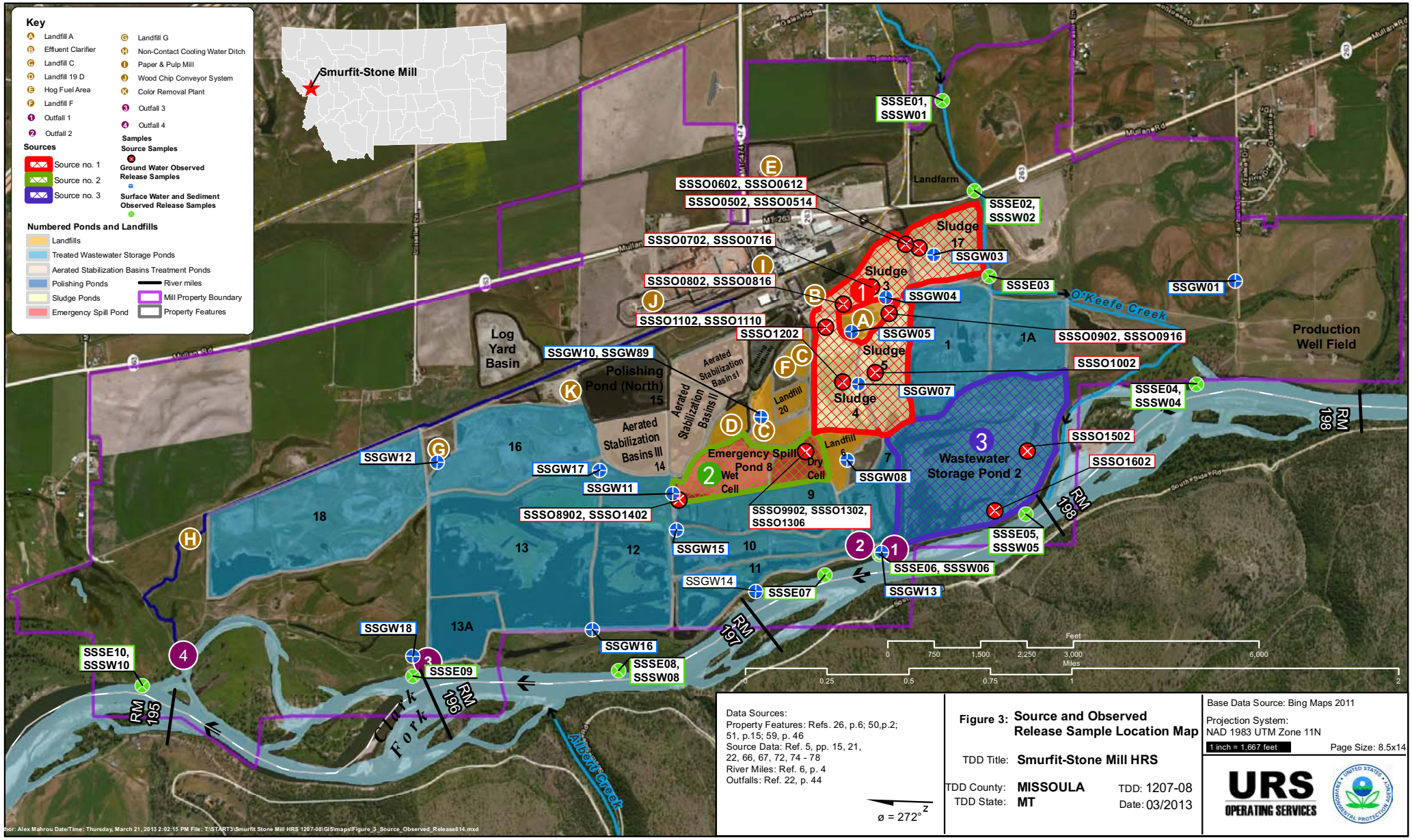
Additional evidence of transport of material from the sources includes a breach through the dike at the northwest corner of the emergency spill pond 8 (Source No. 2) into wastewater storage pond 9, which was noted during the 2011 PA field reconnaissance (Ref. 48, pp. 21, 66; 79, p. 2). A photo taken during the combined SI and RA in October 2011 shows that a lobe of material was deposited through the breach and into wastewater spill pond 9 (Ref. 79, p. 2). In addition, a breach through the dike at the western corner of Sludge Pond 5 (part of Source No. 1) was also noted during the 2011 PA field reconnaissance (Ref. 79, p. 5). The circumstances behind these breaches are not currently known.

These breaches show that it is possible that hazardous substances documented to be present in both sources through chemical analysis (See Tables 1 and 2 of this HRS documentation record) have been transported and deposited within other areas of the mill.

Landfills at Areas D and E

According to a Stone Container Corporation document, 'Area D' (also variously identified as landfill or pond 19, located adjacent to Landfill C) and 'Area E' (also variously identified as landfill or pond 20, located between Landfills C and F) contained primary and secondary sludge (Ref. 51, pp. 9, 15). Of note, Area E was also identified as a rapid infiltration pond in the EIS completed in1986 (Ref. 26, p. 6).

Given that sludge has been reportedly disposed of in Areas D and E, it is possible that these areas would have similar types and concentrations of hazardous substances to those identified in Source 1 through chemical analysis (e.g., dioxins, furans, and metals including manganese) (Ref. 5, pp. 403, 404, 417-418, 1006-1011, 1038-1045; Table 1 of this HRS documentation record).


Key
Landfill A
Effluent Clarifier
Landfill C
Landfill 19 D
Hog Fuel Area
Landfill F
Outfall 1
Outfall 2
Landfill G
Non-Contact Cooling Water Ditch
Paper & Pulp Mill
Wood Chip Conveyor System
Color Removal Plant
Outfall 3
Outfall 4
Sources
Source no. 1
Source no. 2
Source no. 3
Samples
Source Samples
Ground Water Observed Release Samples
Surface Water and Sediment Observed Release Samples
Numbered Ponds and Landfills
Landfills
Treated Wastewater Storage Ponds
Aerated Stabilization Basins Treatment Ponds
Polishing Ponds
Sludge Ponds
Emergency Spill Pond
River miles
Mill Property Boundary
Property Features
Smurfit-Stone Mill
SSSE01, SSSW01
SSSE02, SSSW02
SSSO0602, SSSO0612
SSSO0502, SSSO0514
SSSO0702, SSSO0716
SSSO0802, SSSO0816
SSSO1102, SSSO1110
SSSO1202
SSGW03
SSGW04
SSGW05
SSGW07
SSGW08
SSGW01
SSSE03
SSSO0902, SSSO0916
SSSO1002
SSSE04, SSSW04
SSSO1502
SSSO1602
SSSE05, SSSW05
SSSE06, SSSW06
SSGW13
SSGW10, SSGW89
SSGW12
SSGW17
SSGW11
SSSO8902, SSSO1402
SSSO9902, SSSO1302, SSSO1306
SSGW15
SSGW14
SSSE07
SSGW18
SSSE09
SSGW16
SSSE08, SSSW08
SSSE10, SSSW10
Landfarm
Sludge 17
Sludge 3
Sludge 5
Sludge 4
Log Yard Basin
Polishing Pond (North) 15
Aerated Stabilization Basins I
Aerated Stabilization Basins II
Aerated Stabilization Basins III 14
Landfill 20
Landfill 6
Emergency Spill Pond 8
Wet Cell
Dry Cell
Wastewater Storage Pond 2
O'Keefe Creek
Production Well Field
Clark Fork
Albert Creek
RM 195
RM 196
RM 197
RM 198
Mullan Rd
Feet
0 750 1,500 2,250 3,000 6,000
Miles
0 0.25 0.5 0.75 1 2
Data Sources:
Property Features: Refs. 26, p.6; 50,p.2; 51, p.15; 59, p. 46
Source Data: Ref. 5, pp. 15, 21, 22, 66, 67, 72, 74 - 78
River Miles: Ref. 6, p. 4
Outfalls: Ref. 22, p. 44
ø = 272°
Figure 3: Source and Observed Release Sample Location Map
TDD Title: Smurfit-Stone Mill HRS
TDD County: MISSOULA
TDD State: MT
TDD: 1207-08
Date: 03/2013
Base Data Source: Bing Maps 2011
Projection System: NAD 1983 UTM Zone 11N
1 inch = 1,667 feet
Page Size: 8.5x14
URS OPERATING SERVICES
Author: Alex Mahrou Date/Time: Thursday, March 21, 2013 2:02:15 PM File: T:\START3\Smurfit Stone Mill HRS 1207-08\GIS\maps\Figure_3_Source_Observed_Release814.mxd

4.0 SURFACE WATER MIGRATION PATHWAY

4.0.1 Migration Components

The surface water migration pathway score for the Smurfit-Stone Mill is based on the ground water to surface water migration component, as described in Section 4.2 below (Ref. 1, pp. 51604-51605, Section 4.0.1). The ground water to surface water migration component is used to evaluate surface water threats that result from migration of hazardous substances from source(s) to surface water via ground water, as has occurred at the Smurfit-Stone Mill.

Given that many of the wastewater storage ponds (e.g., other possible sources) at the property, including Source No. 3, lie within the 100-year flood plain for the Clark Fork River, the overland/flood migration to surface water component is likely complete at this site (Refs. 63; 71; Figures 1 and 2 of this HRS documentation record). In addition, for many years the Smurfit-Stone Mill directly discharged wastewater to the Clark Fork River through three outfalls (Refs. 22, pp. 10, 27, 44; 26, p. 6). These outfalls are considered probable points of entry (PPEs) for the entry of hazardous substances from the three identified sources into the river, as well as from the other possible sources identified within Section 2.5 of this HRS documentation record, for the overland/flood migration component. They are not used for scoring the ground water to surface water migration component.

The overland/flood migration component was not scored because the ground water to surface water component scores sufficiently to place the site on the NPL.

As per the HRS, three threats exist for the surface water migration pathway through the ground water to surface water migration component: the drinking water threat, human food chain threat, and environmental threat (Ref. 1, pp. 51604-51605, Sec. 4.0.1). For the Smurfit-Stone Mill site, the human food chain and environmental threats are scored for the ground water to surface water migration component of the surface water migration pathway. These threats are discussed within Sections 4.2.3 and 4.2.4 of this HRS documentation record.

4.2 GROUND WATER TO SURFACE WATER MIGRATION COMPONENT

4.2.1 General Considerations

4.2.1.1 Eligible Surface Waters

According to the HRS, surface waters eligible to be scored under the ground water to surface water migration component must meet certain conditions. The Clark Fork River is documented to be an eligible surface water for the ground water to surface water migration component, as described below (Ref. 1, p. 51626, Section 4.2.1.1).

Condition 1:

A portion of the surface water is located within 1 mile of one or more sources at the site having a containment value greater than 0:

The Clark Fork River is located approximately 2,000 feet in straight-line distance from the edge of Source No. 1, approximately 1,600 feet in straight-line distance from the edge of Source No. 2, and approximately 100 feet in straight-line distance from the edge of Source No. 3. All three of these sources have a containment value of 10 (Refs. 5, pp. 21, 67, 69, 73, 75-76, 78; 21, pp. 15-16, 21, 25-27, 36-37,

39; 22, p. 3; 26, p. 6; 35, p. 6; 38, p. 6; 51, pp. 1, 18; 77, pp. 2, 3, 5, 10-14; Section 2.2.3 for Sources 1, 2 and 3 and Figure 2 of this HRS documentation record):

Source Number	Containment Value for Source	Distance to Surface Water Body (Clark Fork River)
1	10	2,000 feet
2	10	1,600 feet
3	10	100 feet

Condition 2:

The top of the uppermost aquifer (the surficial alluvial aquifer) is at or above the bottom of the surface water body (Clark Fork River):

A detailed description of the geology and hydrogeology of the site is found within section 4.2.1.2 (Definition of Hazardous Substance Migration Path for Ground Water to Surface Water Component) below. The pertinent information from section 4.2.1.2 is summarized here.

The uppermost aquifer beneath the Smurfit-Stone Mill property is the surficial alluvial aquifer that exists within the recent surficial alluvium (Unit 4 within Ref. 43, Figure 7; Refs. 58, pp. 2, 4; 59, p. 45). Ground water elevations were measured within existing facility monitoring wells completed in the surficial alluvial aquifer during the 2011 combined SI and RA (Refs. 5, pp. 24, 202, 204-206, 213-215; 72, pp. 3-9). Two representative wells, SMW-17 and SMW-11, have been selected to demonstrate the elevation of the top of the uppermost aquifer. These wells have been chosen as they are in line with the general ground water flow direction within the aquifer (Ref. 58, pp. 5, 6; Ref. 59, pp. 52, 58, 79-82).

For comparison to the ground water elevations within these two wells, a topographic survey of the bottom of the Clark Fork River was conducted in February 2013 by a geomorphologist from the University of Montana (Ref. 70, p. 1). The area of the river surveyed was chosen to be aligned with both of the wells (Ref. 72, pp. 18-19). The survey consisted of a transect of 25 measurements across the river (Ref. 70, pp. 2, 4). The average elevation of the river surface was also surveyed as part of the transect (Ref. 70, pp. 1, 4).

The lowest elevation measured for the bottom of the Clark Fork River (i.e. its deepest point) was 3,028.64 feet above mean sea level (amsl), measured in a side channel on the western side of the river (Ref. 70, pp. 1, 2, 4, 5). This elevation is 7.26 feet lower than the ground water elevation measured in SMW-17 (3,035.9), and 2.51 feet lower than the ground water elevation measured in SMW-11 (3,031.15) (Refs. 70, pp. 1, 2, 4, 5; 72, pp. 6, 7, 18, 19). Historic ground water elevations measured in these two wells are also higher than the elevation of the bottom of the river (Ref. 51, p. 23). Therefore, the condition that the top of the uppermost aquifer is at or above the bottom of the surface water body is met.

It should be noted that elevations from the topographic survey conducted in February 2013 approximate those from the USGS published in 1963 (photorevised in 1978). Specifically, on the USGS quadrangle for the area, the elevation at a point on the main river channel approximately 1,000 feet upstream of the 2013 survey is 3,030 feet amsl (Refs. 71, pp. 1, 2; 72, p. 18; Figure 2 of this HRS documentation record). The elevation of the main channel from the 2013 survey was between 3030.98 – 3,029.83 feet amsl (Ref. 70, pp. 4, 5). This shows that the elevation has not significantly changed in 50 years.

Elevation information from these wells and the bottom of the Clark Fork River is shown in the table below and represented graphically in Reference 72 (Refs. 70, pp. 4, 5; 72, p. 19).

Location	Ground/River Surface Elevation (feet amsl)	Depth to Water Below Ground Surface - October 2011 (feet)	Ground Water Elevation (feet amsl)	Lowest Bottom Elevation of Clark Fork River (feet amsl)	References
Well SMW-17	3050.50	14.6	3035.90	NA	51, p. 21; 72, pp. 6, 18, 19
Well SMW-11	3048.10	16.95	3031.15	NA	51, p. 21; 72, pp. 7, 18, 19
Clark Fork River near Albert Creek	3032.53	NA	NA	3028.64	70, pp. 1, 2, 4, 5

Notes:
amsl above mean sea level
NA not applicable

Additional evidence that the bottom of the Clark Fork River is below the top of the surficial alluvial aquifer, namely historic ground water level data collected for the mill, is provided within the Elevation of Top of Uppermost Aquifer (mean sea level) discussion later in section 4.2.1.2 below.

Condition 3:

No aquifer discontinuity is established between the source and the portion of the Clark Fork River within 1 mile of any of the sources:

In the vicinity of the Smurfit-Stone Mill site, the surficial alluvial aquifer is present in valley-fill alluvium that is continuous between the areas of the sources and the Clark Fork River (Ref. 59, pp. 8, 45 (Figure 2-2)). There is no evidence that any geologic, topographic, or other structure or feature, that entirely transects the surficial alluvial aquifer and that creates a continuous boundary to ground water flow, exists anywhere between the sources (e.g., ponds) and the Clark Fork River. Evidence that there are no discontinuities between the source areas includes that all seepage water from the ponds that entered the shallow, surficial alluvial aquifer eventually reached the river. This, in turn, was substantiated by color measurements taken on the river through times of low or no direct discharge, as well as ground water flow measurements (Refs. 21, pp. 16, 26, 27; 22, pp. 14, 30; 26, pp. 11, 13, 94; 58, pp. 5, 6, 8, 9, 10, 11; 59, pp. 8, 16, 22, 40-41, 51-52, 77-86).

4.2.1.2 Definition of Hazardous Substance Migration Path for Ground Water to Surface Water Migration Component

Ground Water Migration Pathway Description

The hazardous substance migration path includes both the ground water segment and the surface water in-water segment that hazardous substances would take as they migrate away from sources at the site (Ref. 1, p. 51626).

The ground water segment of the hazardous substance migration path begins at each source and extends to the PPE through the uppermost aquifer (the surficial alluvial aquifer) to the surface water (Figure 4 of this HRS documentation record). The PPE is defined as the point at the surface water that results from the shortest straight-line distance through the uppermost aquifer beneath the sources with a containment factor greater than zero to the surface water (Ref. 1, p. 51626, Section 4.2.1.2). There are three sources identified for the site, each having a PPE into the Clark Fork River (Figure 4 of this HRS documentation record).

The ground water segment is restricted to migration via the uppermost aquifer between a source and the surface water (Ref. 1, p. 51626). A description of the geology and hydrogeology (both regional and site-specific) is therefore necessary in order to evaluate this migration pathway.

Regional Geology/Aquifer Description:

The Smurfit-Stone Mill lies in the northwest portion of the Missoula Valley (Ref. 43, Figure 1; Figure 1 of this HRS documentation record). The Missoula Valley is a broad northwest-trending valley that contains a segment of the Clark Fork River and the lowermost reach of the Bitterroot River, which joins the Clark Fork just west of the City of Missoula (Ref. 43, Figure 1; Figure 1 of this HRS documentation record). Quaternary-aged unconsolidated sand, silt and gravel in the Missoula Valley (i.e., Units 2, 3, and 4 within Figure 7 of Reference 43) rest on top of bedrock consisting of either the Tertiary-aged sedimentary rocks (near to and beneath the City of Missoula) (Unit 1 within Figure 7 of Reference 43) or the Proterozoic-aged metamorphic rocks of the Belt Supergroup (in the northwestern portion of the Missoula Valley (Ref. 43, Figures 4 and 7). The unconsolidated Quaternary sand and gravel deposits in the center of the Missoula Valley are generally greater than 100 feet, and locally greater than 200 feet thick (Ref. 43). Most of the sand and gravel is interbedded with and overlain by Glacial Lake Missoula silt and clay, and thus was deposited before or during glacial time (Ref. 43).

The unconsolidated deposits in the Missoula Valley contain upper (Unit 4 of Ref. 43, Figure 7) and lower (Unit 2 of Ref. 43, Figure 7) sand and gravel units that are separated by interbedded sand, gravel or silty gravel areas (Unit 3 of Ref. 43, Figure 7). This middle unit of interbedded sand, gravel or silty gravel is interpreted as likely being deposited as lake beds in a stand of Glacial Lake Missoula (Ref. 43). Quaternary sand and gravel reach thicknesses greater than 200 feet near Missoula and Frenchtown, areas where a deep basin-fill aquifer is present (Ref. 43). This deeper aquifer is the principal aquifer for water supply in the area, including the production wells for the former Smurfit-Stone Mill (Ref. 59, p. 8).

Site Geology/Aquifer Description:

In the immediate area of the Smurfit-Stone Mill, the geology consists of unconsolidated recent surficial alluvium (Unit 4 of Ref. 43, Figure 7; Figure 1 of this HRS documentation record) which overlies interbedded silty gravel, sand, and gravel (Unit 3 of Ref. 43, Figure 7) as described above (Ref. 43, Figure 7). This middle unit is also reported (via drillers' logs) to contain clay (Refs. 51, pp. 71-90; 59, p. 45). Beneath this lies more unconsolidated interbedded gravel and sand (Unit 2 of Ref. 43, Figure 7), which sits on a unit of tertiary sedimentary rocks (Ref. 43, Figure 7). Immediately to the west of the Smurfit-Stone Mill (and the Clark Fork River) the bedrock is comprised of the Paleozoic-aged Hasmark Dolomite (Refs. 43, Figures 1 and 4; 59, pp. 17, 45).

There are two aquifer systems beneath the Smurfit-Stone Mill: the shallow-basin aquifer (also termed the surficial alluvial aquifer) that exists within the surficial alluvium (Unit 4 of Ref. 43, Figure 7), and the deeper (principal) aquifer that exists within the deeper unconsolidated interbedded gravel and sand (Unit 2 of Ref. 43, Figure 7), and which is the principal supply of potable water in the area (Ref. 59, pp. 8, 45). The glaciofluvial lake sediments (Unit 3 of Ref. 43, Figure 7) in between the aquifers are generally more fine-grained than the other two units (Refs. 58, p. 2; 59, p. 45).

-Aquifer/Stratum 1 (uppermost): Surficial Alluvial Aquifer

The uppermost aquifer beneath the Smurfit-Stone Mill property is the surficial alluvial aquifer that exists within the recent surficial alluvium (Unit 4 within Ref. 43, Figure 7) (Refs. 58, pp. 2, 4; 59, p. 45). The aquifer terminates to the west of the site at the Clark Fork River (and the bedrock on the western side of the river), and pinches out to the east of the mill property, where it transitions into the glaciofluvial lake

sediments within approximately 2 miles of the Clark Fork River (Unit 3 of Ref. 43, Figure 7; Ref. 59, pp. 17, 19, 22, 44, 45). The surficial alluvium containing the aquifer continues to both the northwest and the southeast for at least 4 miles beyond the mill property boundary (Ref. 43, Figures 1 and 7).

