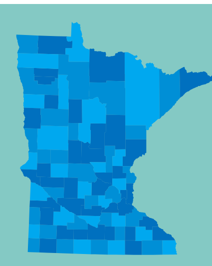
Superfund cleanup

July 2018

Record of Decision Operable Unit 5-
Soils from West Area and Southern Lots
Summary of Remedial Alternative Selection
Joslyn Manufacturing & Supply Co. Site

MINNESOTA POLLUTION CONTROL AGENCY



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Part 1: The declaration

1.1. Site name and location

This Record of Decision (ROD) is for the Joslyn Manufacturing & Supply Co. Site (Joslyn Site, or Site), Operable Unit 5 (OU5), which is located north of the intersection of Azelia Avenue North and Lakebreeze Avenue North in Brooklyn Center, Hennepin County, Minnesota (Figure 1). The United States Environmental Protection Agency (EPA) Site Identification Number is MND044799856. OU5 consists of contaminated soils remaining at the Joslyn Site in the 11.1-acre west area (West Area) and two residential lots totaling 0.56 acres that adjoin the West Area to the south (Southern Lots; Figure 1). All of the land encompassing OU5, the West Area, and the Southern Lots is owned by Joslyn Manufacturing & Supply Co. (Joslyn). The Joslyn Site is on the EPA's National Priorities List (NPL) and the Minnesota Pollution Control Agency's (MPCA) Permanent List of Priorities (PLP). MPCA oversees remedy selection and cleanup at the Site as a State-enforcement lead Site under the Minnesota Environmental Response and Liability Act of 1983 (MERLA).

1.2 Statement of basis and purpose

This decision document presents the remedial actions selected by the MPCA (Selected Remedy, or Remedy) to address contaminated soils for at the Joslyn Site, OU5. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, or Superfund), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), the Minnesota Environmental Response and Liability Act of 1983 (MERLA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300, as amended. This decision is based on the administrative record for the Joslyn Site (Administrative Record).

The MPCA has selected the remedial actions for the Site. The proposed remedy has been shared with EPA Region V and EPA Region V has not notified MPCA of any inconsistencies with Federal Superfund Law (CERCLA) and the NCP. The Selected Remedy will be implemented under the May 30, 1985 Response Order by Consent between Joslyn and the MPCA (1985 Consent Order; MPCA, 1985).

1.3 Assessment of site

The Selected Remedy identified in this ROD is necessary to protect public health or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of Selected Remedy

The Selected Remedy for OU5 will address contaminated soils through the elimination of exposure pathways for protection of potential human and ecological receptors. Eight remedial alternatives were evaluated in the OU5 Focused Feasibility Study (FFS; Barr, 2017). The Selected Remedy, Alternative 8B of the FFS, will use offsite disposal and onsite consolidation and containment of these soils to eliminate the exposure pathways.

The major components of the Selected Remedy for OU5 include:

- Implementation of surface water engineering controls to protect Middle Twin Lake.
- Excavation of shallow soils with dioxin concentrations above the selected cleanup goals to depths of one to four feet, from the West Area and the Southern Lots (approximately 30,000 cubic yards).
- Consolidation of a portion of the excavated soils (approximately 10,000 cubic yards) to an onsite consolidation area in the southeastern portion of the West Area.
- Containment and isolation of contaminated soil within the onsite consolidation area using a non-woven geotextile fabric overlaid with a two-foot thick vegetative soil cover.
- Offsite disposal of a portion of the excavated soils (approximately 20,000 cubic yards) at a Subtitle D landfill.
- Backfilling of excavations to original grade with clean soil, re-vegetation, and wetland re-establishment to the extent possible in the West Area.
- Mitigation and restoration of any wetland or floodplain impacts.
- Implementation of post-construction site inspections, maintenance, and contingency action plans to protect the remedy.
- Establishment of institutional controls (i.e., restrictive covenant) to restrict future land use and groundwater use.
- Five-year reviews of the remedy to ensure protectiveness is maintained.

The Selected Remedy for OU5 is compatible with the remedies for the other Operable Units at the Joslyn Site that are currently ongoing or have been completed: OU1, OU2, and OU3 (groundwater monitoring and dense non-aqueous phase liquid [DNAPL] pump-out that is ongoing) and OU4 (land treatment of contaminated soils that has been completed). OU1, OU2, OU3, and OU4 are defined and their remedies described in detail in the 1989 ROD for the Joslyn Site (MPCA, 1989).