The surficial alluvium consists of poorly sorted, unconsolidated floodplain silt, sand and gravel and varies from approximately 15 to 41 feet thick in the vicinity of the mill, as measured from 20 shallow monitoring wells emplaced on mill property (Refs. 58, pp. 2, 3, 4, 5; 59, pp. 44, 45). Formation logs completed for these wells indicate that the alluvium is primarily composed of sand, gravel and cobblestones, with a general increase in the amount of clay at depth (Ref. 51, pp. 71-90). Depth to ground water in the wells in July-August 1991 ranged from 2.4 to 19.8 feet bgs (Ref. 58, pp. 4, 5). The hydraulic conductivity of the aquifer as measured from slug tests performed at this time within all 20 wells ranges from 120 to 1,040 feet per day (Ref. 58, p. 10).

The surficial alluvial aquifer is not considered a major source of water in the local area, although a few domestic wells in the area are completed in the aquifer (Ref. 59, pp. 20, 21). Ground water flow direction within the surficial alluvial aquifer in the areas of the mill where the identified sources are located is primarily to the west towards the Clark Fork River (Ref. 58, pp. 5, 6; Ref. 59, pp. 52, 58, 79-82). During the winter and spring times when storage rates in the wastewater storage ponds were at their highest, ground water mounding created a more radial flow pattern away from the ponds (Ref. 59, pp. 85, 86).

-Aquifer/Stratum 2 (deepest): Principal Aquifer

The principal aquifer exists within the deeper unconsolidated interbedded gravel and sand (Unit 2 of Ref. 43, Figure 7), and is the principal supply of potable water in the area (Ref. 59, pp. 8, 45). Domestic wells completed in this aquifer just north of the mill property are completed at depths ranging from 141 to 169 feet (Ref. 59, pp. 21, 70, 72-76). Lithology information reported for these wells supports that the aquifer consists of gravel and sand (Ref. 59, pp. 70, 72-76). As with the surficial alluvial aquifer, the deeper principal aquifer terminates to the west of the mill property (at the bedrock on the western side of the river) (Ref. 59, p. 45). To the east of the mill property, the gravel and sands containing the aquifer abut up against Tertiary-aged sedimentary bedrock, although the exact extent of the aquifer in this direction is currently not known (Ref. 59, Figure 1).

The aquifer is 20 to 30 feet thick locally, and pump tests have shown that the hydraulic conductivity is approximately 1,500 feet/day (Ref. 58, p. 2). Yields from these wells have been reported up to 60 gallons per minute (Ref. 59, p. 73). No information regarding the flow direction of ground water present in the deeper aquifer has been found.

-Local Aquifer Interconnections:

The glaciofluvial lake sediments (Unit 3 of Ref. 43, Figure 7) in between the surficial alluvial aquifer and the deep principal aquifer are generally more fine-grained than the aquifers (Refs. 58, p. 2; 59, p. 45). These sediments have been variously reported to be approximately 100 feet (Ref. 58, p. 2) or 120 to 150 feet thick in the area of the mill (Ref. 59, pp. 22, 45). According to a report completed for the mill, pump test data indicate that these lake sediments have an apparent low vertical permeability of less than 0.1 feet/day, and act as a barrier between the two aquifers (Ref. 58, p. 2). In addition, this report states that ground water in the deeper aquifer would tend to flow upwards to the surface (Ref. 58, p. 4).

Conversely, the 1974 Final EIS for the mill stated that the upper and lower aquifers appear to be poorly, but definitely connected (Ref. 21, p. 24). The report states that hydraulic testing on the mill's wells indicated the lower aquifer obtains water from the overlying zone and slightly affects water levels in the upper aquifer, due to aquifer leakage, although pumping of deep aquifer wells does not elicit a response in

shallow observation wells (Ref. 21, p. 24). The report also states that 'there is also definite evidence of vertical movement of waste effluent from the upper shallow aquifer into the deep aquifer in the plant area,' as evidenced by the detection of dissolved chemicals from waste ponds within plant production wells tapping the deep aquifer (Ref. 21, pp. 30, 31, 39).

Sampling of nearby domestic wells (to the north of the site) performed on behalf of the Smurfit-Stone Mill have indicated that process wastewater constituents present within the shallow, surficial alluvial aquifer have not been found in the deep principal aquifer (Ref. 59, pp. 22, 23). Similar sampling performed by EPA-START in 2011 also appeared to indicate that the deeper aquifers in the vicinity of the domestic wells were not impacted (Ref. 5, p. 47). It should be noted however that sampling of wells completed in the deep aquifer located adjacent to the identified sources was not conducted (Ref. 5, p. 46).

-Local Aquifer Discontinuities

In the vicinity of the Smurfit-Stone Mill property, the surficial alluvial aquifer is present in valley-fill alluvium that is continuous between the areas of the sources and the Clark Fork River (Ref. 59, p. 45). There is no evidence that any geologic (e.g., major faults, intrusive formations such as dikes or sills), topographic, or other structure or feature (e.g., erosional channels and large bodies of water), that entirely transects the surficial alluvial aquifer and that creates a continuous boundary to ground water flow, exists anywhere between the sources (e.g., ponds) and the Clark Fork River (Refs. 43, Figures 1 and 7; 59, p. 45; 71; Figure 1 of this HRS documentation record).

Evidence that there are no discontinuities between the source areas includes that all seepage water from the ponds that entered the shallow, surficial alluvial aquifer eventually reached the river. This, in turn, was substantiated by color measurements taken on the river through times of low or no direct discharge, as well as ground water flow measurements (Refs. 21, pp. 16, 26, 27; 22, pp. 14, 30; 26, pp. 11, 13, 94; 58, pp. 5, 6, 8, 9, 10, 11; 59, pp. 8, 16, 22, 40, 41, 51, 52, 77-103).

Elevation of Top of Uppermost Aquifer (mean sea level):

The hydrogeologic units beneath the Smurfit-Stone Mill property are, from shallowest to deepest: surficial alluvium, the Lower or pre-Wisconsin glaciofluvial deposits (Lake Missoula sediment), and a deep gravel aquifer (Refs. 58, p. 2; 59, pp. 8, 45). The surficial alluvium is primarily composed of sand and gravel and contains the local water table (unconfined) aquifer (Refs. 58, p. 2; 59, pp. 8, 44, 45). The deep gravel aquifer is the principal aquifer for water supply in the area (Ref. 59, p. 8). The glaciofluvial lake sediments in between the aquifers are generally more fine-grained than the other two units (Ref. 58, p. 2). These units all extend beneath the property to the west, ending at the contact with bedrock (the Hasmark Dolomite) located on the west side of the Clark Fork River (Ref. 59, pp. 17, 45). The surficial alluvial aquifer is, therefore, the uppermost aquifer beneath the mill property (Refs. 58, p. 2; 59, pp. 8, 45).

Ground water elevations from monitoring wells located nearest to the source areas have been consistently higher than the elevation of the bottom of the Clark Fork River (Refs. 51, pp. 21-23; 58, pp. 5, 6; 59, pp. 48, 52; 70, pp. 1, 4, 5). For example, ground water elevations of the surficial alluvial aquifer as measured within the monitoring well SMW-16 (the facility monitoring well located between all three sources identified at the site) between August 1991 and June 1992 ranged from a low of 3,040.48 feet amsl to a high of 3,043.21 feet amsl (Refs. 51, pp. 21-23; 59, pp. 13, 46). These elevations are 11.84 to 14.57 feet higher than the lowest elevation of the bottom of the Clark Fork River, as measured in February 2013 (Refs. 51, pp. 21-23; 70, pp. 1, 4, 5).

A ground water study conducted from 2002 to 2004 showed similar results, with ground water elevations within wells located within the wastewater storage pond area (e.g., SMW-15, SMW-16, SMW-17, SMW-19 ranging from 3,042.83 to 3,045.84 feet amsl) being 14.19 feet to 17.20 feet higher than the lowest elevation of the bottom of the Clark Fork River, as measured in February 2013 (Refs. 59, pp. 48, 52; 70, pp. 1, 4, 5). It is noted that the ground water elevation measured within the well SMW-11 in October 2011 (3031.15 feet amsl) approximated those historically measured in this well (Refs. 51, p. 21-23; 72, pp. 7, 18, 19). The ground water elevation measured in the well SMW-17 in October 2011 (3035.90 feet amsl) was approximately 4-10 feet lower than those elevations historically measured in this well, likely due to the cessation of wastewater storage in the ponds surrounding this well (and the associated ground water mounding effect) since the closure of the mill (Refs. 51, pp. 21-23; 70, pp. 1, 2, 4, 5; 72, p. 6).

It should be noted that elevations from the topographic survey conducted in February 2013 matches those from the USGS published in 1963. Specifically, on the USGS quadrangle for the area, the elevation at a point on the main river channel approximately 1,000 feet upstream of the 2013 survey is 3,030 feet amsl (Ref. 71, pp. 1, 2; Figure 1 of this HRS documentation record). The elevation of the main channel from the 2013 survey was 3030.98 – 3,029.83 feet amsl (Ref. 70, pp. 4, 5). This shows that the elevations have not significantly changed in 50 years.

Elevation of Bottom of Surface Water Body (mean sea level):

As previously discussed above, a topographic survey of the bottom of the Clark Fork River was conducted in February 2013 by a geomorphologist from the University of Montana (Ref. 70, p. 1). The area of the river surveyed was chosen to be aligned with both of the aforementioned wells (Ref. 72, pp. 18-19). The survey consisted of a transect of 25 measurements across the river (Ref. 70, pp. 2, 4). The elevation of the river surface was also surveyed as part of the transect (Ref. 70, pp. 1, 4, 5).

The lowest elevation measured for the bottom of the Clark Fork River (i.e. its deepest point) was 3028.64 feet above mean sea level (amsl), measured in a side channel on the western side of the river (Ref. 70, pp. 1, 2, 4, 5). This elevation is 7.26 feet lower than the ground water elevation measured in SMW-17 (3035.9 feet amsl), and 2.51 feet lower than the ground water elevation measured in SMW-11 (3031.15 feet amsl) (Refs. 70, pp. 1, 2, 4, 5; 72, pp. 6, 7, 18, 19).

<u>Surface Water Probable Point of Entry and In-Water Segment Description:</u>

The hazardous substance migration path includes both the ground water segment and the surface water in-water segment that hazardous substances would take as they migrate away from sources at the site (Ref. 1, p. 51626, Section 4.2.1.2). The hazardous substance migration path for the Smurfit-Stone Mill site begins at Source No. 3 (wastewater storage pond 2), the source with the most upstream PPE to the Clark Fork River (Figure 4 of this HRS documentation record). As wastewater storage pond 2 is directly adjacent to the Clark Fork River, the ground water segment of the hazardous substance migration path is only approximately 100 feet (Figure 4 of this HRS documentation record).

The location where this PPE enters the Clark Fork River marks the beginning of the surface water in-water segment of the hazardous substance migration path for the ground water to surface water migration component (Ref. 1, p. 51626; Figure 5 of this HRS documentation record). From this point, the Clark Fork River flows generally north along the western edge of the Smurfit-Stone Mill property, passing the ground water to surface water PPEs[1] from source No. 1, and then source No. 2 (Figure 4 of this HRS

1 While shown on Figures 2, 3, and 4 of this HRS documentation record, the PPEs for the overland/flood migration component of the surface water migration pathway, Outfalls 1, 2 and 3, are not considered when scoring the ground

documentation record). The PPE for Source No. 2 is the lowest (most downstream) PPE for the site and is located approximately 1.25 miles downstream of the PPE for Source No. 3 (Figures 4 and 5 of this HRS documentation record). From this lowest PPE, the Clark Fork River (and therefore the migration pathway) then continues generally north, and then west to the end of the target distance limit (TDL) (Figure 5 of this HRS documentation record). The total distance from the highest PPE (most upstream) to the end of the TDL is approximately 16.25 miles (Ref. 1, p. 51626, Section 4.2.1.4; Figure 5 of this HRS documentation record).

The mean annual flow rate for the Clark Fork River as measured from a USGS gauging station located below Missoula, Montana (USGS station # 12353000) from the years 1930 through 2011 is 5,330 cfs (Ref. 60). The river is, therefore, described as a large stream to river under the HRS (Ref. 1, Table 4-13, p. 51613). It is shown as a perennial river on the 7.5 minute quadrangle (Ref. 71; Figure 1 of this HRS documentation record).

The surface water body being scored for this HRS documentation record is the Clark Fork River (a large stream to river). The in-water segment for HRS purposes begins at the highest upstream ground water to surface water PPE on the Clark Fork River and ends 15 miles downstream of the PPE from Source No. 2, a total distance of approximately 16.25 miles (as described above) (Figure 5 of this HRS documentation record).

Dilution Weight Adjustment for In-Water Segment

A dilution weight adjustment is not calculated because the inclusion of potential contamination in the drinking water, human food chain and environmental threats of the ground water to surface water migration component of the surface water migration pathway does not likely contribute significantly to the overall site score.

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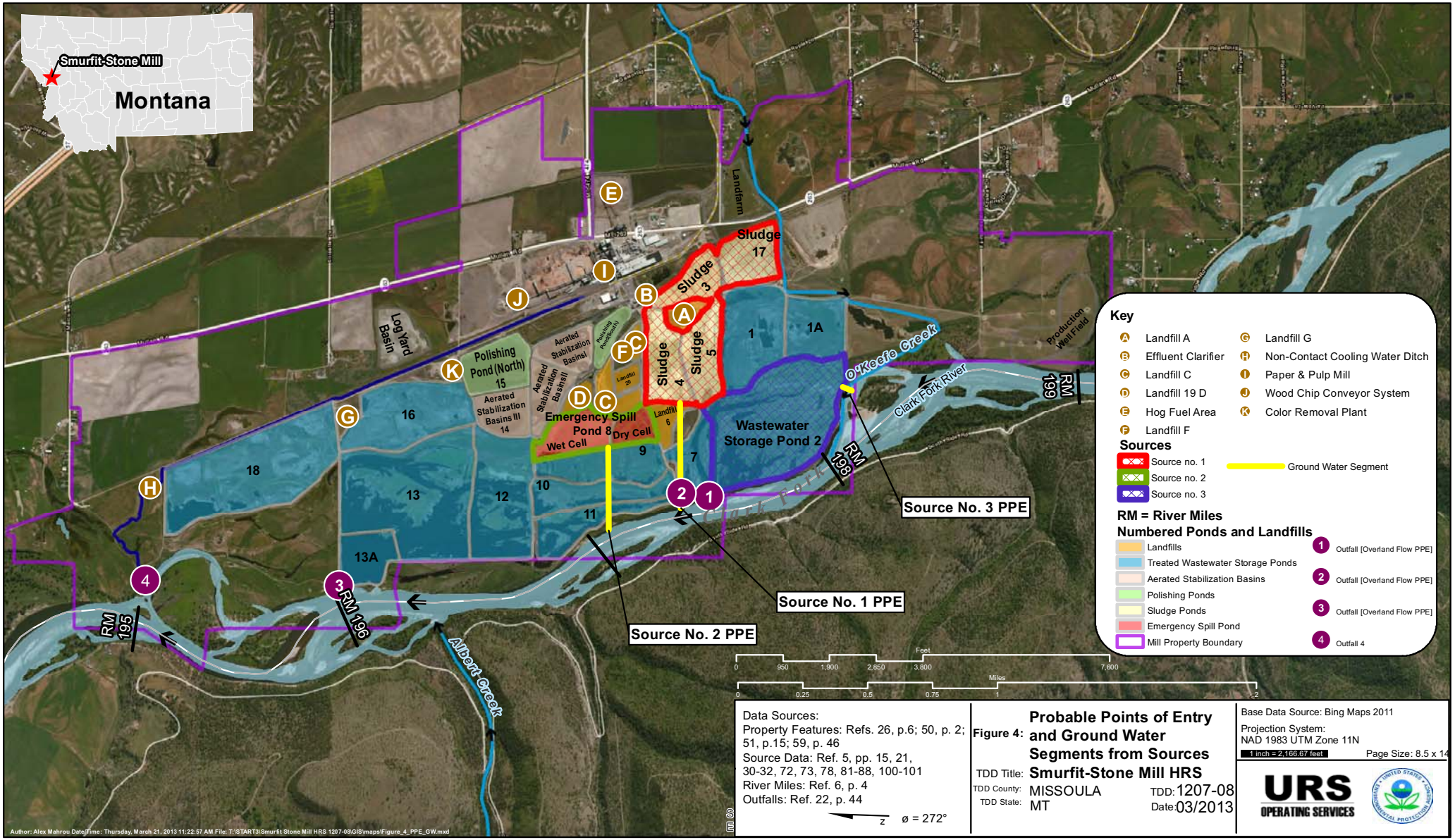
water to surface water migration component.



Data Sources:
Property Features: Refs. 26, p.6; 50, p. 2; 51, p.15; 59, p. 46
Source Data: Ref. 5, pp. 15, 21, 30-32, 72, 73, 78, 81-88, 100-101
River Miles: Ref. 6, p. 4
Outfalls: Ref. 22, p. 44

N ø = 272°

Figure 4: Probable Points of Entry and Ground Water Segments from Sources

TDD Title: **Smurfit-Stone Mill HRS**
TDD County: MISSOULA
TDD State: MT
TDD: 1207-08
Date: 03/2013

Base Data Source: Bing Maps 2011
Projection System: NAD 1983 UTM Zone 11N
1 inch = 2,166.67 feet
Page Size: 8.5 x 14

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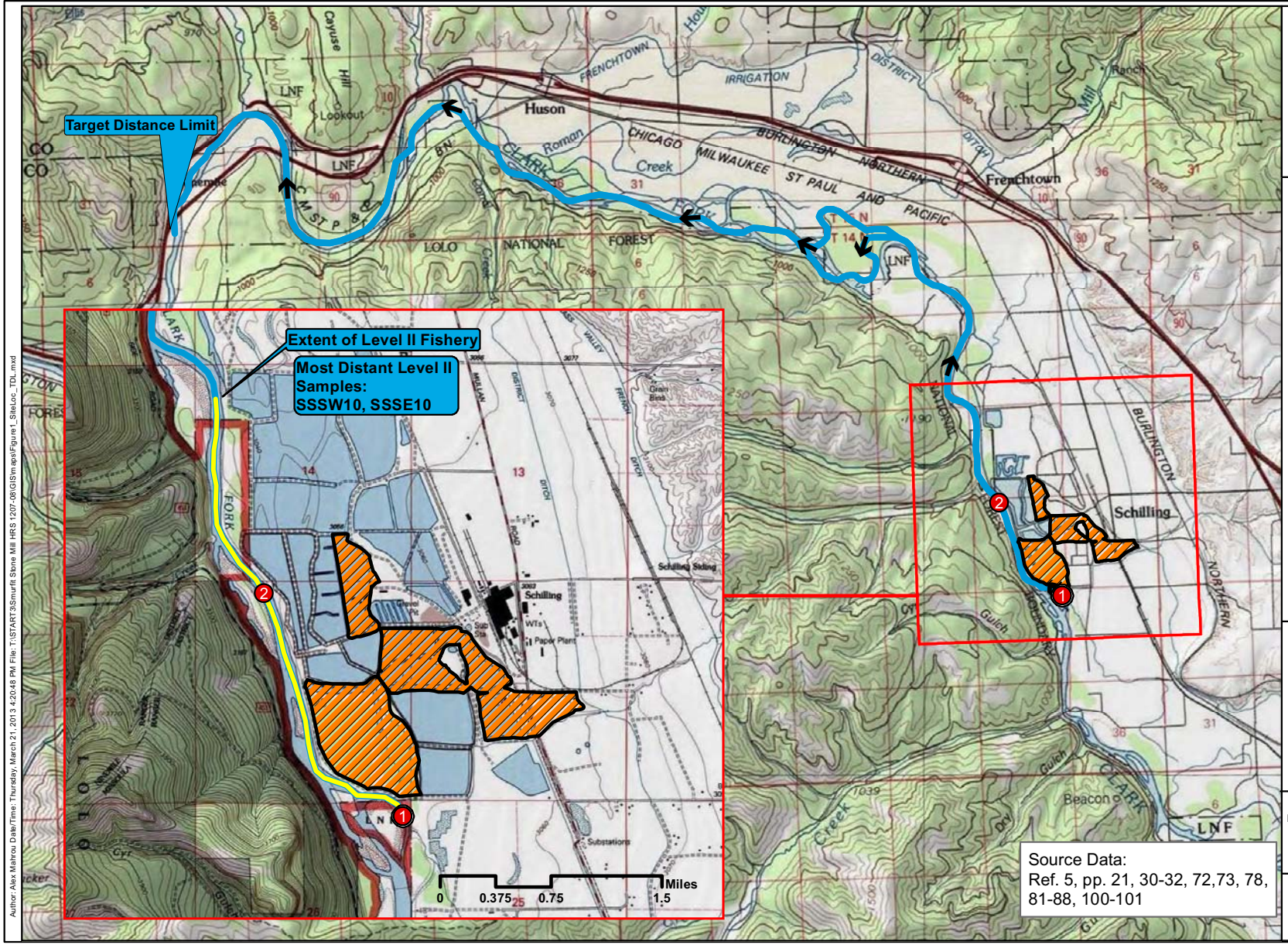

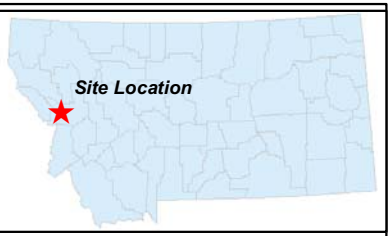

Legend

- (1) Groundwater to Surface Water PPE from Source No. 3
- (2) Groundwater to Surface water PPE from Source No.2
- Source Areas
- Hazardous Substance Migration Path
- Extent of Level II Fishery

Source Data:
Ref. 5, pp. 21, 30-32, 72,73, 78, 81-88, 100-101

TDD Title: **Smurfit-Stone Mill HRS**

Figure Title: Target Distance Limit (TDL) Map

Figure No. 5

TDD State: MT

TDD County: Missoula

TDD: 1207-08

Date: 03/2013

Base Data Source: Bing Maps 2011

Page Size: 8.5 x 14

Datum/Projection: WGS 1984 Web Mercator Auxiliary Sphere

Miles: 0 0.5 1 2

N

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Author: Alex Mahrou Date/Time: Thursday, March 21, 2013 4:20:48 PM File: T:\START3\Smurfit Stone Mill HRS 1207-08\GIS\mapsFigure 1_SiteLoc_TDL.mxd

4.2.1.3 Observed Release of a Specific Hazardous Substance to Surface Water In-Water Segment

According to the HRS, in order to establish an observed release of an individual hazardous substance to surface water under the ground water to surface water migration component of the surface water migration pathway, an observed release both to ground water and an observed release by chemical analysis to surface water must be documented (Ref. 1, p. 51626, Section 4.2.1.3). The following section presents the necessary information to support the observed release conditions present in the surface water body (Clark Fork River).

Observed Release by Direct Observation to Surface Water Body: Clark Fork River

An observed release by direct observation is not being scored. However, evidence of an observed release includes that the direct discharge of stored wastewater occurred to the Clark Fork River through one of three outfalls (Refs. 22, pp. 9-10, 27; 26, p. 6). In a study performed by the EPA where wastewater effluent from bleaching kraft mills was sampled, 90 of 107 samples (84 percent) contained detectable amounts of 2,3,7,8-TCDD and 104 of 111 samples (94 percent) contained detectable quantities of 2,3,7,8-TCDF (Ref. 45, p. 5). In the same study, 94 of 97 sludge samples (97 percent) collected from bleaching kraft mills contained detectable amounts of 2,3,7,8-TCDD and 100 percent of the 97 samples contained detectable amounts of 2,3,7,8-TCDF (Ref. 45, pp. 5, 8).

Sources of metals in pulp and paper mill waste streams include spent pulping solutions that dissolve metals from wood, papermaking additives such as alum and kaolin clay, soils on logs and wood chips, green liquor dregs (particularly for manganese), and lime used in the causticizing reaction (Ref. 44, pp. 6-20, 6-22, 6-23). At the Smurfit-Stone Mill, the dregs from the recausticizing operation and fly ash from the multi-fuel boiler were both disposed of into the sludge ponds (Ref. 22, pp. 7, 8). After passing through the clarifier and/or sludge ponds, wastewater discharge from all portions of the paper and pulp mill, including from the recausticizing plant, was sent to the aeration basins and then the wastewater storage ponds (Ref. 22, pp. 25, 26).

Observed Release by Chemical Analysis to Surface Water Body: Clark Fork River

In October 2011, EPA-START collected surface water and sediment samples from seven locations on the Clark Fork River; a background location (co-located samples SSSW04 and SSSE04), and six release locations (co-located samples SSSW05 and SSSE05, SSSW06 and SSSE06, SSSW07 and SSSE07, SSSW08 and SSSE08, SSSW09 and SSSE09, and SSSW10 and SSSE10) (Refs. 5, pp. 7, 20, 41, 68, 74; 62, pp. 1-3; 79, pp. 7-9; Tables 4A and 4B and Figure 3 of this HRS documentation record). The background location samples, SSSW04 and SSSE04 were collected from the Clark Fork River approximately 2,700 feet upstream from Source No. 3 (i.e., wastewater storage pond 2) and 600 feet upstream of the confluence of O'Keefe Creek with the Clark Fork River (Refs. 62, pp. 1-3; 79, p. 7; Tables 4A and 4B and Figure 3 of this HRS documentation record). The release samples were collected from the east bank (i.e., the bank adjacent to the Smurfit-Stone Mill property) of the Clark Fork River from various locations over a distance of approximately 3.6 miles below the background location (Refs. 5, pp. 68, 74; 79, pp. 8, 9; Tables 4A and 4B and Figure 3 of this HRS documentation record).

Specifically, SSSW05 and SSSE05 were collected adjacent to the wastewater storage pond 2 (i.e., Source No. 3) and approximately 0.3 mile below the highest ground water to surface water PPE (from Source No. 3), SSSW06 and SSSE06 were collected approximately 300 feet downstream of outfall 1 and approximately 0.8 mile below the highest PPE, SSSW07 and SSSE07 were collected approximately 500 feet downstream of outfall 2 and approximately 1.0 mile below the highest PPE, SSSW08 and SSSE08 were collected due west of wastewater storage pond 12 and approximately 1.8 miles below the highest PPE, SSSW09 and SSSE09 were collected approximately 300 feet downstream of outfall 3 and

approximately 2.5 miles below the highest PPE, and SSSW10 and SSSE10 were collected approximately 1,000 feet downstream of outfall 4 and approximately 3.6 miles below the highest PPE (Refs. 5, pp. 73-74, 80; 79, pp. 8, 9; Tables 4A and 4B and Figures 3 and 4 of this HRS documentation record).

All surface water and sediment sampling was done in accordance with EPA-START TSOPs 4.17 and 4.18 (Ref. 53, pp. 34-43). For example, at each location the surface water sample was collected before the sediment sample, and a new disposable plastic scoop was used to collect sediment. All samples were collected during the same October 2011 sampling event, over a period of two days (October 24 and 25) (Ref. 5, pp. 199, 210-211). All samples were collected from the east bank of the Clark Fork River, the side closest to the mill property (Refs. 5, pp. 7, 20, 41, 68, 74, 199, 210-211; 62, pp. 1-3; 79, pp. 7-9). Surface water quality parameters, such as pH, temperature, and conductivity, were measured at each sampling location and the results were similar at each (Ref. 5, pp. 199, 210-211). The specific areas sampled were backwater locations that acted as sediment traps for the finer-grained material (sands and silts) that were targeted for sampling (Refs. 5, p. 211; 79, pp. 7-9). All surface water samples were collected from 0 to 1 foot depth, and were collected before the sediment samples. All sediment samples were collected from material in the top 2 inches.

All samples of surface water and sediment were analyzed for dioxins and furans using EPA Method 8290A by the private laboratory ALS Laboratory Group in Burlington, Ontario, Canada, and for total and dissolved metals using method CLP-ISM01.3 by ICP-MS by the EPA CLP RAS laboratory, Chemtech Consulting Group, Inc., in Mountainside, New Jersey. EPA-START contractor TechLaw, Inc. reviewed all dioxin and furan data according to the "National Functional Guidelines for Chlorinated Dibenzo-p-dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review September 2011" and reviewed all metals data in accordance with "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," January 2010 (Ref. 5, p. 7-9, 52-53, 394, 397, 408, 410, 957, 959).

When compared to the upstream background surface water location (SSSW04), the release samples SSSW05, SSSW06, SSSW08, and SSSW10 all document an observed release by chemical analysis for dissolved manganese, as shown in Table 4A below (Refs. 1, p. 51589 (Table 2-3); 5, pp. 974-976, 978; 980; Table 4A and Figure 3 of this HRS documentation record).

When compared to the upstream background sediment location (SSSE04), the release samples SSSE05, SSSE06, SSSE07, SSSE08, SSSE09, and SSSE10 all document an observed release by chemical analysis for 1,2,3,4,6,7,8-HpCDD, as shown in Table 4B below (Refs. 1, p. 51589 (Table 2-3); 5, pp. 405-406, 416; Table 4B and Figure 3 of this HRS documentation record).

TABLE 4A: Observed Release (Surface Water Samples) to the Surface Water In-water Segment (Clark Fork River)								
Sample ID (Date Collected)	**CLP Sample ID**	**Location on Clark Fork River**	**Sample Depth (feet)**	**Distance from Highest PPE (miles)**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/L)**	**Sample Quantitation Limit (SQL) (µg/L)**	**References**
Background Sample								
SSSW04 (10/24/11)	**MH3102**	east bank, ~600 feet upstream of O'Keefe Creek	0-1	NA	Manganese (dissolved)	4.8	0.15	5, pp. 68, 74, 199, 974, 1055; 53, pp. 40-43; 62, pp. 1-3; 76, p. 39; 78, p. 21; 79, p. 7
Contaminated Release Samples								
SSSW05 (10/24/11)	**MH3103**	adjacent to wastewater storage pond 2 (Source No. 3)	0-1	0.3	Manganese (dissolved)	30.7	0.15	5, pp. 68, 74, 210, 975, 1055; 53, pp. 40-43; 76, p. 39; 78, p. 21
SSSW06 (10/24/11)	**MH3104**	approximately 300 feet downstream of outfall 1	0-1	0.8	Manganese (dissolved)	24.8	0.15	5, pp. 68, 74, 199, 976, 1055; 53, pp. 40-43; 76, p. 39; 78, p. 21
SSSW08 (10/25/11)	**MH3106**	due west of wastewater storage pond 12	0-1	1.8	Manganese (dissolved)	32.0	0.15	5, pp. 68, 74, 211, 978, 1056; 53, pp. 40-43; 76, p. 39; 78, p. 21
SSSW10 (10/25/11)	**MH3108**	approximately 1,000 feet downstream of outfall 4	0-1	3.6	Manganese (dissolved)	18.2	0.15	5, pp. 68, 74, 211, 980, 1056; 53, pp. 40-43; 76, p. 39; 78, p. 21

Notes:

Sample ID	Smurfit-Stone, Surface Water, Sequential sample number (e.g., 01) (Ref. 5, p. 20)
ID	Identification
PPE	Probable Point of Entry
NA	not applicable
SQL	Sample Quantitation Limit: for metals = CRDL x dilution factor (Ref. 78, p. 21; Ref. 81).
CRDL	Contract required detection limit
CLP	Contract Laboratory Program
µg/L	micrograms per liter (equivalent to parts per billion)

TABLE 4B: Observed Release (Sediment Samples) to the Surface Water In-water Segment (Clark Fork River)								
Sample ID (Date Collected)	**Private Lab Sample ID**	**Location on Clark Fork River**	**Depth (inches)**	**Distance from Highest PPE (miles)**	**Hazardous Substance**	**Hazardous Substance Concentration (pg/g)**	**Sample Quantitation Limit (SQL) (pg/g)**	**References**
Background Sample								
SSSE04 (10/24/11)	L1080162-16	east bank, ~600 feet upstream of O'Keefe Creek	0-2	NA	1,2,3,4,6,7,8-HpCDD	0.062 U	0.02	5, pp. 68, 74, 199, 397, 400, 405; 62, pp. 1-3; 67, p. 154; 78, p. 24
Contaminated Release Samples								
SSSE05 (10/24/11)	L1080162-17	due west of Source No. 3	0-2	0.3	1,2,3,4,6,7,8-HpCDD	2.34	0.09	5, pp. 68, 74, 210, 405; 67, p. 154; 78, p. 24
SSSE06 (10/24/11)	L1080162-18	approximately 300 feet downstream of outfall 1	0-2	0.8	1,2,3,4,6,7,8-HpCDD	0.698	0.12	5, pp. 68, 74,199, 405; 67, p. 154; 78, p. 25
SSSE07 (10/24/11)	L1080162-19	approximately 500 feet downstream of outfall 2	0-2	1.0	1,2,3,4,6,7,8-HpCDD	1.69	0.07	5, pp. 68, 74, 210, 406; 67, p. 154; 78, p. 25
SSSE08 (10/25/11)	L1080162-20	due west of wastewater storage pond 12	0-2	1.8	1,2,3,4,6,7,8-HpCDD	1.44	0.14	5, pp. 68, 74, 211, 416; 67, p. 154; 78, p. 25
SSSE09 (10/25/11)	L1080162-21	approximately 300 feet downstream of wastewater storage pond 13A	0-2	2.5	1,2,3,4,6,7,8-HpCDD	3.80	0.20	5, pp. 68, 74, 211, 416; 67, p. 155; 78, p. 26
SSSE10 (10/25/11)	L1080162-22	approximately 1,000 feet downstream of outfall 4	0-2	3.6	1,2,3,4,6,7,8-HpCDD	2.20	0.14	5, pp. 68, 74, 211, 416; 67, p. 155; 78, p. 26

Notes:

Sample ID	Smurfit-Stone, Sediment, Sequential sample number (e.g., 01) (Ref. 5, p. 20)
ID	Identification
NA	Not applicable
SQL	Sample Quantitation Limit: for dioxins/furans = (CRQL/%solids) x dilution factor (Ref. 78, pp. 24-26).
CRQL	Contract Required Quantitation Limit
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit (Ref. 5, pp. 397, 402).
pg/g	picograms per gram (equivalent to parts per trillion)
HpCDD	Heptachlorodibenzo-p-dioxin

Hazardous Substances Meeting Criteria for Observed Release to Surface Water In-Water Segment:

Manganese (dissolved)
1,2,3,4,6,7,8-HpCDD

4.2.2 Drinking Water Threat

4.2.2.1 Drinking Water Threat Likelihood of Release

No drinking water intakes are located on the Clark Fork River within the downstream Target Distance Limit (Figure 5 of this HRS documentation record). As such, the drinking water threat was not scored because it is not expected to contribute significantly to the overall site score.

4.2.2.1.1 Observed Release

According to the HRS, in order to establish an observed release of an individual hazardous substance to surface water under the ground water to surface water migration component of the surface water pathway, an observed release to both ground water and an observed release by chemical analysis to surface water must be documented (Ref. 1, p. 51626, Section 4.2.1.3). The following section presents the necessary information to support the observed release conditions present in the uppermost aquifer beneath the Smurfit-Stone Mill (Surficial Alluvial Aquifer).

Observed Release to Ground water (Uppermost Aquifer) by Direct Observation: Surficial Alluvial Aquifer

An observed release by direct observation is not being scored.

Observed Release to Ground water (Uppermost Aquifer) by Chemical Analysis: Surficial Alluvial Aquifer

The uppermost aquifer beneath the Smurfit-Stone Mill property is the surficial alluvial aquifer. It is described above in section 4.2.1.2 of this HRS documentation record. An observed release to ground water within the surficial alluvial aquifer is established by chemical analysis of monitoring well samples collected by EPA-START in 2011.

In October 2011, ground water samples were collected by EPA-START from both existing and newly installed wells completed in the shallow, surficial alluvial aquifer (Ref. 5, pp. 7, 26, 36, 74-77). While a number of existing shallow ground water wells were known to be present at the Smurfit-Stone Mill property, most of these were located some distance away from the suspected sources at the property. For example, the closest existing shallow ground water monitoring well to the sludge ponds (Source No. 1) is monitoring well SMW-16, nearly 1,000 feet downgradient of sludge pond 4 (Ref. 59, p. 46). For this reason, EPA-START established additional shallow ground water monitoring wells within the surficial alluvial aquifer, closer to, and at some locations, directly beneath, some of the suspected sources (see Figure 3 of this HRS documentation record). One existing shallow well located upgradient of all sources at the property (well SMW-020 (sample ID: SGW01)) was chosen to represent background conditions (Ref. 5, pp. 30, 74; Figure 3 of this HRS documentation record).

At each monitoring well the depth to ground water was gauged and recorded, required purge volumes were calculated, then the ground water was evacuated from the monitoring well in accordance with EPA-START TSOP 4.12 “Ground water Sampling” (Ref. 53, pp. 16-24). At each existing well location, a new,

disposable pump and tubing were used to purge each well. At each newly-installed well location, a peristaltic pump was used to purge the well, with new tubing used at each location.

All surficial alluvial aquifer ground water samples were collected during the same October 2011 sampling event, over a period of four days (October 26 through 29) and by the same sampling team (Ref. 5, pp. 213-215; 72, pp. 3-17). With the expected exception of the conductivity and salinity readings at the background ground water location (i.e., being indicative of unpolluted, upgradient ground water), all purge water quality parameters observed at each well completed in the surficial alluvial aquifer were similar (Ref. 5, p. 24; 72, pp. 3-17). Water at all locations (except the background location) was noted to be discolored, typically being brown or grey, and often smelled of sulfur (Refs. 5, pp. 213-215; 72, pp. 3-17).

All samples of ground water were analyzed for dioxins and furans using EPA Method 8290A by the private laboratory ALS Laboratory Group in Burlington, Ontario, Canada, and for total and dissolved metals using method CLP-ISM01.3 by ICP-MS by the EPA CLP RAS laboratory, Chemtech Consulting Group, Inc., in Mountainside, New Jersey. EPA-START contractor TechLaw, Inc. reviewed all dioxin and furan data according to the "National Functional Guidelines for Chlorinated Dibenzo-p-dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review September 2011" and reviewed all metals data in accordance with "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," January 2010 (Ref. 5, pp. 7-9, 52-53, 897, 899, 957, 959; Ref. 67, p. 1-2, 4, 160, 162).

When compared to the background ground water concentrations, observed release concentrations of dioxins, furans, and metals were documented in wells completed within the surficial alluvial aquifer in locations both directly beneath sources as well as crossgradient and downgradient of Sources No. 1, 2, and 3 (Table 4C of this HRS documentation record). Depth to ground water in the background well (SMW-20, sample ID SSGW01) was 10.77 feet bgs, while depth to ground water in the release/downgradient wells (SSGW03, SSGW04, SSGW05, SSGW07, SSGW08, SSGW10, SSGW11, SSGW12, SSGW13 (SMW-14), SSGW14 (SMW-13), SSGW16 (SMW-11), SSGW17 (SMW-19), and SSGW18 (SMW-10) varied from 6.5 to 26.25 feet bgs (Ref. 5, pp. 14, 24, 44; 72, pp. 3, 4, 7-17). This closely matches the depth to shallow ground water measured in July-August 1991 (background well = 14.4 feet bgs, and release/downgradient wells = 2.4 to 19.8 feet bgs) (Ref. 58, pp. 4, 5), as well as those recorded at various times throughout 2001 to 2004 (background well SMW-20 = 8.9 to 13.0 feet bgs; and release/downgradient wells = 2.44 to 27.33 feet bgs) (Ref. 59, pp. 61-68). The locations of all shallow ground water wells sampled as part of the October EPA-START investigation are shown in Figure 3 of this HRS documentation record.

TABLE 4C: Observed Release (Ground Water Samples) to the Surficial Alluvial Aquifer (Ground Water Segment)								
Sample Number (Date Collected)	**EPA CLP Sample Number (for metals)**	**Well ID**	**Ground water Elevation* (feet amsl)**	**Well Screened Interval* (feet amsl)**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/L) (metals-µg/L)**	**Sample Quantitation Limit (SQL)** (dioxins/furans-pg/L) (metals-µg/L)**	**References**
Background Sample								
SSGW01 (10/26/11)	-	SMW-20	3,046.1	3,047.4-3,032.0	2,3,7,8-TCDD	0.27 U	0.27	5, p. 74; 51, pp. 21, 25, 65; 67, p. 53, 156; 72, p. 3
“	-	“	“	“	1,2,3,6,7,8-HxCDD	0.90 U	0.90	5, p. 74; 51, pp. 21, 25, 65; 67, p. 53, 156; 72, p. 3
“	-	“	“	“	1,2,3,4,6,7,8-HpCDD	2.91 J (29.1)[¥]	1.4	5, p. 74; 49, p. 51, pp. 21, 25, 65; 67, p. 53, 156; 72, p. 3; 80
“	-	“	“	“	Total-TCDD	0.27 U	0.27	5, p. 74; 51, pp. 21, 25, 65; 67, p. 53, 156; 72, p. 3
“	-	“	“	“	2,3,7,8-TCDF	0.20 U	0.20	5, p. 74; 51, pp. 21, 25, 65; 67, p. 53, 156; 72, p. 3
“	-	“	“	“	2,3,4,7,8-PeCDF	0.44 U	0.44	5, p. 74; 51, pp. 21, 25, 65; 67, p. 53, 156; 72, p. 3
“	**MH3109**	“	“	“	Arsenic (dissolved)	1.6	0.14	5, pp. 74, 981, 1066; 51, pp. 21, 25, 65; 72, p. 3; 76, p. 38; 78, p. 20
“	“	“	“	“	Lead (dissolved)	1.0 U	0.05	5, pp. 74, 960, 964, 981, 1066; 51, pp. 21, 25, 65; 72, p. 3; 76, p. 38; 78, p. 20