The potential risk to human and ecological receptors posed within OU5 arises from possible direct contact with contaminated soil. The Selected Remedy addresses this risk by eliminating the direct contact pathway. Contaminants in the soils in OU5 are unlikely to migrate within the soil or from the soil to other media due to low mobility of those contaminants.

1.5 Statutory determinations

The Selected Remedy is protective of human health and the environment, and complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

The statutory preference is for treatment that reduces toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element of the remedy. The Selected Remedy for OU5 does not satisfy the statutory preference for treatment on its own, but taken in conjunction with the remedy for OU4 (land treatment of contaminated soils), the statutory preference for treatment has been satisfied for the Joslyn Site as a whole. The contaminants being addressed in OU5 are essentially immobile. Under the Selected Remedy for OU5, soils classified as principal threat wastes will be contained and isolated on site below a vegetative cover. The Selected Remedy eliminates the potential for both human and ecological exposure to contaminants in the soil. The alternative remedial actions that satisfy the statutory preference for treatment were not selected because of technical feasibility, consideration of short-term risk to human health and the environment, and extraordinarily high cost.

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on site, the MPCA will review the Remedy in accordance with 42 USC § 9621(c) no less often than every five years after initiation of remedial action to ensure that the Remedy is, or will be, protective of human health and the environment.

1.6 Data certification checklist

The following information is included in the Decision Summary section of this ROD (Part 2). Additional information can be found in the Administrative Record file for the Joslyn Site.

- Chemicals of concern and their respective concentrations (Section 2.54)
- Baseline risk represented by the chemicals of concern (Section 2.7)
- Cleanup levels established for chemicals of concern and the basis for these levels (Section 2.8)
- How source materials constituting principal threats are addressed (Section 2.10.4.1)
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the Baseline Risk Assessment and ROD (Section 2.6).
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy (Section 2.11.4)
- Estimated capital; annual operation and maintenance (O&M); and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.9)
- Key factors that led to selecting the remedy (Section 2.11.1)

1.7 Authorizing signatures

This ROD documents the Selected Remedy for Operable Unit 5 of the Joslyn Site. This remedy was selected by the MPCA.

Kathy Sather

Kathy Sather
Division Director
Remediation Division
Minnesota Pollution Control Agency
July 16, 2018

Part 2: The decision summary

This Record of Decision documents the selection of a Remedy by the MPCA for OU5 at the Joslyn Site. This Remedy has been selected in accordance with MERLA and following the process set forth in the 1985 Consent Order. In accordance with the 1985 Consent Order, Joslyn has funded the investigations and remedial actions at the Joslyn Site and will fund the OU5 remedy.

Pursuant to an agreement between the MPCA and the EPA entitled "Minnesota Pollution Control Agency Enforcement Deferral Pilot Project" dated June 20, 1995 (1995 Deferral Pilot Agreement), the MPCA is the lead agency for enforcement of Superfund cleanup requirements for the Joslyn Site. The decision to select this Remedy is not inconsistent with the requirements of CERCLA and the NCP, and complies with the terms and conditions of the 1995 Deferral Pilot Agreement.

2.1 Site name, location, and brief description

The Joslyn Site is a former wood treatment facility located north of the intersection of Azelia Avenue North and Lakebreeze Avenue North in Brooklyn Center, Hennepin County, Minnesota. The MPCA is the lead agency for the Joslyn Site and the EPA Site Identification Number is MND044799856. Figure 1 shows the location of the Joslyn Site. The Joslyn Site is bounded to the south by residential development, by Middle Twin Lake to the west, by an active Canadian Pacific Railway track to the north, and State Highway 100 to the east (Figure 1).

The Joslyn Site is now divided into two discrete areas: a 25-acre portion that has been delisted and redeveloped for commercial use, and an 11.1-acre portion known as the West Area that remains undeveloped (Figure 1). The West Area, which remains on the MPCA's PLP and the EPA's NPL, is designated as part of OU5. Two undeveloped residential lots acquired by Joslyn that adjoin the West Area to the south totaling approximately 0.56 acres (southern lots) constitute the remainder of OU5.