TABLE 4C: Observed Release (Ground Water Samples) to the Surficial Alluvial Aquifer (Ground Water Segment)								
Sample Number (Date Collected)	**EPA CLP Sample Number (for metals)**	**Well ID**	**Ground water Elevation* (feet amsl)**	**Well Screened Interval* (feet amsl)**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/L) (metals-µg/L)**	**Sample Quantitation Limit (SQL)** (dioxins/furans-pg/L) (metals-µg/L)**	**References**
"	"	"	"	"	Manganese (dissolved)	1.1 U	0.15	5, pp. 74, 960, 964, 981; 51, pp. 21, 25, 65; 72, p. 3; 76, p. 38; 78, p. 21
Contaminated Release Samples								
SSGW03 (10/28/11)	**MH3BA1**	SSGW03	3,052.5	3046.7-3036.7	Arsenic (dissolved)	26.2	0.14	5, pp. 75, 911; 72, p. 16; 76, p. 24; 77, p. 2; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	1,100	0.15	5, pp. 75, 911; 72, p. 16; 76, p. 24; 77, p. 2; 78, p. 21; 82, p. 3
SSGW04 (10/27/11)	-	SSGW04	3,054.3	3052.1-3042.1	2,3,7,8-TCDD	6.36	1.1	5, p. 75; 67, p. 199, 283; 72, p. 10; 77, p. 3
"	-	"	"	"	1,2,3,6,7,8-HxCDD	51.2	2.1	5, p. 75; 67, p. 199, 283; 72, p. 10; 77, p. 3
"	-	"	"	"	1,2,3,4,6,7,8-HpCDD	426	5.6	5, p. 75; 67, p. 199, 283; 72, p. 10; 77, p. 3
"	-	"	"	"	Total-TCDD	152	1.1	5, p. 75; 67, p. 199, 283; 72, p. 10; 77, p. 3
"	-	"	"	"	2,3,7,8-TCDF	35.9	2.5	5, p. 75; 67, p. 199, 283; 72, p. 10; 77, p. 3
"	-	"	"	"	2,3,4,7,8-PeCDF	18.6	1.1	5, p. 75; 67, p. 199, 283; 72, p. 10; 77, p. 3
"	**MH3BA2**	"	"	"	Arsenic (dissolved)	16.1	0.14	5, pp.75, 912; 72, p. 10; 76, p. 24; 77, p. 3; 78, p. 20; 82, p. 3

TABLE 4C: Observed Release (Ground Water Samples) to the Surficial Alluvial Aquifer (Ground Water Segment)								
Sample Number (Date Collected)	**EPA CLP Sample Number (for metals)**	**Well ID**	**Ground water Elevation* (feet amsl)**	**Well Screened Interval* (feet amsl)**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/L) (metals-µg/L)**	**Sample Quantitation Limit (SQL)** (dioxins/furans-pg/L) (metals-µg/L)**	**References**
"	"	"	"	"	Manganese (dissolved)	4,530	3.75	5, pp. 75, 912; 72, p. 10; 76, p. 24; 77, p. 3; 78, p. 21; 82, p. 3
SSGW05 (10/27/11)	-	SSGW05	3,047.5	3,051.0-3,041.0	2,3,7,8-TCDD	4.18	3.4	5, p. 75; 67, p. 200, 283; 72, p. 11; 77, p. 4
"	-	"	"	"	1,2,3,4,6,7,8-HpCDD	546	13	5, p. 75; 67, p. 200, 283; 72, p. 11; 77, p. 4
"	-	"	"	"	Total-TCDD	4.18	3.4	5, p. 75; 67, p. 200, 283; 72, p. 11; 77, p. 4
"	**MH3BA3**	"	"	"	Arsenic (dissolved)	31.0	0.14	5, pp. 75, 913; 72, p. 11; 76, p. 24; 77, p. 4; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	726	0.15	5, pp. 75, 913; 72, p. 11; 76, p. 24; 77, p. 4; 78, p. 21; 82, p. 3
SSGW07 (10/28/11)	**MH3BA4**	SSGW07	3,047.9	3,046.4-3,026.4	Arsenic (dissolved)	32.4	0.14	5, pp. 75, 914; 72, p. 15; 76, p. 24; 77, p. 5; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	9,240	3.75	5, pp. 75, 914; 72, p. 15; 76, p. 24; 77, p. 5; 78, p. 21; 82, p. 3
SSGW08 (10/28/11)	**MH3BA5**	SSGW08	3026.5	3,029.0-3,009	Arsenic (dissolved)	95.9	0.14	5, pp. 75, 915; 76, p. 24; 72, p. 12; 77, p. 6; 78, p. 20; 82, p. 3
"	"	"	"	"	Lead (dissolved)	1.7	0.05	5, pp. 75, 915; 76, p. 24; 72, p. 12; 77, p. 6; 78, p. 20; 82, p. 3

TABLE 4C: Observed Release (Ground Water Samples) to the Surficial Alluvial Aquifer (Ground Water Segment)								
Sample Number (Date Collected)	**EPA CLP Sample Number (for metals)**	**Well ID**	**Ground water Elevation* (feet amsl)**	**Well Screened Interval* (feet amsl)**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/L) (metals-µg/L)**	**Sample Quantitation Limit (SQL)** (dioxins/furans-pg/L) (metals-µg/L)**	**References**
"	"	"	"	"	Manganese (dissolved)	4,790	3.75	5, pp. 75, 915; 76, p. 24; 72, p. 12; 77, p. 6; 78, p. 21; 82, p. 3
SSGW10 (10/28/11)	**MH3BA6**	SSGW10	3041.5	3020.6-3010.6	Arsenic (dissolved)	121	0.14	5, pp. 75, 916; 72, p. 14; 76, p. 24; 77, p. 7; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	1,320	0.15	5, pp. 75, 916; 72, p. 14; 76, p. 24; 77, p. 7; 78, p. 21; 82, p. 3
SSGW89 (duplicate of SSGW10) (10/28/11)	**MH3BB4**	"	"	"	Arsenic (dissolved)	109	0.14	5, pp. 75, 77, 924; 72, p. 14; 76, p. 27; 77, p. 7; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	1,180	0.15	5, pp. 75, 77, 924; 72, p. 14; 76, p. 27 77, p. 7; 78, p. 21; 82, p. 3
SSGW11 (10/28/11)	**MH3BA7**	SSGW11	3,034.6	3,016.8-3,006.8	Arsenic (dissolved)	90.4	0.14	5, pp. 75, 917; 72, p. 13; 76, p. 24; 77, p. 8; 78, p. 20; 82, p. 3
"	"	"	"	"	Lead (dissolved)	4.6	0.05	5, pp. 75, 917; 72, p. 13; 76, p. 24; 77, p. 8; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	4,260	3.75	5, pp. 75, 917; 72, p. 13; 76, p. 24; 77, p. 8; 78, p. 21; 82, p. 3

TABLE 4C: Observed Release (Ground Water Samples) to the Surficial Alluvial Aquifer (Ground Water Segment)								
Sample Number (Date Collected)	**EPA CLP Sample Number (for metals)**	**Well ID**	**Ground water Elevation* (feet amsl)**	**Well Screened Interval* (feet amsl)**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/L) (metals-µg/L)**	**Sample Quantitation Limit (SQL)** (dioxins/furans-pg/L) (metals-µg/L)**	**References**
SSGW12 (10/29/11)	**-**	SSGW12	3,045.2	3,033.2-3,023.2	1,2,3,4,6,7,8-HpCDD	115	3.0	5, p. 76; 67, p. 205, 283; 72, p. 17; 77, p. 9
"	**MH3BA8**	"	"	"	Arsenic (dissolved)	63.3	0.14	5, pp. 76, 918; 72, p. 17; 76, p. 24; 77, p. 9; 78, p. 20; 82, p. 3
"	"	"	"	"	Lead (dissolved)	8.6	0.05	5, pp. 76, 918; 72, p. 17; 76, p. 24; 77, p. 9; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	3,630	3.75	5, pp. 76, 918; 72, p. 17; 76, p. 24; 77, p. 9; 78, p. 21; 82, p. 3
SSGW13 (10/26/11)	**MH3121**	SMW-14	3,033.5	3,037.9-3,015.1	Arsenic (dissolved)	35.7	0.14	5, pp. 76, 983, 1066; 51, pp. 21, 25, 53; 72, p. 4 ; 76, p. 38; 78, p. 20
"	"	"	"	"	Manganese (dissolved)	1,800	0.15	5, pp. 76, 983, 1066; 51, pp. 21, 25, 53; 72, p. 4; 76, p. 38; 78, p. 21
SSGW14 (10/26/11)	**MH3122**	SMW-13	3,032.4	3,038.1-3,019.1	Arsenic (dissolved)	13.0	0.14	5, pp. 76, 984, 1066; 51, pp. 21, 25, 51; 72, p. 5; 76, p. 38; 78, p. 20
"	"	"	"	"	Manganese (dissolved)	2,660	3.75	5, pp. 76, 984, 1066; 51, pp. 21, 25, 51; 72, p. 5; 76, p. 38; 78, p. 21
SSGW15 (10/26/11)	**MH3123**	SMW-17	3,035.9	3,041.52-3,021.52	Arsenic (dissolved)	14.5	0.14	5, pp. 76, 985, 1066; 51, pp. 21, 25, 59; 72, p. 6; 76, p. 38; 78, p. 20

TABLE 4C: Observed Release (Ground Water Samples) to the Surficial Alluvial Aquifer (Ground Water Segment)								
Sample Number (Date Collected)	**EPA CLP Sample Number (for metals)**	**Well ID**	**Ground water Elevation* (feet amsl)**	**Well Screened Interval* (feet amsl)**	**Hazardous Substance**	**Hazardous Substance Concentration (dioxins/furans-pg/L) (metals-µg/L)**	**Sample Quantitation Limit (SQL)** (dioxins/furans-pg/L) (metals-µg/L)**	**References**
"	"	"	"	"	Manganese (dissolved)	4,170	3.75	5, pp. 76, 985, 1066; 51, pp. 21, 25, 59; 72, p. 6; 76, p. 38; 78, p. 21
SSGW16 (10/26/11)	**MH3124**	SMW-11	3,031.2	3,035.33-3,009.03	Arsenic (dissolved)	44.8	0.14	5, pp. 76, 986, 1066; 51, pp. 21, 24, 47; 72, p. 7; 76, p. 38; 78, p. 20
"	"	"	"	"	Manganese (dissolved)	3,580	3.75	5, pp. 76, 986, 1066; 51, pp. 21, 24, 47; 72, p. 7; 76, p. 38; 78, p. 21
SSGW17 (10/26/11)	**-**	SMW-19	3,040.4	3,044.85-3,021.65	2,3,7,8-TCDF	2.96	0.76	5, pp. 76, 376; 51, pp. 21, 25, 63; 67, p. 28, 156; 72, p. 8
"	**MH3125**	"	"	"	Arsenic (dissolved)	9.2	0.14	5, pp. 76, 987, 1066; 51, pp. 21, 25, 63; 72, p. 8; 76, p. 38; 78, p. 20
"	"	"	"	"	Manganese (dissolved)	921	0.15	5, pp. 76, 987, 1066; 51, pp. 21, 25, 63; 72, p. 8; 76, p. 38; 78, p. 21
SSGW18 (10/27/11)	**MH3BA9**	SMW-10	3,029.4	3,032.98-3,006.98	Arsenic (dissolved)	42.2	0.14	5, pp. 76, 919; 51, pp. 21, 24, 45; 72, p. 9; 76, p. 24; 78, p. 20; 82, p. 3
"	"	"	"	"	Manganese (dissolved)	3,340	3.75	5, pp. 76, 919; 51, pp. 21, 24, 45; 72, p. 9; 76, p. 24; 78, p. 21; 82, p. 3

Notes:
* Elevations and screened intervals for all wells are estimated based on best available information and are rounded to the nearest 0.1 foot.
** For dioxin and furan analytes the limit presented is an estimated detection limit (EDL).
Sample ID Smurfit-Stone, Ground water, Sequential sample number (e.g., 01) (Ref. 5, p. 20)

ID	Identification
SQL	Sample Quantitation Limit: for metals = MDL x dilution factor; for dioxins/furans = EDL. MDLs can be found in Ref. 81; Ref. 67 presents the EDLs.
¥	Although not required, this 'J'-flagged analytical result has been adjusted to illustrate the relative increase in contamination over background (Refs. 49, p. 8; 80).
MDL	Method Detection Limit
CLP	Contract Laboratory Program
pg/L	picograms per liter (equivalent to parts per quadrillion)
µg/L	micrograms per liter (equivalent to parts per billion)
(x.x)	Concentration shown in parentheses was adjusted based on its type of bias (Refs. 49; 80).
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit (Refs. 5, p. 970; 67, p. 10)
J	(for dioxins and furans) Indicates that the target analyte was detected below the calibrated range (Ref. 67, p. 53). The associated numerical value is an estimated quantity because the Quality Control criteria were not met (Ref. 67, p. 10).
EDL	Estimated Detection Limit
TCDD	Tetrachlorodibenzo-p-dioxin
PeCDD	Pentachlorodibenzo-p-dioxin
HxCDD	Hexachlorodibenzo-p-dioxin
HpCDD	Heptachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran
PeCDF	Pentachlorodibenzofuran

Hazardous Substances Meeting Observed Release Criteria to Ground Water (Surficial Alluvial Aquifer) by Chemical Analysis:

2,3,7,8-TCDD
1,2,3,6,7,8-HxCDD
1,2,3,4,6,7,8-HpCDD
Total-TCDD
2,3,7,8-TCDF
2,3,4,7,8-PeCDF
Arsenic (dissolved)
Lead (dissolved)
Manganese (dissolved)

An observed released of site-attributable contaminants is established as outlined above in the HRS documentation record (Ref. 1, p. 51629, Section 4.2.2.1.1). Therefore, an observed release factor value of 550 is assigned for the watershed (Ref. 1, p. 51629, Section 4.2.2.1.1).

Observed Release Factor Value: 550

Additional Supporting Information

In 1987, the EPA collected fish tissue from the Clark Fork River near Huson at river mile 186[2] (approximately 10 miles below the mill) as part of the National Study of Chemical Residues in Fish study (previously known as the National Bioaccumulation Study) (Refs. 11, p. 1; 24, pp. 20, 21, 39 and 40 of Table 3; 73, pp. 2, 8, 9, 22; Figure 1 of this HRS documentation record). The sample site near Huson was a 'targeted' study site for the Smurfit-Stone Mill (then owned by the Stone Container Corporation), as it was thought to be a producer of dioxins due to bleaching (Ref. 73, pp. 7, 8, 10, 22). Tissue from both of the fish species tested (largescale sucker and rainbow trout) contained dioxins and furans (Ref. 24, p. 21, 39 and 40 of Table 3). The concentrations were below guidelines for whole or edible fish (Ref. 24, p. 21, 39 and 40 of Table 3).

Attribution

The Smurfit-Stone Mill began operation as a kraft pulp mill in 1957 (Refs. 16, p. 1; 26, p. 5). Beginning in 1958, wastewater was temporarily stored onsite in unlined ponds before being discharged to the river under high flow, spring runoff conditions (e.g., March through June) (Refs. 22, pp. 5, 44; 26, pp. 7, 11). During the storage months, a substantial amount of water seeped through the bottom of the storage ponds into the shallow, surficial alluvial aquifer (Ref. 22, pp. 3, 5; 26, pp. 7, 11). In fact, seepage was one of the principal methods of discharge of wastewater from the mill since its inception (Ref. 22, p. 3). By 1973, the major volume of wastewater, 10.56 mgd, was being disposed of by seepage to the shallow ground water, with another 5.28 mgd being discharged directly into the Clark Fork during high flow periods (Ref. 21, pp. 15, 16, 26, 27). Ground water flow direction within the shallow, surficial alluvial aquifer in the areas of the mill where the identified sources are located is primarily to the west and northwest towards the Clark Fork River (Refs. 58, pp. 5, 6; 59, pp. 52 (Figure 4-1), 58 (Figure 4-7), 77-86 (Exhibit 1)).

2 Note: the river mile reported in Reference 24 is from a different numbering system than that used by the MWFP in Reference 6. The Reference 6 system is used here.

-Dioxins and furans

Bleaching pulp mills in particular are responsible for the formation of dioxins and furans (Refs. 37, pp. 2, 4, 5; 44, p. 1-5; 45, p. 3). In 1990, the EPA published a report summarizing analytical results from the sampling of 104 pulp and paper mills across the U.S. that practiced chlorine bleaching of chemically produced pulps (Ref. 45, pp. 1, 3). Samples were collected from three 'export matrices': bleached pulp, wastewater sludge, and wastewater effluent (Ref. 45, p. 3). The results of chemical analysis of the samples showed that, for kraft mills with bleaching operations, 2,3,7,8-TCDD was detected in 90 percent of overall samples, and 2,3,7,8-TCDF was detected in 97 percent of overall samples (Ref. 45, p. 4).

Specifically for wastewater effluent samples from bleaching kraft mills, 90 of 107 samples (84 percent) contained detectable amounts of 2,3,7,8-TCDD and 104 of 111 samples (94 percent) contained detectable quantities of 2,3,7,8-TCDF (Ref. 45, pp. 4-5). In the same study, 94 of 97 sludge samples (97 percent) collected from bleaching kraft mills contained detectable amounts of 2,3,7,8-TCDD and 100 percent of the 97 samples contained detectable amounts of 2,3,7,8-TCDF (Ref. 45, pp. 5, 8). Pulp samples yielded similar results, with 98 of 104 (94 percent) samples of bleached kraft softwood pulp showing detectable levels of 2,3,7,8,-TCDD, and 99 of 102 (97 percent) samples showing detectable levels of 2,3,7,8-TCDF (Ref. 45, p. 5).

None of the mills sampled were free of either compound (Ref. 45, p. 4). A subset of samples from nine mills were also analyzed for 2,3,7,8-substituted CDDs and CDFs. The most common 2,3,7,8-substituted CDDs and CDFs found across all matrices sampled were 1,2,3,4,6,7,8-HpCDD; OCDD; 1,2,3,7,8-PeCDF; 2,3,4,7,8-PeCDF; and OCDF (Ref. 45, pp. 24-27).

The Smurfit-Stone Mill produced bleached pulp and paper from 1960 through 1999 (Refs. 16, p. 1; 22, pp. 7, 9; 25, p. 9; 26, p. 5). For example, the mill produced an average of 159 tons of bleached product in 1973 (Ref. 21, pp. 7, 13). For this year, the mill reported that 30,000 gallons of water were needed per ton of bleached product; therefore, the wastewater discharge from the bleach plant was computed to average 4.8 million gallons per day (Ref. 21, p. 13).

Analytical results from the sampling of sources identified on the Smurfit-Stone Mill property show that a number of dioxin and furan compounds are present (Ref. 5, pp. 67, 69, 72-73, 403-404, 416-418; Tables 1, 2 and 3 of this HRS documentation record). In particular, the dioxin compound detected in sediment samples collected from the Clark Fork River adjacent to the mill property, 1,2,3,4,6,7,8-HpCDD, was also detected in source samples at concentrations as high as 311 picograms per gram (pg/g) (sample SSSO0602, Table 1 of this HRS documentation record), and in the shallow ground water beneath the mill at concentrations as high as 546 picograms per liter (pg/L) (Refs. 5, pp. 67, 68, 72, 75, 212, 214, 403; 67, p. 200; 77, p. 4; 78, p. 44; sample SSGW05, Table 4C of this HRS documentation record).

In 1997, a contractor engaged by the Smurfit-Stone Mill (at that time, operated by the Stone Container Corporation) conducted compliance monitoring sampling for dioxins and furans in alluvial sediment and fish collected near the mill (Ref. 42, pp. 1, 3). Sediment composite samples were collected at one 'background' location upstream of the mill (sample ID SSCS-4, "Sediment Sampling Site 4"), and at one location approximately ½ mile downstream of Outfall 3 (sample IDs SSCS-1 and SSCS-2 (the field replicate of SSCS-1)) (Ref. 42, pp. 4, 8). The samples were submitted to a laboratory and were analyzed for dioxin/furan congeners using EPA Method 1613A (Ref. 42, p. 9). Analytical results from the background sediment sample SSCS-4 contained a detectable concentration of 1,2,3,4,6,7,8-HpCDD of 4.1 nanograms per kilogram (ng/kg) (equivalent to pg/g) while the downstream sediment samples were non-detect for this compound (Ref. 42, p. 11). The authors of the report attribute the detection of this compound in sample SSCS-4 to an upstream source (Ref. 42, p. 13).

It should be noted that the 1997 report did not identify other potential avenues, such as flooding of the Clark Fork River or atmospheric deposition from sources at the mill, as a possible reason for the presence of the dioxin compound. Air emissions in particular have been an issue with the mill in the past. For example, in a report filed by the MDEQ in early October 2011, a complainant described "a plume of dust coming from a settling pond just south of the former Smurfit-Stone mill." (Ref. 57, p. 1). The pond located directly south of the mill is sludge pond 17, part of Source No. 1 identified in this HRS documentation record (Ref. 5, p. 67; Figure 2 of this HRS documentation record). The complainant reported that the plume was approximately 250 feet high and 0.5 mile wide (Ref. 57, p. 1).

It should also be stressed that the sediment sampling data collected in October 2011 represents the most recent available data set.

Sources of metals in kraft pulp and paper mill waste streams include wood (calcium, potassium, manganese), spent pulping solutions that dissolve metals from wood, papermaking additives such as alum and kaolin clay, soils on logs and wood chips, green liquor dregs (particularly for manganese), and make-up lime used in the causticizing reaction (Ref. 44, pp. 6-20, 6-22, 6-23). At the Smurfit-Stone Mill, the dregs from the recausticizing operation and fly ash from the multi-fuel boiler were both disposed of into the sludge ponds (Ref. 22, pp. 8, 9). After passing through the clarifier and/or sludge ponds, wastewater discharge from all portions of the paper and pulp mill, including from the recausticizing plant, was sent to the aeration basins and then eventually to the wastewater storage ponds (Ref. 22, pp. 8, 9, 26, 27). These discharges could also bypass the clarifier and report directly to the emergency spill pond 8 (Ref. 22, p. 26).

The EPA published a report in November 2006 that, in part, reported on the releases of metals reported by pulp and paper mills through the Toxics Release Inventory (TRI) database (Ref. 44, pp. xvi, 1-1, 4-8). Manganese was the metal with the highest toxic-weighted pound equivalents (TWPE) reported for both types of mills (Ref. 44, pp. xvi, 4-8). Additionally, wood is noted to be a major source of manganese in the kraft process (Ref. 44, p. 6-20). The Smurfit-Stone Mill (known at that time as Stone Container Corporation) was one of the mills for which TRI data was compiled (Ref. 44, p. A-6).

The presence of metals in wastewater discharged from the mill was noted in the EIS for the mill, and total manganese was detected at a concentration of 0.219 mg/L within a representative wastewater sample collected by the Smurfit-Stone Mill as part of MPDES permit requirements (Refs. 22, pp. 56, 61, 81).

Analytical results from the sampling of sources identified on the Smurfit-Stone Mill property show that a number of metals including arsenic, cadmium, manganese and lead are present in the ponds (Ref. 5, pp. 67, 69, 72-73, 1006-1011, 1036-1038-1048, 1050-1051; Tables 1, 2 and 3 of this HRS documentation record). In particular, manganese, which was detected in sediment samples collected from the Clark Fork River adjacent to the mill property, was also detected in source samples at concentrations as high as 6,840 mg/kg (Refs. 5, pp. 67, 72, 202, 1008, 1065; 78, p. 6). Dissolved manganese was also detected in shallow ground water beneath the property in concentrations as high as 9,240 µg/L (Refs. 5, pp. 68, 75, 914; 77, p. 5; 82, p. 3).

The concentration of dissolved manganese in the background surface water sample on O'Keefe Creek (SSSW01), collected as part of the 2011 combined SI and RA, was 4.4 micrograms per liter (µg/L), similar to the background dissolved manganese concentration on the Clark Fork River (sample SSSW04, 4.8 µg/L) (Refs. 5, pp. 29, 73, 135; 62, pp. 1-3; 79, p. 7). This indicates that the elevated concentrations of dissolved manganese noted in the Clark Fork River adjacent to the Smurfit-Stone Mill property are not attributable to O'Keefe Creek.

When compared to the background ground water concentrations, concentrations of manganese meeting HRS observed release criteria have been documented in wells completed within the surficial alluvial aquifer in locations both directly beneath sources as well as downgradient of Sources No. 1, 2, and 3 (Ref. 5, pp. 911-919, 959, 960, 963, 964, 981, 983-987; and section 4.2.1.3 and Table 4C of this HRS documentation record). No elevated concentrations of those hazardous substances identified in ground water beneath the identified sources were documented in a ground water monitoring well upgradient of the identified sources, providing evidence that there are no other likely sources of the elevated concentrations documented in the surficial alluvial aquifer (Refs. 5, pp. 959, 960, 963, 964, 981; 67, p. 53; Table 4C of this HRS documentation record).

The Smurfit-Stone Mill is located in a rural area, surrounded primarily by agricultural land and residential areas to the north, east and south, and by the Clark Fork River and forest to the west (see Figure 2 of this HRS documentation record). No other major industrial facilities have been identified in the vicinity (i.e., within 3 radial miles, including upstream of the mill along O'Keefe Creek) (Ref. 61).

Two methods were used to search for other industrial facilities that could be potential off-site sources of hazardous substances identified at the Smurfit-Stone Mill site or within the Clark Fork River adjacent to the mill (Ref. 61, pp. 1-3). First, a search of the EPA's Facility Registration System (FRS) was conducted to ascertain whether any other industrial facilities existed 1), in the area immediately surrounding the mill (i.e., within approximately 3 radial miles) to assess the potential for another facility to contribute contamination to ground water beneath the mill; and 2), upstream of the mill on or near (i.e., within approximately 0.5 mile) the Clark Fork River, to assess the potential for another facility to contribute to contamination of the surface water or sediments adjacent to the mill (Ref. 61, p. 1). The upstream extent of the search was approximately 9 miles above the Smurfit-Stone Mill property, to the location of the USGS Station 12353000, where the USGS has conducted water quality sampling for manganese (discussed on the following page of this HRS documentation record) (Ref. 65, pp. 1, 17-20).

The FRS is a centrally managed database that identifies facilities, sites or places subject to a wide range of environmental regulations or that are of environmental interest (Ref. 61, p. 5). The FRS contains facility records that are based on information from EPA's national program systems and state master facility records, including the MDEQ's Consolidated Environmental Data Acquisition and Retrieval System (MT-CEDARS), which is the MDEQ's consolidated system (Ref. 61, pp. 2, 5-6).

An initial search of the databases above yielded 483 facilities in the greater Missoula area (Ref. 61, p. 10). These search results were vetted using the spatial parameters mentioned above (i.e., the search was narrowed to only those facilities within 3 miles radially, or within 9 miles upstream and on or near the Clark Fork). Except for the mill itself (identified within FRS as M2Green Redevelopment, Ref. 61, pp. 17-20), this narrowed search yielded three facilities within a 3 mile radius of the mill: a stone mining and quarrying facility, a sign manufacturer, and a body shop (Ref. 61, pp. 21-23). Only one additional facility was identified upstream of the mill and within approximately 0.5 mile of the Clark Fork River, a construction company (Ref. 61, pp. 24-25). Further details of the methodology and search data used during the search of FRS are provided in Reference 61 (pp. 1-2, 5-9). Based on the distances between the site and the facilities mentioned above, along with the close proximity of the Smurfit-Stone Mill sources to the documented releases to ground water and surface water (Ref. 61, pp. 1-12, 21-25; Figure 3 of this HRS documentation record), it is expected that the four identified facilities are not significant contributors to the releases.

The second search was conducted of records within the MDEQ Remediation Response Site Query System (Ref. 61, pp. 27-28). This database compiles information gathered by various state programs, including the Superfund program (known as the Comprehensive Environmental Cleanup and Responsibility Act [CECRA]), Brownfields, Enforcement, the Hazardous Waste Act Program, and others. Details for the

methods used for this search are also provided in Reference 61 (Ref. 61, p. 2-3). Of the 43 facilities identified by this search (Ref. 61, pp. 28-29), two facilities (the Missoula White Pine Sash Company and the Missoula Sawmill site) were listed as having dioxins/furans or manganese as contaminants of concern (Ref. 61, pp. 30, 37). MDEQ was contacted for more information about these sites and the site managers for both sites reported that contamination at either site had not been documented to have reached the Clark Fork River (Ref. 61, pp. 35-36, 40).

In 1908, a flood washed millions of cubic yards of mine wastes (tailings) in to the Clark Fork River below Butte, Montana. In 1983, the EPA listed the Milltown Reservoir Sediments/ Clark Fork River site on the NPL due to contamination from these tailings (Ref. 64, p. 1). The Milltown Reservoir/Clark Fork River site has three operable units (OUs): Milltown Reservoir Sediments, Milltown Water Supply, and the Clark Fork River upstream of the Milltown Dam. The Milltown Dam, which was located approximately 24 miles upstream of the Smurfit-Stone Mill at the confluence of the Clark Fork and the Blackfoot rivers, is the downstream extent of the NPL site (Ref. 64, pp. 1, 2, 10; Figure 1 of this HRS documentation record). By September 2009, the Milltown Dam and over 2.2 million cubic yards of contaminated sediments that had been trapped behind the dam had been removed (Ref. 65, p. 8). The primary contaminants of concern for the Milltown Reservoir Sediments OU are arsenic and copper; and for the Clark Fork River OU are arsenic, cadmium, copper, lead and zinc (Ref. 64, pp. 3, 9).

Manganese is not a primary contaminant of concern for the Milltown Reservoir Sediments/Clark Fork River NPL site. USGS water quality data show that dissolved (filtered) manganese concentrations in the Clark Fork River increased slightly just downstream of the (now former) Milltown Dam location. Specifically, USGS water quality data shows that the average dissolved manganese concentration on the Clark Fork River above the dam (USGS Station #12334550 on the Clark Fork at Turah Bridge - 345 samples) is 7.68 µg/L (Ref. 65, pp. 1-16; Figure 1 of this HRS documentation record). Below its confluence with the Bitterroot River, the average dissolved manganese concentration on the Clark Fork River is 8.5 µg/L (USGS Station #12353000 - 41 samples, approximately 9 miles upstream of the Smurfit-Stone Mill), (Ref. 65, pp. 17-20).

The concentration of dissolved manganese in the background surface water sample (SSSW04) collected by EPA-START just above the mill in 2011 was 4.8 µg/L (Refs. 5, p. 974; 62, pp. 1-3; 79, p. 7; Table 4A and Figure 3 of this HRS documentation record). Four of six release samples (SSSW05, SSSW06, SSSW08, and SSSW10) collected adjacent to and just downstream of the mill showed observed release concentrations ranging from 18.2 to 32 µg/L (Refs. 5, pp. 975-976, 978, 980; Table 4A and Figure 3 of this HRS documentation record).

4.2.3 Human Food Chain Threat

The human food chain threat is based on three factor categories: likelihood of release, waste characteristics, and targets. These are discussed individually in the sections below.

4.2.3.1 <u>Human Food Chain Threat - Likelihood of Release</u>

As was shown above in Section 4.2.1.3 of this HRS documentation record, an observed released of site-attributable contaminants is established for both the uppermost aquifer as well as the Clark Fork River. Therefore, an observed release factor value of 550 is assigned for the watershed (Ref. 1, pp. 51629, 51637, Sections 4.2.2.1.1 and 4.2.3.1).

Likelihood of Release Factor Value: 550

4.2.3.2 Human Food Chain Threat Waste Characteristics

4.2.3.2 Human Food Chain Threat – Waste Characteristics

4.2.3.2.1 Toxicity/ mobility/ persistence/ bioaccumulation

Table 5 below summarizes the toxicity, mobility, persistence, and bioaccumulation potential factor values for each hazardous substance for which an observed release into the surficial alluvial aquifer has been established (Ref. 1, p. 51637, Section 4.2.3.2.1). As per Section 4.2.3.2.1.5 of the HRS, the substance with the highest toxicity/ mobility/ persistence/ bioaccumulation potential factor value is used to assign the toxicity/ mobility/ persistence/ bioaccumulation potential factor value for the watershed (Ref. 1, p. 51637, Section 4.2.3.2.1.5). 1,2,3,4,6,7,8-HpCDD; 2,3,7,8-TCDF; and manganese all have a toxicity/ mobility/ persistence/ bioaccumulation potential factor value of 5×10^8.

Toxicity/ Mobility/ Persistence/ Bioaccumulation Factor value: 5×10^8

4.2.3.2.1 Toxicity/Mobility/Persistence/Bioaccumulation

Table 5: Toxicity/Mobility/Persistence/Bioaccumulation Factor Values for the Human Food Chain Threat								
Hazardous Substance	**Source No.**	**Toxicity Factor Value (human food chain) (Ref. 1, p. 51637, Section 4.2.3.2.1.1)**	**Mobility Factor Value***	**Persistence Factor Value (for rivers) (Ref. 1, p. 51637, Section 4.2.3.2.1.3)**	**Toxicity/ Mobility/ Persistence Factor Value (Ref. 1, p. 51630, Table 4-26)**	**Bio-accumulation Potential Factor Value (Freshwater) (Ref. 1, p. 51637, Section 4.2.3.2.1.4)**	**Toxicity/Mobility/ Persistence/Bio-accumulation Factor Values (Ref. 1, Section 4.2.3.2.1.5, Table 4-28)**	**References**
2,3,7,8-TCDD	1, 2, 3	10000	1	1	10000	5000	5×10^{7}	1, pp. 51601-51602, Table 3-9; 2, p. A-330
1, 2, 3, 7, 8-PeCDD	1, 2, 3	10000	0.0001	1	1	50000	5×10^{4}	1, pp. 51601-51602, Table 3-9; 2, p. A-264
1,2,3,6,7,8-HxCDD	1, 2, 3	10000	1	1	10000	5000	5×10^{7}	1, pp. 51601-51602, Table 3-9; 2, p. A-202
1,2,3,4,6,7,8-HpCDD	1, 2, 3	10000	1	1	10000	50000	5×10^{8}	1, pp. 51601-51602, Table 3-9; 2, p. A-184
Total-TCDD	1, 2, 3	0	1	1	0	50000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-328
2,3,7,8-TCDF	1, 2, 3	10000	1	1	10000	50000	5×10^{8}	1, pp. 51601-51602, Table 3-9; 2, p. A-332
2,3,4,7,8-PeCDF	1, 2, 3	10000	1	1	10000	0.5	5×10^{3}	1, pp. 51601-51602, Table 3-9; 2, p. A-268
Arsenic	1	10000	1	1	10000	5	5×10^{4}	1, pp. 51601-51602, Table 3-9; 2, p. A-30
Lead	1	10000	1	1	10000	5	5×10^{4}	1, pp. 51601-51602, Table 3-9; 2, p. A-224
Manganese	1, 2, 3	10000	1	1	10000	50000	5×10^{8}	1, pp. 51601-51602, Table 3-9; 2, p. A-232

* As per Ref. 1, p. 51601 (Section 3.2.1.2), all substances that meet the criteria for an observed release by chemical analysis to one or more aquifers underlying the identified sources are assigned a mobility factor value of 1.

4.2.3.2.2 Hazardous Waste Quantity

The sum of the hazardous waste quantity values for Sources 1, 2 and 3 corresponds to a hazardous waste quantity factor value of 1,000,000 in Table 2-6 of the HRS (Ref. 1, p. 51591). Therefore, a hazardous waste quantity factor value of 1,000,000 is assigned for the ground water to surface water migration component of the surface water pathway (Ref. 1, Sections 2.4.2.2 and 4.2.3.2.2, pp. 51591, 51592, 51638).

Hazardous Waste Quantity Factor Value: 1,000,000

4.2.3.2.3 Calculation of Human Food Chain Threat – Waste Characteristics Factor Category Value

The hazardous substance manganese associated with all waste sources (which all have surface water pathway containment factors of greater than 0 for the watershed) corresponds to a toxicity/ mobility/ persistence factor of 10,000 and a bioaccumulation potential factor value of 50,000 (Ref. 1, Tables 3-9, 4-26; 2, p. A-232, Table 5 of this HRS documentation record).

(Toxicity/ mobility/ persistence factor value) x (hazardous waste quantity factor value for the watershed):
$10{,}000 \times 1{,}000{,}000 = 1 \times 10^{10}$
Subject to a maximum of $1 \times 10^{8} = 1 \times 10^{8}$ (Ref. 1, p. 51638, Section 4.2.3.2.3)

(Product above) x (bioaccumulation potential factor value for the substance)
$(1 \times 10^{8}) \times (50{,}000) = 5 \times 10^{12}$
Subject to a maximum of $1 \times 10^{12} = 1 \times 10^{12}$ (Ref. 1, p. 51638, Section 4.2.3.2.3)

The waste characteristics product of 1×10^{12} corresponds to a waste characteristics factor category value of 1,000 in Table 2-7 of the HRS (Ref. 1, p. 51592, Section 2.4.3.2).

Waste Characteristics Factor Category Value: 1,000

4.2.3.3 Human Food Chain Threat – Targets

Level I Concentrations:

No Level I concentrations have been documented.

Level II Concentrations:

Level II concentrations of dissolved manganese and 1,2,3,4,6,7,8-HpCDD have been documented in the Clark Fork River, which is a fishery, as discussed below.

According to Montana Fish, Wildlife and Parks (MFWP) and a fishing outfitter on the Clark Fork, the portion of the Clark Fork River adjacent to the Smurfit-Stone Mill property is fished and the fish are kept and consumed (Refs.11, p. 1; 40; 52, p. 1). This area is subject to contaminated ground water from Source Nos. 1, 2, and 3 migrating to surface water. Surface water samples collected from the river adjacent to the mill property during 2011 show concentrations of dissolved manganese meeting HRS observed release criteria (Ref. 5, pp. 975-976, 978, 980; section 4.2.1.3 and Table 4A of this HRS documentation record). The sampling locations are shown in Figure 3 of this HRS documentation record.

The Clark Fork River is managed by the MFWP as a cold water fishery and is heavily used by anglers and other water-based recreationists (Refs. 9, pp. 1, 20, 22, 24, 25; 10, p. 2; 40; 41, p. 1; 52, p. 1). A 1996

creel census documented that the section of the river that includes the area adjacent to the mill property received the highest rate of fishing pressure and had the highest catch rate of any section of the river (Ref. 10, pp. 4, 7, 19, A-1; 11, p. 1). While this section also had the lowest percentage of fish kept (2 percent), the study still documented that over 1,000 fish were kept during the period of the survey (July 1, 1995 through June 30, 1996) (Ref. 10, p. 7). The study also documented that anglers had concerns over the mill's effect on water quality and fish populations on the river (Ref. 10, pp. 16-17). While fluctuating from year to year, data from the most recent angling pressure study (2009) shows an overall increase in the number of licensed anglers in the state (Ref. 9, pp. 15, 16).

The fish species kept for consumption include rainbow trout, brown trout, northern pike, and mountain whitefish (Refs. 10, p. 7; 40; 41). Crayfish are also caught and consumed (Ref. 11, p. 1).

MFWP have established over two dozen formal river access sites on the Clark Fork, including the Deep Creek and Harper's Bridge sites (both at river mile 200, approximately 2 miles upstream of Source No. 3), and the Erskine site (stretching from river mile 192.5 to 190), approximately 3.5 miles downstream of the mill property boundary (Refs. 6, p. 1; 12, pp. 5, 12; Figure 1 of this HRS documentation record). Anglers access the stretch of river adjacent to the mill from the upstream formal river access points, as well as via a road (South Side Rd.) that runs along the south side of the river across from the mill (Ref. 40; Figure 2 of this HRS documentation record). In 2004, the mill reported that each year the number of people recreating on the river in the area of the mill continued to increase (Ref. 22, pp. 3, 22).

Most Distant Level II Sample (collected October 2011)

Sample ID:	SSSW10
Sample Medium:	Surface water
Hazardous Substance:	Manganese (dissolved)
Distance from the highest PPE:	approximately 3.6 miles

Sample ID:	SSSE10
Sample Medium:	Sediment
Hazardous Substance:	1,2,3,4,6,7,8-HpCDD
Distance from the highest PPE:	approximately 3.6 miles

Level II Fishery

Identity of Fishery	**Extent of Level II Fishery (Relative to Highest PPE)**	**References**
Clark Fork River	3.6 miles, as measured from the highest PPE on the Clark Fork River (i.e., the PPE from Source No.3), downstream to the co-located samples SSSE10/SSSW10	5, pp. 22, 68; 6, p. 1; 9, pp. 15-16; 10, pp. 4, 7, 19; 11, p. 1; 12, pp. 5, 12; 22, p. 22; 40; 79, p. 9; Tables 4A and 4B and Figures 3 and 5 of this HRS documentation record

4.2.3.3.1 Food Chain Individual

As noted previously, an observed release of the hazardous substances manganese and 1,2,3,4,6,7,8-HpCDD, which both have a bioaccumulation factor value of 500 or greater, is documented in a perennial surface water body that is a fishery (the Clark Fork River) (see Tables 4A and 4B of this HRS documentation record). The Clark Fork River is managed by the MFWP as a cold water fishery and is

heavily used by anglers and other water-based recreationists (Refs. 9, pp. 1, 11, 13, 18, 22, 24, 25; 10, p. 2; 40; 41, p. 1; 52, p. 1). According to the MFWP and a fishing outfitter on the Clark Fork, the portion of the Clark Fork River adjacent to the Smurfit-Stone Mill property is fished and the fish are kept and consumed (Refs. 6, p. 4; 11, p. 1; 12, p. 5; 40; 52, p. 1; Figure 1 of this HRS documentation record). The fish species kept for consumption include rainbow trout, brown trout, northern pike, and mountain whitefish (Refs. 10, p. 7; 40; 41). Crayfish are also caught and consumed (Ref. 11, p. 1).

Sample IDs: SSSW05, SSSW06, SSSW08, SSSW010
Sample Medium: Surface water
Level I/Level II/Potential: Level II
Hazardous Substance: Manganese (dissolved)
Bioaccumulation Potential: 50,000

Sample IDs: SSSE05, SSSE06, SSSE07, SSSE08, SSSE09, SSSE10
Sample Medium: Sediment
Level I/Level II/Potential: Level II
Hazardous Substance: 1,2,3,4,6,7,8-HpCDD
Bioaccumulation Potential: 50,000

Identity of Fishery	Type of Surface Water Body	References
Clark Fork River	Large stream to river (mean annual flow rate = 5,330 cfs)	1, Table 4-13, p. 51613; 9, pp. 20, 78, 118, 129, 138; 10, pp. 2, 7; 11, p. 1; 40; 41, p. 1; 52, p. 1; 60; 71; Figure 1 of this HRS documentation record

As a portion of the Clark Fork River where fish are taken and consumed is subject to Level II contamination, this portion of the river is assigned a food chain individual factor value of 45 (Ref. 1, p. 51638, and Section 4.2.3.3.1).

Food Chain Individual Factor Value: 45

4.2.3.3.2 Population

4.2.3.3.2.1 Level I Concentrations

No Level I concentrations have been documented.

4.2.3.3.2.2 Level II Concentrations

The Clark Fork River is evaluated as a Level II fishery. According to the MFWP and a fishing outfitter on the Clark Fork, the portion of the Clark Fork River adjacent to the Smurfit-Stone Mill property is fished and the fish are kept and consumed (Refs.11, p. 1; 40; 52, p. 1). The fish species kept for consumption include rainbow trout, brown trout, northern pike, and mountain whitefish (Refs. 10, p. 7; 40; 41). Crayfish are also caught and consumed (Ref. 11, p. 1). Specific information is not available on the annual production of fish caught in the Clark Fork River within the TDL. Therefore, the annual production for the water body is undetermined, but greater than zero because the Clark Fork River is a fishery (Refs.11, p. 1; 40; 52, p. 1).

Identity of Fishery	Annual Production (pounds)	References	Human Food Chain Population Value (Ref. 1, Table 4-18)
Clark Fork River	>0	1, pp. 51621, 51638, Sections 4.1.3.3.2.2 and 4.2.3.3.2.2; 10, p. 7; 11, p. 1; 40; 52, p. 1	0.03

Level II Concentrations Factor Value: 0.03

4.2.4 Environmental Threat

4.2.4.1 Environmental Threat – Likelihood of Release

As was shown above in Section 4.2.1.3 of this HRS documentation record, an observed released of site-attributable contaminants is established for both the uppermost aquifer as well as the Clark Fork River. Therefore, an observed release factor value of 550 is assigned for the watershed (Ref. 1, pp. 51629, 51638, Sections 4.2.2.1.1 and 4.2.4.1).

Likelihood of Release Factor Value: 550

4.2.4.2 Environmental Threat – Waste Characteristics

4.2.4.2.1 Ecosystem Toxicity/ Mobility/ Persistence/ Bioaccumulation

Table 6 below summarizes the ecosystem toxicity, mobility, persistence, and bioaccumulation potential factor values for each hazardous substance for which an observed release into the surficial alluvial aquifer has been established (Ref. 1, p. 51638, Section 4.2.4.2.1). As per Section 4.2.4.2.1.5 of the HRS, the substance with the highest ecosystem toxicity/ mobility/ persistence/ bioaccumulation potential factor value is used to assign the ecosystem toxicity/ mobility/ persistence/ bioaccumulation potential factor value for the watershed (Ref. 1, p. 51638, Section 4.2.4.2.1.5). Lead has the highest ecosystem toxicity/ mobility/ persistence/ bioaccumulation potential factor value of 5×10^7.

Ecosystem toxicity/ Mobility/ Persistence/ Bioaccumulation Factor value: 5×10^7

Table 6: Ecosystem Toxicity/Mobility/Persistence/Bioaccumulation Factor Values for the Environmental Threat								
Hazardous Substance	**Source No.**	**Ecosystem Toxicity Factor Value (Environmental) (Ref. 1, p. 51638, Section 4.2.4.2.1.1)**	**Mobility Factor Value***	**Persistence Factor Value (for rivers)**	**Ecosystem Toxicity/ Mobility/ Persistence Factor Value (Ref. 1, p. 51639, Table 4-29)**	**Bio-accumulation Potential Factor Value (Freshwater) (Ref. 1, p. 51638, Section 4.2.4.2.1.4)**	**Ecosystem Toxicity/Mobility/ Persistence/Bio-accumulation Factor Values (Ref. 1, pp. 51640-51643, Table 4-30)**	**References**
2,3,7,8-TCDD	1, 2, 3	0	1	1	0	5000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-330
1,2,3,7,8-PeCDD	1, 2, 3	0	0.0001	1	0	50000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-264
1,2,3,6,7,8-HxCDD	1, 2, 3	0	1	1	0	5000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-202
1,2,3,4,6,7,8-HpCDD	1, 2, 3	0	1	1	0	50000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-184
Total-TCDD	1, 2, 3	0	1	1	0	50000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-328
2,3,7,8-TCDF	1, 2, 3	0	1	1	0	50000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-332
2,3,4,7,8-PeCDF	1, 2, 3	0	1	1	0	0.5	0	1, pp. 51601-51602, Table 3-9; 2, p. A-268
Arsenic	1	10	1	1	10	5000	5×10^4	1, pp. 51601-51602, Table 3-9; 2, p. A-30
Lead	1	1000	1	1	1000	50000	5×10^7	1, pp. 51601-51602, Table 3-9; 2, p. A-224
Manganese	1, 2, 3	0	1	1	0	50000	0	1, pp. 51601-51602, Table 3-9; 2, p. A-232

Notes:* As per Ref. 1, p. 51601 (Section 3.2.1.2), all substances that meet the criteria for an observed release by chemical analysis to one or more aquifers underlying the identified sources are assigned a mobility factor value of 1.

4.2.4.2.2 Hazardous Waste Quantity

The sum of the hazardous waste quantity values for Sources 1, 2 and 3 corresponds to a hazardous waste quantity factor value of 1,000,000 in Table 2-6 of the HRS (Ref. 1, p. 51591). Therefore, a hazardous waste quantity factor value of 1,000,000 is assigned for the ground water to surface water migration component of the surface water migration pathway (Ref. 1, Sections 2.4.2.2 and 4.2.4.2.2, pp. 51591, 51592, 51644).

Hazardous Waste Quantity Factor Value: 1,000,000

4.2.4.2.3 Calculation of Environmental Threat – Waste Characteristics Factor Category Value

The hazardous substance lead associated with Source No. 1 (which has a ground water pathway containment factor of greater than 0 for the watershed) corresponds to an ecosystem toxicity/ mobility/ persistence factor of 1,000 and a bioaccumulation potential factor of 50,000 (Ref. 1, Tables 3-9 and 4-29; Ref. 2, p. A-224; Table 6 of this HRS documentation record).

(Ecosystem toxicity/ mobility/ persistence factor value) x (hazardous waste quantity factor value for the watershed):
$1{,}000 \times 1{,}000{,}000 = 1 \times 10^9$
Subject to a maximum of $1 \times 10^8 = 1 \times 10^8$ (Ref. 1, p. 51644, Section 4.2.4.2.3)

(Product above) x (bioaccumulation potential factor value for the substance)
$(1 \times 10^8) \times (50{,}000) = 5 \times 10^{12}$
Subject to a maximum of $1 \times 10^{12} = 1 \times 10^{12}$ (Ref. 1, p. 51644, Section 4.2.4.2.3)

The waste characteristics product of 1×10^{12} corresponds to a waste characteristics factor category value of 1,000 in Table 2-7 of the HRS (Ref. 1, p. 51592, Section 2.4.3.2).

Waste Characteristics Factor Category Value: 1,000

4.2.4.3 Environmental Threat - Targets

4.2.4.3.1.1 Level I Concentrations:

No Level I concentrations have been documented.

4.2.4.3.1.2 Level II Concentrations:

Sensitive Environments (Habitat known to be used by the Federally-Designated Threatened Bull Trout)

Level II concentrations of dissolved manganese have been documented in the Clark Fork River. According to the MFWP and the U.S. Fish and Wildlife Service, the Clark Fork River is habitat known to be used by the federally designated threatened native bull trout, including the area of the Clark Fork adjacent to the Smurfit-Stone Mill (Ref. 5, pp. 971, 975-976, 978, 980; 6, pp. 1-4; 7, p. 2; 8, pp. 1, 10, 13-15; 10, pp. 7, 20; 11, p. 1; 12, p. 3; 13, pp. ix, 1, 2, 3, 10, 23, 24, 125; 14, pp. 1, 6; 15, pp. 1-4; 20, p. 2; 40; section 4.2.1.3, Figure 5 and Table 4A of this HRS documentation record). This area is subject to contaminated ground water from Source Nos. 1, 2, and 3 migrating to surface water. Surface water samples collected from the river adjacent to the mill property during 2011 show concentrations of dissolved manganese meeting HRS observed release criteria (Ref. 5, pp. 971, 975-976, 978, 980; section 4.2.1.3 and Table 4A of this HRS documentation record). The sampling locations are shown in Figure 3 of this HRS documentation record.

Therefore, actual contamination is documented, and the target sensitive environments are evaluated for actual contamination, within the zone of actual contamination.

Level II Sensitive Environment targets

Sensitive Environment	**Distance from PPE to Nearest Sensitive Environment**	**References**	**Sensitive Environment Value (Ref. 1, Table 4-23)**
Habitat known to be used by Federal designated threatened Species (bull trout)	0.0 mile	6, pp. 1-4; 7, p. 2; 8, pp. 1, 10, 13-15; 10, pp. 7, 20, A-1; 11, p. 1; 12, p. 3;13, pp. ix, 1, 2, 3, 10, 23, 24, 125; 14, pp. 1, 6; 15, pp. 1-4; 20, p. 2; 40	75

Sum of Sensitive Environments Value: 75

Level II Concentrations Factor Value: 75
(Ref. 1, p. 51644, Section 4.2.4.3.1.2, p. 51624, Table 4-23)

Additional Supporting Documentation

Sensitive Environments

In 2007, the bald eagle was removed from the Federal List of Threatened and Endangered Species due to its recovery. The USFWS will continue to monitor the status of the bald eagle over a 20-year period, at 5-year intervals (Ref. 74). The portion of the Clark Fork River immediately adjacent to the Smurfit-Stone Mill property has been listed as a Wildlife Protected Area by the Northwest Power and Conservation Council (an entity created by the U.S. Congress and authorized in the Northwest Power Act of 1980), as it contains bald eagle nesting territory, is a bald eagle winter concentration area of high density, and is a big game critical wintering/spring area (Ref. 8, p. 12; Figure 2 of this HRS documentation record).

Wetlands frontage

Approximately 1.9 miles of riverside palustrine wetlands (both emergent and scrub-shrub) have been provisionally mapped within the area of the Clark Fork River subject to actual contamination (Refs. 27; 71, p. 2; Figures 1, 2 and 3 of this HRS documentation record). While palustrine emergent and scrub-shrub wetlands are presumed to be HRS-eligible, field verification of these wetland areas has not occurred. As such, wetlands frontage has not been included in scoring for the site.

4.2.4.3.1.3 Potential Contamination

There are targets subject to potential contamination associated with the surface water bodies downstream of the zone of contamination and within the TDL, including additional bull trout habitat and wetlands; however, as the actual contamination score is sufficient to score the environmental threat, potential contamination is not scored (Refs. 1, Section 4.2.4.3.1.3; 6, pp. 1, 4; 10, pp. 7, A-1).

Potential Contamination Factor Value: Not Scored

NATIONAL PRIORITIES LIST (NPL)

****Proposed Site****

May 2013

SMURFIT-STONE MILL | **Missoula, Montana**
Missoula County

Site Location:

The Smurfit-Stone Mill site is an inactive integrated pulp and paper mill located in west-central Montana, approximately 12 miles northwest of the city of Missoula, in Missoula County.

Site History:

The mill property covers approximately 3,150 acres, 900 acres of which consists of a series of unlined impoundments. Approximately 150 industrial acres of the property have not been characterized and 1,800 acres is currently used for agricultural purposes. The site began operation as a pulp mill in the fall of 1957 and then later produced paper and cardboard box components. The mill filed for Chapter 11 bankruptcy in December 2009 and ceased operations in January 2010.

Site Contamination/Contaminants:

Samples from sludge ponds, an emergency spill pond and a wastewater storage pond contain dioxins and furans, and several metals, including arsenic, cadmium, lead, manganese and zinc.

Potential Impacts on Surrounding Community/Environment:

Contaminants have been released into ground water beneath the site, as well as O'Keefe Creek and the Clark Fork River (both located directly adjacent to the site). The Clark Fork River is a fishery that supports a variety of finfish, including the federally-designated threatened bull trout, and other species that are harvested for human consumption. Both O'Keefe Creek and the Clark Fork River contain significant areas of wetlands. The segment of the Clark Fork River directly adjacent to the site is listed as a Wildlife Protected Area for bald eagle nesting territory, a high-density bald eagle winter concentration area, a big game critical wintering/spring area and a historical peregrine falcon nesting area. The site also lies within the Clark Fork River – Grass Valley Important Bird Area, designated due to its significance to bird species of conservation concern.

Response Activities (to date):

There have been no response activities to date.

Need for NPL Listing:

The release of hazardous substances, the overall size of the site, and areas/wetlands supporting sensitive populations of fish and bird species will require significant time and resources to clean up. Therefore listing this site on the NPL would be the most effective approach for cleaning up contamination. Other federal and state cleanup programs were evaluated, but are not viable at this time. The EPA received a letter of support from the state of Montana for placing this site on the NPL.

[The description of the site (release) is based on information available at the time the site was evaluated with the HRS. The description may change as additional information is gathered on the sources and extent of contamination. See 56 FR 5600, February 11, 1991, or subsequent FR notices.]

For more information about the hazardous substances identified in this narrative summary, including general information regarding the effects of exposure to these substances on human health, please see the Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs. ATSDR ToxFAQs can be found on the Internet at http://www.atsdr.cdc.gov/toxfaqs/index.asp or by telephone at 1-888-42-ATSDR or 1-888-422-8737.

OFFICE OF THE GOVERNOR
STATE OF MONTANA

BRIAN SCHWEITZER
GOVERNOR

JOHN BOHLINGER
LT. GOVERNOR

December 17, 2012

James B. Martin, Regional Administrator
US Environmental Protection Agency
Region 8
1595 Wyncoop Street
Denver, CO 80202-8917

Re: Superfund National Priority List - Former Smurfit-Stone Mill site, Frenchtown, Montana

Dear Mr. Martin:

I write to offer my support for listing the former Smurfit-Stone Mill site located near Frenchtown on the Superfund National Priority List (NPL).

I appreciate the Environmental Protection Agency's efforts to investigate the site. Sampling from that investigation has shown that the historical paper manufacturing and other industrial activities at the site have contaminated portions of the floodplain adjacent to the Clark Fork River. The contamination is serious enough to indicate potential long-term risks to the health of the community and the Clark Fork River downstream from the site.

Although the nature and extent of contamination is not fully characterized, we know there is sufficient data to justify an NPL listing. The next issue to address is what approach the community believes is the best way to tackle the cleanup. I have seen widespread local support for listing of the site on EPA's NPL. I base this on my conversations with the Missoula County Commissioners, and letters the state has received from the Missoula County Water Quality Advisory Council, Missoula City-County Board of Health and Water Quality District Board, and Missoula County commissioners in letters of November 13, 15, and 29, 2012, respectively (attached). The community clearly wants to tackle the cleanup through a Federal Superfund approach.

I offer the following suggestions of how I believe EPA should proceed if this site is approved for NPL listing:

- Support and maintain a close working relationship with the Montana Department of Environmental Quality (DEQ) as you proceed with the site characterization and

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cleanup, especially in the development of cleanup levels of pollutants like dioxins and furans.

- Encourage community involvement and coordination with Missoula County throughout the process.

- Based on concerns we have heard from local resident about dust emissions from contaminated soil, I encourage EPA to evaluate this potential exposure pathway before summer and implement dust suppression measures, if appropriate.

- Where possible, use contractors that can maximize the potential for local employment in the cleanup process.

- Facilitate redevelopment of the site in ways that support the types of green industries being proposed by the current facility owners.

I have directed the Montana DEQ to provide assistance to and full cooperation with EPA as it proceeds with the listing process, site characterization, development of cleanup plans, and the cleanup itself. As always, I urge you to oversee a process that is timely, transparent, and cost-effective. Please work with Richard Opper, Director of the Montana DEQ, and his staff to meet our common goals.

Sincerely,

BRIAN SCHWEITZER
Governor

Attachments (3)
c: Richard Opper, Director, Montana DEQ
Bill Carey, Missoula County Commissioner
Jean Curtis, Missoula County Commissioner
Michele Landquist, Missoula County Commissioner
Dale Bickell, Chief Administrator Officer, Missoula County
Martin Hestmark, Assistant Regional Administrator, EPA Region 8
James Woolford, Director, EPA Headquarters Office of Superfund Remediation

REFERENCE 1

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SUPERFUND CHEMICAL DATA MATRIX METHODOLOGY

Prepared For EPA
January 2004

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1.0 INTRODUCTION

The Superfund Chemical Data Matrix (SCDM) is a database containing factor values and benchmark values used for applying the Hazard Ranking System (HRS; 40 CFR Part 300 Appendix A, 55 *FR* 51583) to evaluate potential National Priorities List (NPL) sites. The HRS assigns factor values for toxicity, gas migration potential, gas and ground water mobility, surface water persistence, and bioaccumulation potential. These assignments are based on the physical, chemical, ecological, toxicological, and radiological properties of hazardous substances present at a site. Hazardous substances, as defined for HRS purposes, includes both hazardous substances referenced in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) section 101(14), which are substances specifically listed under other federal laws and are known as "CERCLA hazardous substances," and "pollutants or contaminants" as defined in CERCLA itself in section 101(33).

SCDM contains HRS factor values and benchmarks for those hazardous substances frequently found at sites that are evaluated using the HRS. SCDM also contains the physical, chemical, toxicological, and radiological input data used to calculate the factors and benchmarks. The input data presented in SCDM are taken directly from peer reviewed, generally accepted literature sources and databases and/or EPA developed literature sources and databases; or are calculated using procedures set forth by EPA and in the HRS. Further HRS procedures are then applied to the input data to determine a factor value or benchmark. The HRS also assigns extra weight to targets with exposure levels to hazardous substances that are at or above benchmarks. These benchmarks include both risk-based screening concentrations and concentrations specified in regulatory limits for the hazardous substances present at a site for a particular migration pathway.

Chapter 2.0, *Data Selection Methodology*, of this document explains how data are selected and prioritized into a hierarchy for assigning SCDM values. Chapter 3.0, *Calculations in SCDM*, describes how some types of data (i.e., volatilization half-lives, distribution coefficients, and screening concentrations) are internally calculated using data in SCDM and methodologies from published literature or regulatory guidance documents. Chapter 4.0, *Chemical Data, Factor Values, and Benchmarks*, describes how SCDM data, HRS factor values, and benchmark values are presented. The factor values and benchmark values are listed, substance by substance, in Appendix A. Appendix B contains the HRS factor values and benchmark tables (organized by pathway) for both nonradiological hazardous substances and radionuclides. Please note that *National Recommended Water Quality Criteria* (*NRWQC)* Chronic Criteria Continuous Concentration (CCC) and Acute Criteria Maximum Concentration (CMC) values have endnotes associated with them listed at the end of Appendix B. Appendix C contains a cross-reference index of substance name synonyms.

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Aluminum

CAS Number: 007429-90-5

TOXICITY

Parameter	Value		Unit	Source
Oral RfD:			mg/kg/day	
Inhal RfD:			mg/kg/day	
Oral Slope:			(mg/kg/day)^-1	
Oral Wt-of-Evid:				
Inhal Slope:			(mg/kg/day)^-1	
Inhal Wt-of-Evid:				
Oral ED10:			mg/kg/day	
Oral ED10 Wgt:				
Inhal ED10:			mg/kg/day	
Inhal ED10 Wgt:				
Oral LD50:			mg/kg	
Dermal LD50:			mg/kg	
Gas Inhal LC50:			ppm	
Dust Inhal LC50:			mg/L	
ACUTE				
Fresh CMC:	7.5E+2	G2, I2	µg/L	WATCRIT
Salt CMC:			µg/L	
CHRONIC				
Fresh CCC:	8.7E+1	G2, I2, L2	µg/L	WATCRIT
Salt CCC:			µg/L	
Fresh Ecol LC50:	1.2E+2		µg/L	ECOTOX
Salt Ecol LC50:			µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	

Log Kow:

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	Yes		
Organic:	No		
Gas:	No		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	2.7E+1		
Density:	2.7E+0	g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:		Torr	
Henry's Law:		atm-m3/mol	
Water Solub:		mg/L	
Distrib Coef:	9.9E+0	ml/g	DITOR_KD
Geo Mean Sol:	9.5E+4	mg/L	CALC

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	3.6E+1		ECOTOX
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:	6.6E+3		ECOTOX
Salt BCF:			
Log Kow:			
Water Solub:			
Geo Mean Sol:	9.5E+4	mg/L	CALC

OTHER DATA

Melting Point:	6.6E+2	C
Boiling Point:	2.5E+3	C
Formula:	Al	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Aluminum

CAS Number: 007429-90-5

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	0
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter	Value
Toxicity:	0
Water Solub:	
Distrib:	9.9E+0
Geo Mean Sol:	9.5E+4
Mobility:	
Liquid Karst:	1.0E+0
Non Karst:	1.0E+0
Non Liq. Karst:	1.0E+0
Non Karst:	1.0E+0

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	0

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	0
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50.0
Salt:	50.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	100
Salt Tox:	100
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5000.0
Salt:	5000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:		mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:		mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:		mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:	7.5E+2 [G2, I2]	µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:	8.7E+1 [G2, I2, L2]	µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Arsenic

CAS Number: 007440-38-2

TOXICITY

Parameter	Value		Unit	Source
Oral RfD:	3.0E-4		mg/kg/day	IRIS
Inhal RfD:			mg/kg/day	
Oral Slope:	1.5E+0		(mg/kg/day)^-1	IRIS
Oral Wt-of-Evid:	A			
Inhal Slope:	1.5E+1		(mg/kg/day)^-1	IRIS
Inhal Wt-of-Evid:	A			
Oral ED10:	7.0E-3		mg/kg/day	EPA_ED10
Oral ED10 Wgt:	A			
Inhal ED10:	7.0E-3		mg/kg/day	EPA_ED10
Inhal ED10 Wgt:	A			
Oral LD50:			mg/kg	
Dermal LD50:			mg/kg	
Gas Inhal LC50:			ppm	
Dust Inhal LC50:			mg/L	
ACUTE				
Fresh CMC:	3.4E+2	A, D, K	µg/L	WATCRIT
Salt CMC:	6.9E+1	A, D, bb	µg/L	WATCRIT
CHRONIC				
Fresh CCC:	1.5E+2	A, D, K	µg/L	WATCRIT
Salt CCC:	3.6E+1	A, D, bb	µg/L	WATCRIT
Fresh Ecol LC50:	1.5E+3		µg/L	ECOTOX
Salt Ecol LC50:	3.9E+2		µg/L	ECOTOX

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	6.8E-1		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	Yes		
Organic:	No		
Gas:	No		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	7.5E+1		
Density:	5.8E+0	g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:		Torr	
Henry's Law:	7.7E-1	atm-m3/mol	PHYSPROP
Water Solub:		mg/L	
Distrib Coef:	2.9E+1	ml/g	SSG_KD
Geo Mean Sol:	1.2E+5	mg/L	CALC

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	4.0E+0		VER_BCF
Salt BCF:	3.5E+2		VER_BCF
ENVIRONMENTAL			
Fresh BCF:	8.7E+3		ECOTOX
Salt BCF:	3.5E+2		VER_BCF
Log Kow:	6.8E-1		PHYSPROP
Water Solub:			
Geo Mean Sol:	1.2E+5	mg/L	CALC

OTHER DATA

Melting Point:	8.2E+2	C
Boiling Point:	6.0E+2	C
Formula:	As	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Arsenic

CAS Number: 007440-38-2

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10000
Water Solub:		
Distrib:		2.9E+1
Geo Mean Sol:		1.2E+5
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-2
Non Liq.	Karst:	1.0E+0
	Non Karst:	1.0E-2

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5.0
Salt:	500.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	10
Salt Tox:	100
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5000.0
Salt:	500.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:	5.7E-7	mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:	1.0E-2	mg/L
Cancer Risk:	5.7E-5	mg/L
Non Cancer Risk:	1.1E-2	mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:	4.3E-1	mg/kg
Non Cancer Risk:	2.3E+1	mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:	1.0E-2	mg/L
Cancer Risk:	5.7E-5	mg/L
Non Cancer Risk:	1.1E-2	mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:	2.1E-3	mg/kg
Non Cancer Risk:	4.1E-1	mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:	3.4E+2 [A, D, K]	µg/L
Salt CMC:	6.9E+1 [A, D, bb]	µg/L
CHRONIC		
Fresh CCC:	1.5E+2 [A, D, K]	µg/L
Salt CCC:	3.6E+1 [A, D, bb]	µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Heptachlorodibenzo-p-dioxin 1,2,3,4,6,7,8-
CAS Number: 035822-46-9

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:		mg/kg/day	
Inhal RfD:		mg/kg/day	
Oral Slope:	1.5E+2	(mg/kg/day)^-1	LIVECHEM
Oral Wt-of-Evid:	B2		
Inhal Slope:	1.5E+2	(mg/kg/day)^-1	LIVECHEM
Inhal Wt-of-Evid:	B2		
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:	6.3E+0	mg/kg	RTECS
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:	1.8E+2	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:	2.2E+0	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	8.2E+0		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value
Metal Contain:	No
Organic:	Yes
Gas:	No
Particulate:	Yes
Radionuclide:	No
Rad. Element:	No
Molecular Weight:	4.3E+2
Density:	@

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	7.5E-10	Torr	PHYSPROP
Henry's Law:	1.7E-4	atm-m3/mol	PHYSPROP
Water Solub:	2.4E-6	mg/L	PHYSPROP
Distrib Coef:	1.7E+7	ml/g	DITOR_KD
Geo Mean Sol:		mg/L	

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	2.8E+4		ECOTOX
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:	2.8E+4		ECOTOX
Salt BCF:			
Log Kow:	8.2E+0		PHYSPROP
Water Solub:	2.4E-6		PHYSPROP
Geo Mean Sol:		mg/L	

OTHER DATA

Melting Point:
Boiling Point:
Formula: C12 H Cl17 O2

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Heptachlorodibenzo-p-dioxin 1,2,3,4,6,7,8-
CAS Number: 035822-46-9

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter	Value
Toxicity:	10000
Water Solub:	2.4E-6
Distrib:	1.7E+7
Geo Mean Sol:	
Mobility:	
Liquid Karst:	1.0E+0
Liquid Non Karst:	1.0E-4
Non Liq. Karst:	2.0E-5
Non Liq. Non Karst:	2.0E-9

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:	5.7E-8	mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	5.7E-7	mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:	4.3E-3	mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	5.7E-7	mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:	2.1E-5	mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Hexachlorodibenzo-p-dioxin 1,2,3,6,7,8-
CAS Number: 057653-85-7

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:		mg/kg/day	
Inhal RfD:		mg/kg/day	
Oral Slope:	6.0E+3	(mg/kg/day)^-1	LIVECHEM
Oral Wt-of-Evid:	B2		
Inhal Slope:	6.0E+3	(mg/kg/day)^-1	LIVECHEM
Inhal Wt-of-Evid:	B2		
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:	1.3E+0	mg/kg	RTECS
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:	2.0E+2	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:	2.7E+1	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	8.2E+0		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value
Metal Contain:	No
Organic:	Yes
Gas:	No
Particulate:	Yes
Radionuclide:	No
Rad. Element:	No
Molecular Weight:	3.9E+2
Density:	@

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	3.6E-11	Torr	PHYSPROP
Henry's Law:	1.9E-6	atm-m3/mol	PHYSPROP
Water Solub:		mg/L	PHYSPROP
Distrib Coef:	1.8E+7	ml/g	DITOR_KD
Geo Mean Sol:		mg/L	

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	2.8E+3		ECOTOX
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:	5.8E+3		ECOTOX
Salt BCF:			
Log Kow:	8.2E+0		PHYSPROP
Water Solub:			PHYSPROP
Geo Mean Sol:		mg/L	

OTHER DATA

Melting Point:	2.9E+2	C
Boiling Point:		
Formula:	C12H2Cl6O2	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Hexachlorodibenzo-p-dioxin 1,2,3,6,7,8-
CAS Number: 057653-85-7

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10000
Water Solub:		
Distrib:		1.8E+7
Geo Mean Sol:		
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-4
Non Liq.	Karst:	
	Non Karst:	

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5000.0
Salt:	5000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5000.0
Salt:	5000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:	1.4E-9	mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	1.4E-8	mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:	1.1E-4	mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	1.4E-8	mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:	5.3E-7	mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Lead

CAS Number: 007439-92-1

TOXICITY

Parameter	Value		Unit	Source
Oral RfD:			mg/kg/day	
Inhal RfD:			mg/kg/day	
Oral Slope:			(mg/kg/day)^-1	
Oral Wt-of-Evid:				
Inhal Slope:			(mg/kg/day)^-1	
Inhal Wt-of-Evid:				
Oral ED10:			mg/kg/day	
Oral ED10 Wgt:				
Inhal ED10:			mg/kg/day	
Inhal ED10 Wgt:				
Oral LD50:			mg/kg	
Dermal LD50:			mg/kg	
Gas Inhal LC50:			ppm	
Dust Inhal LC50:			mg/L	
ACUTE				
Fresh CMC:	6.5E+1	D, E, bb, gg	µg/L	WATCRIT
Salt CMC:	2.1E+2	D, bb	µg/L	WATCRIT
CHRONIC				
Fresh CCC:	2.5E+0	D, E, bb, gg	µg/L	WATCRIT
Salt CCC:	8.1E+0	D, bb	µg/L	WATCRIT
Fresh Ecol LC50:	4.4E+2		µg/L	ECOTOX
Salt Ecol LC50:	1.1E+2		µg/L	ECOTOX

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	7.3E-1		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	Yes		
Organic:	No		
Gas:	No		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	2.1E+2		
Density:	1.1E+1	g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:		Torr	
Henry's Law:	2.5E-2	atm-m3/mol	PHYSPROP
Water Solub:		mg/L	
Distrib Coef:	9.0E+2	ml/g	BAES_KD
Geo Mean Sol:	8.7E+2	mg/L	CALC

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	8.7E+0		ECOTOX
Salt BCF:	5.0E+3		ECOTOX
ENVIRONMENTAL			
Fresh BCF:	1.7E+4		ECOTOX
Salt BCF:	5.0E+3		ECOTOX
Log Kow:	7.3E-1		PHYSPROP
Water Solub:			
Geo Mean Sol:	8.7E+2	mg/L	CALC

OTHER DATA

Melting Point:	3.3E+2	C
Boiling Point:	1.7E+3	C
Formula:	Pb	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Lead
CAS Number: 007439-92-1

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter	Value
Toxicity:	10000
Water Solub:	
Distrib:	9.0E+2
Geo Mean Sol:	8.7E+2
Mobility:	
Liquid Karst:	1.0E+0
Non Karst:	1.0E-2
Non Liq. Karst:	1.0E+0
Non Karst:	1.0E-2

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5.0
Salt:	5000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	1000
Salt Tox:	1000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	5000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:	1.5E+0	µg/m3
Cancer Risk:		mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:	1.5E-2	mg/L
Cancer Risk:		mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:		mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:	1.5E-2	mg/L
Cancer Risk:		mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:		mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:	6.5E+1 [D, E, bb, gg]	µg/L
Salt CMC:	2.1E+2 [D, bb]	µg/L
CHRONIC		
Fresh CCC:	2.5E+0 [D, E, bb, gg]	µg/L
Salt CCC:	8.1E+0 [D, bb]	µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Manganese

CAS Number: 007439-96-5

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:	1.4E-1	mg/kg/day	IRIS
Inhal RfD:	1.4E-5	mg/kg/day	IRIS
Oral Slope:		(mg/kg/day)^-1	
Oral Wt-of-Evid:			
Inhal Slope:		(mg/kg/day)^-1	
Inhal Wt-of-Evid:			
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:		mg/kg	
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:	1.9E+0	mg/L	RTECS
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	2.3E-1		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	Yes		
Organic:	No		
Gas:	No		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	5.5E+1		
Density:	7.3E+0	g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:		Torr	
Henry's Law:		atm-m3/mol	
Water Solub:		mg/L	
Distrib Coef:	6.5E+1	ml/g	BAES_KD
Geo Mean Sol:	1.1E+3	mg/L	CALC

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:			
Salt BCF:	2.5E+4		ECOTOX
ENVIRONMENTAL			
Fresh BCF:			
Salt BCF:	2.5E+4		ECOTOX
Log Kow:	2.3E-1		PHYSPROP
Water Solub:			
Geo Mean Sol:	1.1E+3	mg/L	CALC

OTHER DATA

Melting Point:	1.2E+3	C
Boiling Point:	2.1E+3	C
Formula:	Mn	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Manganese
CAS Number: 007439-96-5

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10000
Water Solub:		
Distrib:		6.5E+1
Geo Mean Sol:		1.1E+3
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-2
Non Liq.	Karst:	1.0E+0
	Non Karst:	1.0E-2

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:		mg/m3
Non Cancer Risk:	5.2E-5	mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:	5.1E+0	mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:		mg/kg
Non Cancer Risk:	1.1E+4	mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:	5.1E+0	mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:		mg/kg
Non Cancer Risk:	1.9E+2	mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Pentachlorodibenzo-p-dioxin 1,2,3,7,8-
CAS Number: 040321-76-4

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:		mg/kg/day	
Inhal RfD:		mg/kg/day	
Oral Slope:	7.5E+4	(mg/kg/day)^-1	LIVECHEM
Oral Wt-of-Evid:	B2		
Inhal Slope:	7.5E+4	(mg/kg/day)^-1	LIVECHEM
Inhal Wt-of-Evid:	B2		
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:	3.0E-3	mg/kg	RTECS
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:	1.9E+2	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:	2.0E+1	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	6.6E+0		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	No		
Organic:	Yes		
Gas:	No		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	3.6E+2		
Density:		g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	4.3E-10	Torr	PHYSPROP
Henry's Law:	2.6E-6	atm-m3/mol	PHYSPROP
Water Solub:	1.5E-4	mg/L	PHYSPROP
Distrib Coef:	5.1E+5	ml/g	DITOR_KD
Geo Mean Sol:		mg/L	

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:			
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:			
Salt BCF:			
Log Kow:	6.6E+0		PHYSPROP
Water Solub:	1.5E-4		PHYSPROP
Geo Mean Sol:		mg/L	

OTHER DATA

Melting Point:		C
Boiling Point:		C
Formula:	C12 H3 Cl5 O2	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Pentachlorodibenzo-p-dioxin 1,2,3,7,8- **CAS Number:** 040321-76-4

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10000
Water Solub:		1.5E-4
Distrib:		5.1E+5
Geo Mean Sol:		
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-4
Non Liq.	Karst:	2.0E-5
	Non Karst:	2.0E-9

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:	1.1E-10	mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	1.1E-9	mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:	8.5E-6	mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	1.1E-9	mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:	4.2E-8	mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Pentachlorodibenzofuran 2,3,4,7,8-
CAS Number: 057117-31-4

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:		mg/kg/day	
Inhal RfD:		mg/kg/day	
Oral Slope:	1.5E+4	(mg/kg/day)^-1	LIVECHEM
Oral Wt-of-Evid:	B2		
Inhal Slope:	1.5E+4	(mg/kg/day)^-1	LIVECHEM
Inhal Wt-of-Evid:	B2		
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:		mg/kg	
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:	1.7E+2	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:	5.7E+0	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	6.9E+0		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	No		
Organic:	Yes		
Gas:	Yes		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	3.4E+2		
Density:		g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	3.5E-7	Torr	PHYSPROP
Henry's Law:	1.1E-5	atm-m3/mol	PHYSPROP
Water Solub:		mg/L	PHYSPROP
Distrib Coef:	9.6E+5	ml/g	DITOR_KD
Geo Mean Sol:		mg/L	

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:			
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:			
Salt BCF:			
Log Kow:	6.9E+0		PHYSPROP
Water Solub:			PHYSPROP
Geo Mean Sol:		mg/L	

OTHER DATA

Melting Point:		C
Boiling Point:		C
Formula:	C12 H3 Cl5 O	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Pentachlorodibenzofuran 2,3,4,7,8-
CAS Number: 057117-31-4

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	0.0020
Gas Migration:	6

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10000
Water Solub:		
Distrib:		9.6E+5
Geo Mean Sol:		
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-4
Non Liq.	Karst:	
	Non Karst:	

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	0.5
Salt:	0.5

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	0.5
Salt:	0.5

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:	5.7E-10	mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	5.7E-9	mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:	4.3E-5	mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	5.7E-9	mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:	2.1E-7	mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Tetrachlorodibenzo-p-dioxin (TCDD)
CAS Number: 041903-57-5

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:		mg/kg/day	
Inhal RfD:		mg/kg/day	
Oral Slope:		(mg/kg/day)^-1	
Oral Wt-of-Evid:			
Inhal Slope:		(mg/kg/day)^-1	
Inhal Wt-of-Evid:			
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:		mg/kg	
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	6.9E+0		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value
Metal Contain:	No
Organic:	Yes
Gas:	No
Particulate:	Yes
Radionuclide:	No
Rad. Element:	No
Molecular Weight:	3.2E+2
Density:	@

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	5.9E-11	Torr	PHYSPROP
Henry's Law:	7.0E-8	atm-m3/mol	PHYSPROP
Water Solub:	3.5E-4	mg/L	PHYSPROP
Distrib Coef:	9.6E+5	ml/g	DITOR_KD
Geo Mean Sol:		mg/L	

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:			
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:			
Salt BCF:			
Log Kow:	6.9E+0		PHYSPROP
Water Solub:	3.5E-4		PHYSPROP
Geo Mean Sol:		mg/L	

OTHER DATA

Melting Point:
Boiling Point:
Formula: C12H4Cl4O2

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Tetrachlorodibenzo-p-dioxin

CAS Number: 041903-57-5

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	0
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		0
Water Solub:		3.5E-4
Distrib:		9.6E+5
Geo Mean Sol:		
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-4
Non Liq.	Karst:	2.0E-5
	Non Karst:	2.0E-9

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	0

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	0
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:		mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:		mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:		mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Tetrachlorodibenzo-p-dioxin 2,3,7,8- (TCDD) **CAS Number:** 001746-01-6

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:		mg/kg/day	
Inhal RfD:		mg/kg/day	
Oral Slope:	1.5E+5	(mg/kg/day)^-1	HEAST
Oral Wt-of-Evid:	B2		
Inhal Slope:	1.5E+5	(mg/kg/day)^-1	HEAST
Inhal Wt-of-Evid:	B2		
Oral ED10:	1.5E-6	mg/kg/day	EPA_ED10
Oral ED10 Wgt:	B2		
Inhal ED10:	1.5E-6	mg/kg/day	EPA_ED10
Inhal ED10 Wgt:	B2		
Oral LD50:	5.0E-1	mg/kg	RTECS
Dermal LD50:	8.0E-2	mg/kg	RTECS
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:	1.6E+2	days	THOMAS
Photolysis:	6.7E-6	days	CHEMFATE
Biodeg:	5.7E+1	days	CHEMFATE
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:	2.3E+0	days	THOMAS
Photolysis:	6.7E-6	days	CHEMFATE
Biodeg:	5.7E+1	days	CHEMFATE
Radio:		days	
Log Kow:	6.6E+0		CHEMFATE

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	No		
Organic:	Yes		
Gas:	Yes		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	3.2E+2		
Density:		g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	1.5E-9	Torr	CHEMFATE
Henry's Law:	7.9E-5	atm-m3/mol	CHEMFATE
Water Solub:	8.0E-6	mg/L	CHEMFATE
Distrib Coef:	5.1E+5	ml/g	DITOR_KD
Geo Mean Sol:		mg/L	

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	2.0E+3		VER_BCF
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:	4.2E+3		VER_BCF
Salt BCF:			
Log Kow:	6.6E+0		CHEMFATE
Water Solub:	8.0E-6		CHEMFATE
Geo Mean Sol:		mg/L	

OTHER DATA

Melting Point:	3.0E+2	C
Boiling Point:		C
Formula:	C12 H4 Cl4 O2	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Tetrachlorodibenzo-p-dioxin 2,3,7,8- (TCDD) **CAS Number:** 001746-01-6

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	0.0002
Gas Migration:	6

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10000
Water Solub:		8.0E-6
Distrib:		5.1E+5
Geo Mean Sol:		
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-4
Non Liq.	Karst:	2.0E-5
	Non Karst:	2.0E-9

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5000.0
Salt:	5000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5000.0
Salt:	5000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:	5.7E-11	mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:	3.0E-8	mg/L
Cancer Risk:	5.7E-10	mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:	4.3E-6	mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:	3.0E-8	mg/L
Cancer Risk:	5.7E-10	mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:	2.1E-8	mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Tetrachlorodibenzofuran 2,3,7,8-
CAS Number: 051207-31-9

TOXICITY

Parameter	Value	Unit	Source
Oral RfD:		mg/kg/day	
Inhal RfD:		mg/kg/day	
Oral Slope:	1.5E+4	(mg/kg/day)^-1	LIVECHEM
Oral Wt-of-Evid:	B2		
Inhal Slope:	1.5E+4	(mg/kg/day)^-1	LIVECHEM
Inhal Wt-of-Evid:	B2		
Oral ED10:		mg/kg/day	
Oral ED10 Wgt:			
Inhal ED10:		mg/kg/day	
Inhal ED10 Wgt:			
Oral LD50:	5.0E-3	mg/kg	RTECS
Dermal LD50:		mg/kg	
Gas Inhal LC50:		ppm	
Dust Inhal LC50:		mg/L	
ACUTE			
Fresh CMC:		µg/L	
Salt CMC:		µg/L	
CHRONIC			
Fresh CCC:		µg/L	
Salt CCC:		µg/L	
Fresh Ecol LC50:		µg/L	
Salt Ecol LC50:		µg/L	

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:	1.6E+2	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:	4.4E+0	days	THOMAS
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:	6.5E+0		PHYSPROP

PHYSICAL CHARACTERISTICS

Parameter	Value		
Metal Contain:	No		
Organic:	Yes		
Gas:	Yes		
Particulate:	Yes		
Radionuclide:	No		
Rad. Element:	No		
Molecular Weight:	3.1E+2		
Density:		g/mL @	C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:	1.5E-6	Torr	PHYSPROP
Henry's Law:	1.5E-5	atm-m3/mol	PHYSPROP
Water Solub:	6.9E-4	mg/L	PHYSPROP
Distrib Coef:	4.0E+5	ml/g	DITOR_KD
Geo Mean Sol:		mg/L	

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:			
Salt BCF:			
ENVIRONMENTAL			
Fresh BCF:			
Salt BCF:			
Log Kow:	6.5E+0		PHYSPROP
Water Solub:	6.9E-4		PHYSPROP
Geo Mean Sol:		mg/L	

OTHER DATA

Melting Point:		C
Boiling Point:		C
Formula:	C12 H4 Cl4 O	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Tetrachlorodibenzofuran 2,3,7,8-
CAS Number: 051207-31-9

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10000
Gas Mobility:	0.0020
Gas Migration:	6

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10000
Water Solub:		6.9E-4
Distrib:		4.0E+5
Geo Mean Sol:		
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-4
Non Liq.	Karst:	2.0E-5
	Non Karst:	2.0E-9

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10000

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10000
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	0
Salt Tox:	0
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:	5.7E-10	mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	5.7E-9	mg/L
Non Cancer Risk:		mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:	4.3E-5	mg/kg
Non Cancer Risk:		mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:	5.7E-9	mg/L
Non Cancer Risk:		mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:	2.1E-7	mg/kg
Non Cancer Risk:		mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:		µg/L
Salt CMC:		µg/L
CHRONIC		
Fresh CCC:		µg/L
Salt CCC:		µg/L

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Zinc
CAS Number: 007440-66-6

TOXICITY

Parameter	Value		Unit	Source
Oral RfD:	3.0E-1		mg/kg/day	IRIS
Inhal RfD:			mg/kg/day	
Oral Slope:			(mg/kg/day)^-1	
Oral Wt-of-Evid:				
Inhal Slope:			(mg/kg/day)^-1	
Inhal Wt-of-Evid:				
Oral ED10:			mg/kg/day	
Oral ED10 Wgt:				
Inhal ED10:			mg/kg/day	
Inhal ED10 Wgt:				
Oral LD50:			mg/kg	
Dermal LD50:			mg/kg	
Gas Inhal LC50:			ppm	
Dust Inhal LC50:			mg/L	
ACUTE				
Fresh CMC:	1.2E+2	D, E, K	µg/L	WATCRIT
Salt CMC:	9.0E+1	D, bb	µg/L	WATCRIT
CHRONIC				
Fresh CCC:	1.2E+2	D, E, K	µg/L	WATCRIT
Salt CCC:	8.1E+1	D, bb	µg/L	WATCRIT
Fresh Ecol LC50:	1.0E+1		µg/L	ECOTOX
Salt Ecol LC50:	3.3E+1		µg/L	ECOTOX

PERSISTENCE

Parameter	Value	Unit	Source
LAKE - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
RIVER - Halflives			
Hydrolysis:		days	
Volatility:		days	
Photolysis:		days	
Biodeg:		days	
Radio:		days	
Log Kow:			

PHYSICAL CHARACTERISTICS

Parameter	Value	
Metal Contain:	Yes	
Organic:	No	
Gas:	No	
Particulate:	Yes	
Radionuclide:	No	
Rad. Element:	No	
Molecular Weight:	6.5E+1	
Density:	7.1E+0	g/mL @ 25.00 C

MOBILITY

Parameter	Value	Unit	Source
Vapor Press:		Torr	
Henry's Law:	2.5E-2	atm-m3/mol	PHYSPROP
Water Solub:		mg/L	
Distrib Coef:	6.2E+1	ml/g	SSG_KD
Geo Mean Sol:	1.4E+3	mg/L	CALC

BIOACCUMULATION

Parameter	Value	Unit	Source
FOOD CHAIN			
Fresh BCF:	2.8E+0		ECOTOX
Salt BCF:	1.2E+5		ECOTOX
ENVIRONMENTAL			
Fresh BCF:	1.5E+4		ECOTOX
Salt BCF:	1.7E+5		ECOTOX
Log Kow:			
Water Solub:			
Geo Mean Sol:	1.4E+3	mg/L	CALC

OTHER DATA

Melting Point:	4.2E+2	C
Boiling Point:	9.1E+2	C
Formula:	Zn	

CLASS INFORMATION

Class	Parent Substance

SUPERFUND CHEMICAL DATA MATRIX

Date: 3/31/2012
Chemical: Zinc
CAS Number: 007440-66-6

ASSIGNED FACTOR VALUES

AIR PATHWAY

Parameter	Value
Toxicity:	10
Gas Mobility:	
Gas Migration:	

GROUND WATER PATHWAY

Parameter		Value
Toxicity:		10
Water Solub:		
Distrib:		6.2E+1
Geo Mean Sol:		1.4E+3
Mobility:		
Liquid	Karst:	1.0E+0
	Non Karst:	1.0E-2
Non Liq.	Karst:	1.0E+0
	Non Karst:	1.0E-2

SOIL EXPOSURE PATHWAY

Parameter	Value
Toxicity:	10

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value
Toxicity:	10
Persistence	
River:	1.0000
Lake:	1.0000

HUMAN FOOD CHAIN

Parameter	Value
Toxicity:	10
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	5.0
Salt:	50000.0

ENVIRONMENTAL

Parameter	Value
Fresh Tox:	10
Salt Tox:	100
Persistence	
River:	1.0000
Lake:	1.0000
Bioaccumulation	
Fresh:	50000.0
Salt:	50000.0

BENCHMARKS

AIR PATHWAY

Parameter	Value	Unit
NAAQS/NESHAPS:		µg/m3
Cancer Risk:		mg/m3
Non Cancer Risk:		mg/m3

GROUND WATER PATHWAY

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:	1.1E+1	mg/L

SOIL EXPOSURE PATHWAY

Parameter	Value	Unit
Cancer Risk:		mg/kg
Non Cancer Risk:	2.3E+4	mg/kg

RADIONUCLIDE

Parameter	Value	Unit
MCL:		pCi/L
UMTRCA:		pCi/kg
CANCER RISK		
Air:		pCi/m3
DW:		pCi/L
FC:		pCi/kg
Soil Ing:		pCi/kg
Soil Gam:		pCi/kg

SURFACE WATER PATHWAY

DRINKING WATER

Parameter	Value	Unit
MCL/MCLG:		mg/L
Cancer Risk:		mg/L
Non Cancer Risk:	1.1E+1	mg/L

HUMAN FOOD CHAIN

Parameter	Value	Unit
FDAAL:		ppm
Cancer Risk:		mg/kg
Non Cancer Risk:	4.1E+2	mg/kg

ENVIRONMENTAL

Parameter	Value	Unit
ACUTE		
Fresh CMC:	1.2E+2 [D, E, K]	µg/L
Salt CMC:	9.0E+1 [D, bb]	µg/L
CHRONIC		
Fresh CCC:	1.2E+2 [D, E, K]	µg/L
Salt CCC:	8.1E+1 [D, bb]	µg/L

http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm
Last updated on Wednesday, September 19, 2012

Superfund

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Search Superfund Site Information

SMURFIT-STONE MILL

Site Information

Site Info | **Aliases** | **Operable Units** | **Contacts**
Actions | **Contaminants** | **Site-Specific Documents**

Site Name: SMURFIT-STONE MILL
Street: 14377 PULP MILL ROAD
City / State / ZIP: MISSOULA, MT 59808

NPL Status: Not on the NPL
Non-NPL Status: HRS Start Needed

EPA ID: MTN000802850
EPA Region: 08
County: MISSOULA

Federal Facility Flag: Not a Federal Facility

Return to Search Results **Return to Search Superfund Site Informati**

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URL: http://cumulis.epa.gov
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Content is dynamically generated by ColdFusion

URS OPERATING SERVICES, INC.
START 3 - REGION 8

MEMORANDUM

TO: **FILE**

FROM: Jeff Miller, Senior Environmental Officer (303) 291-8212

DATE: **January 3, 2013**

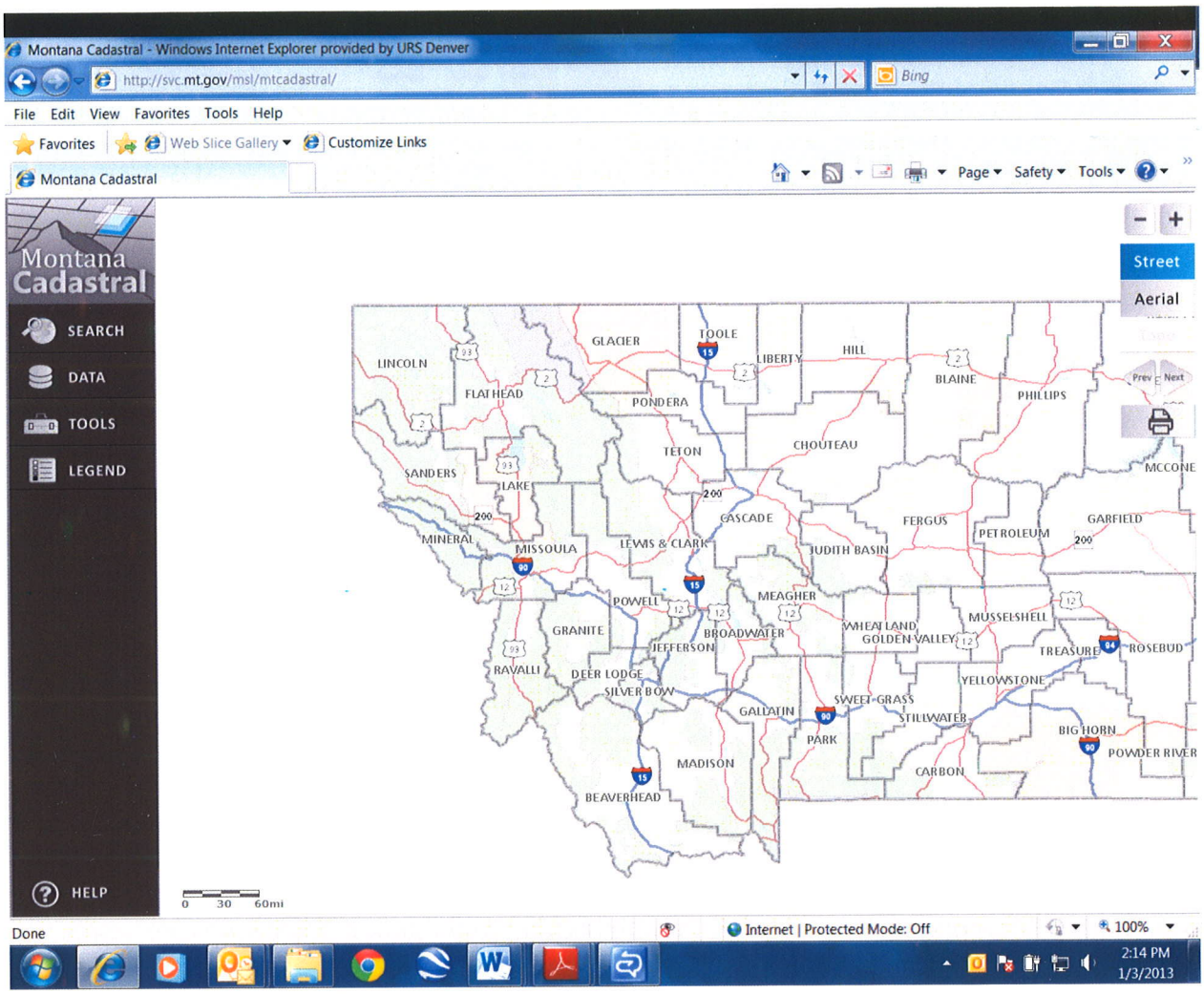
SUBJECT: **Methodology and source data used to create figure entitled:** ***M2Green Redevelopment LLC Properties (Formerly Smurfit-Stone Mill).***

Reference 4 was created by the following method:

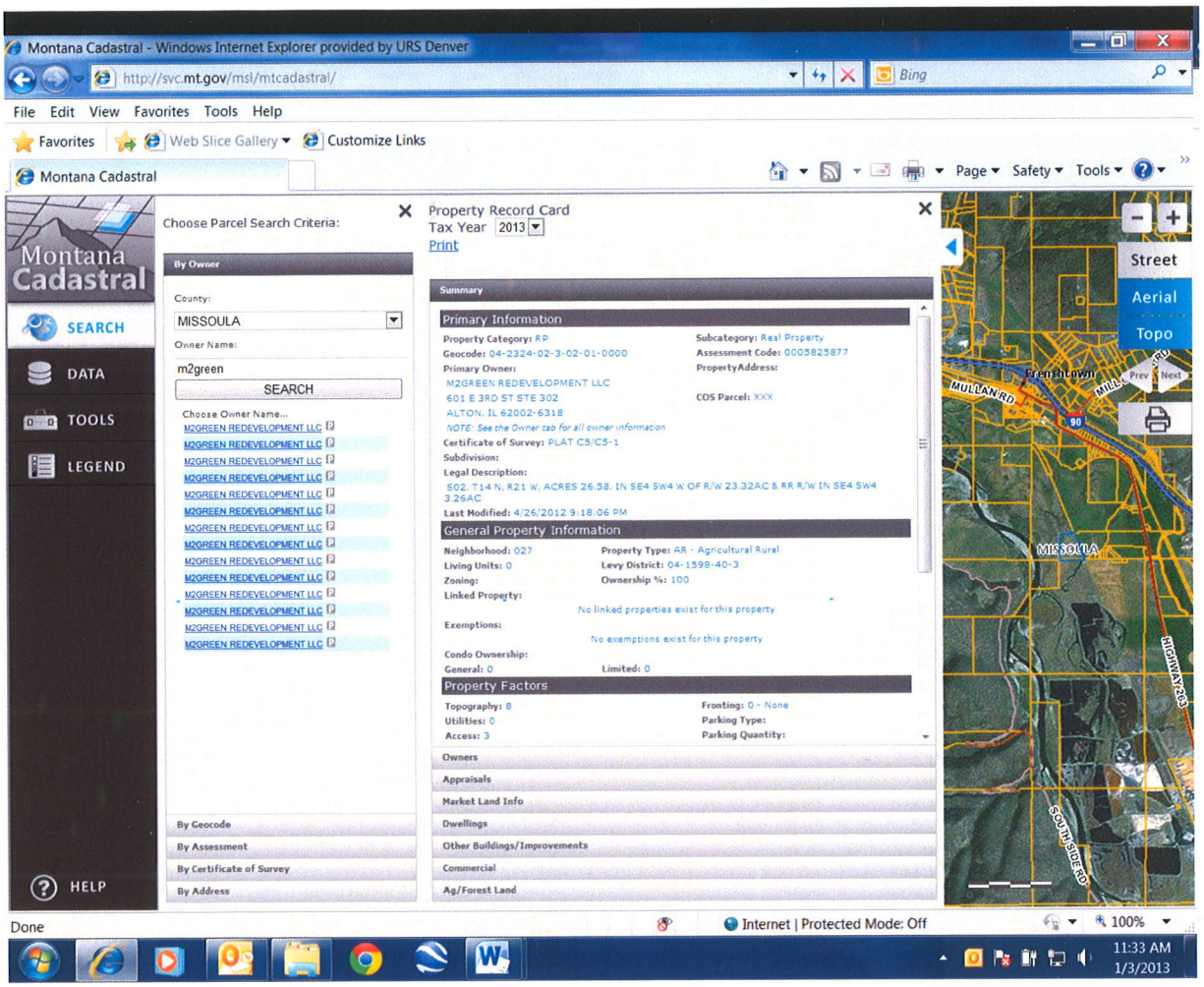
1. The Montana Base Map Service Center (MBMSC) website was accessed at: http://svc.mt.gov/msl/mtcadastral/ (see screen shot on page 2 of this memo).
2. In the upper left hand corner of the MBMSC website home page (page 2 of this memo), the 'SEARCH' button was clicked.
3. In the 'County' search field, 'Missoula' was chosen.
4. In the 'Owner Name' search field, 'M2Green' was entered and the 'SEARCH' button was clicked.
5. Fourteen (14) records for the owner M2Green Redevelopment LLC are then listed on the left hand side of the webpage, beneath the 'SEARCH' button. Each record is a hypertext link to individual properties (i.e. parcels) owned by M2Green Redevelopment LLC. All parcels are located at the previous Smurfit-Stone Mill.
6. Clicking on each record individually will bring up a 'Summary' window showing various information for each parcel, including the primary owner and its legal description. The map on the far right side of the webpage also zooms in to show the property boundary in blue (e.g. in the screen shot on page 3 of this memo, the property with map letter designation 'A' on Reference 4 is shown).
7. Note that the first record on the list cannot be mapped directly on the webpage by clicking on it. However, this record is 'linked' with another M2Green property which can be mapped on the webpage by clicking on the 'View' button with the 'Summary' window.
8. The boundary of each property parcel denoted as being owned by M2Green, including those linked properties, is plotted on Reference 4 in blue. There are a total of 16 parcels, each given a letter identifier.

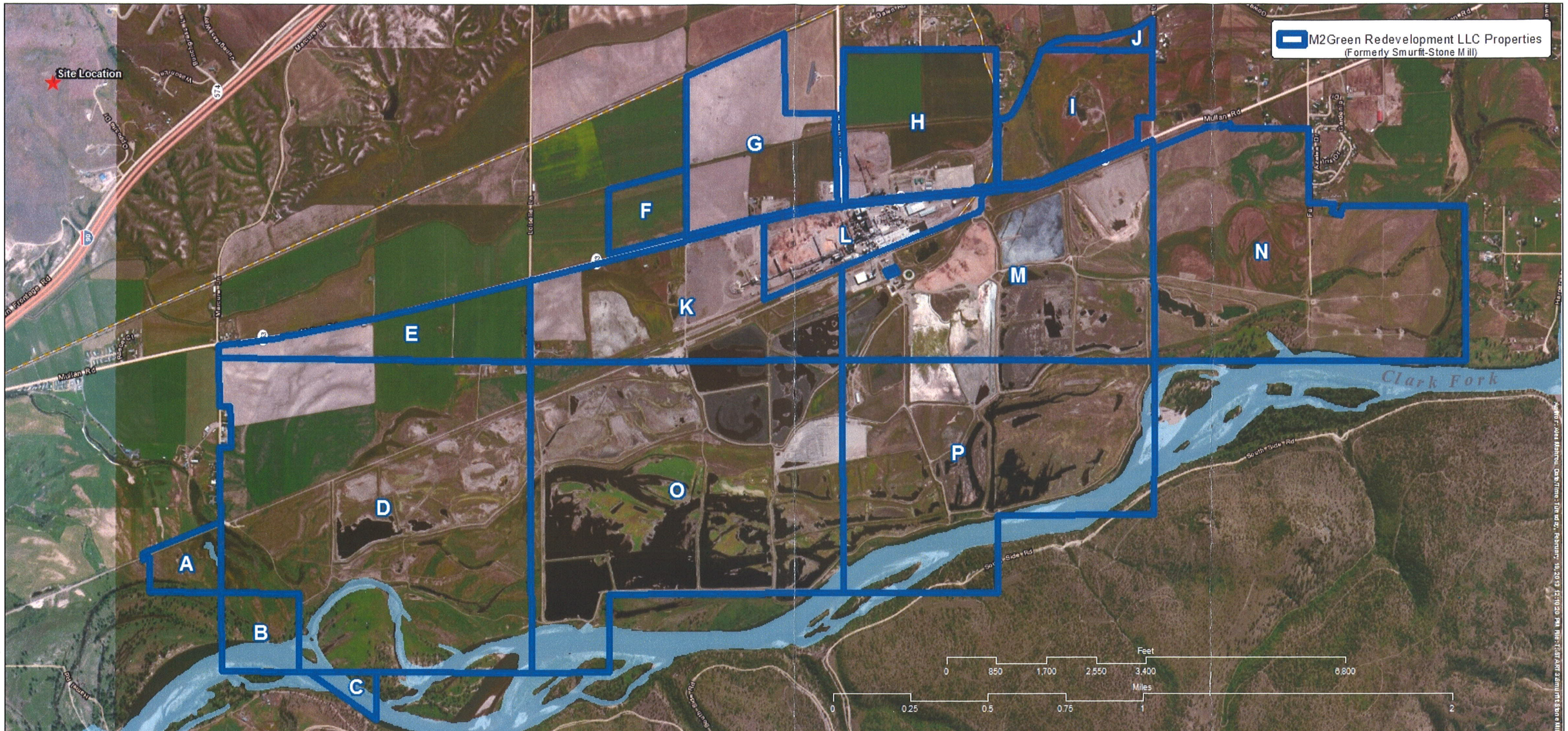
cc: File/ UOS

Screenshot of Montana Base Map Service Center (MBMSC) website (http://svc.mt.gov/msl/mtcadastral/)



Screenshot of 'M2Green' owner name search.





Map Letter	State Plane Acres	Legal Description
A	26.68	S02, T14 N, R21 W, ACRES 26.58, IN SE4 SW4 W OF R/W 23.32AC & RR R/W IN SE4 SW4 3.26AC
B	40.27	S11, T14 N, R21 W, NW4 NW4
C	10.73	S10, T14 N, R21 W, ACRES 10.73, IN NE4
D	600.04	S11, T14 N, R21 W, IN N2 & E2 & IN S2 & RR RIGHT OF WAY IN N2 & SE4
E	89.2	S12, T14 N, R21 W, IN W2 SW4 & IN NW4 WEST OF MULLAN RD
F	33.56	IN NW4 123.43AC & IN W2 106AC & RR R/W IN W2 9.51AC & IN SW4 SE4 1.79AC
G	141.64	S13, T14 N, R21 W, C.O.S. 3220, PARCEL A, IN SE4 & E2 SW4 E OF CO RD W2 SW4 W OF RR
H	146.4	S24, T14 N, R21 W, ACRES 576.85, IN E2 PLATS E & G 251.08AC & IN S2 PLATS A & C 94.68AC & IN W2 PLAT B 218AC & RR R/W IN NW4 & SE4 PLAT C 13.09AC
I	101.55	S24, T14 N, R21 W, ACRES 576.85, IN E2 PLATS E & G 251.08AC & IN S2 PLATS A & C 94.68AC & IN W2 PLAT B 218AC & RR R/W IN NW4 & SE4 PLAT C 13.09AC
J	10.47	S19, T14 N, R20 W, PT LOTS 3 & 4
K	211.42	IN NW4 123.43AC & IN W2 106AC & RR R/W IN W2 9.51AC & IN SW4 SE4 1.79AC
L	72.9	S13, T14 N, R21 W, ACRES 69, IN SE4 SW4 & IN E2 NW4 24-14-21 PLANT SITE
M	326.89	S24, T14 N, R21 W, ACRES 576.85, IN E2 PLATS E & G 251.08AC & IN S2 PLATS A & C 94.68AC & IN W2 PLAT B 218AC & RR R/W IN NW4 & SE4 PLAT C 13.09AC
N	397.49	W2 & TR A IN W2 NE4 LESS R/W, DITCH & PT SOLD PLATS A & E 395.63AC & RR R/W & TR C IN NE4 LESS PT SOLD PLATS C1 & E3 33.21AC
O	522.95	S14, T14 N, R21 W, ACRES 515.63, IN N2 192.72AC**RR R/W IN E2 NE4 3.56AC**IN E2 & E2 SW4 319.53AC
P	400.94	S23, T14 N, R21 W, ACRES 400, IN E2 & E2 NW4

TDD Title: **Smurfit-Stone Mill HRS**
Reference 4

Figure Title: M2Green Redevelopment LLC Properties (Formerly Smurfit-Stone Mill)

TDD County: MISSOULA
TDD State: MT

TDD: 1105-09
Date: 03/2013

Base Data Source: Bing Maps 2011
Property Boundary: Montana Base Map Center
http://svc.mt.gov/msl/mtcadastral
Projection System:
NAD 1983 UTM Zone 11N

1 inch = 1,600 feet

URS
OPERATING SERVICES