The 25-acre portion of the Joslyn Site was redeveloped for light industrial use after extensive environmental investigations and remedial actions as described in Section 2.2.3.1. The West Area is comprised of wetlands and wooded uplands and the Southern Lots are well vegetated, with trees and shrubs covering the majority of both parcels. The majority of the West Area and over half of the area of the Southern Lots are located within both the 100-year floodplain elevation and the ordinary high water level (OHWL) of Middle Twin Lake.

2.2 Site history and enforcement activities

2.2.1 Operational history

The Joslyn Site was used for wood treating operations from the 1920s until its closure in 1980. The property and wood treating operations were originally owned and operated by Naugle Pole and Tie Company who sold the property to Consolidated Pole Treating Company sometime in the 1940s. Joslyn was part owner of the Consolidated Pole Treating Company and eventually obtained sole ownership of the Joslyn Site in the 1960s. Wood treatment operations ended in 1980 (MPCA, 1985).

The primary purpose of the Joslyn wood treating operations was the production of treated or preserved wood utility poles. The Joslyn facility also produced lesser quantities of treated wood railroad ties, treated wood pilings, and cross-arms for wood utility poles. Three methods of wood treatment were used at the Joslyn facility: butt-dip treatment (origin to about 1965), thermal treatment (1940s to close), and pressure treatment (1965 to close). The wood preservatives used at this facility included creosote, pentachlorophenol (PCP), and copper-chromium arsenate. Creosote was the only treatment fluid used in butt-dip treatment and PCP was the only treatment fluid used in the thermal treatment process. Although all three of the preservatives were used (at different times) in the pressure treatment system, PCP was the primary treating chemical used in this process.

Both the butt-dip and thermal treatment methods produced a sludge consisting of soil, grit, wood scraps, wood sugars (sap), and residual treating fluid. The sludge was periodically removed from the process area and buried in shallow pits on the Joslyn Site. Throughout the history of the Joslyn Site, fill was used to increase the usable area for wood treatment and/or storage.

The West Area was not used for day-to-day wood treating operations; however, Pond C at the West Area was used for disposal of boiler blowdown water. The boilers provided steam for butt-dip and thermal treatments and for operation of stiff-leg cranes used on site. Boiler blowdown water containing lubricating oils was disposed at Pond C in addition to other areas at the Joslyn Site. Historical information, including aerial photographs and Minnesota Department of Health (MDH) reports from 1944 and 1950, indicates that Pond C was originally constructed after 1937, was operational in 1944, and no longer received boiler blowdown water as of 1950.

- Although the West Area is located west of the majority of the historic operations at the Joslyn facility, contamination may have spread to the West Area through the following mechanisms:
- Use of Pond C
- Sludge disposal/burial
- Placement of fill
- Overland flow of stormwater runoff and eroded soils

The Southern Lots are zoned for residential use and have never been developed. The Southern Lots were acquired by Joslyn in 2005. The Southern Lots may have been affected by contaminated stormwater runoff and eroded soils from the West Area during flood events. Additionally, historical aerial photographs indicated that small-scale disturbances, which may have included filling, have occurred at the Southern Lots.

2.2.2 Enforcement actions

In 1961, City of Brooklyn Center staff observed phenol contamination in several residential wells near the Joslyn Site, and in 1980, the MPCA also observed PCP and phenols in several nearby residential wells. Several investigations conducted by Joslyn in the early 1980s indicated that groundwater and soils at the Joslyn Site were contaminated with compounds associated with the wood treating process (e.g., phenols and polynuclear aromatic hydrocarbons [PAHs]). On September 27, 1983, the MPCA issued a Request for Response Action (RFRA) to Joslyn pursuant to MERLA requesting that Joslyn undertake remedial actions to abate the release of hazardous substances at the Joslyn Site. On September 21, 1984, the Joslyn Site was listed by EPA on the NPL due to soil and groundwater contamination.

Under the terms of the 1985 Consent Order, Joslyn is responsible for the costs associated with the investigation and remedial actions undertaken. Investigation of the Joslyn Site was substantially completed by 1988.

2.2.3 Historical investigation and remedial actions

2.2.3.1 Actions associated with 1989 record of decision – OU1 through OU4

As a result of the investigations conducted under the 1985 Consent Order, interim response actions were conducted in 1988 when 18,818 tons of contaminated soils were excavated from the Joslyn Site and disposed of at a permitted hazardous waste landfill in Oklahoma.

On July 31, 1989, a Record of Decision (1989 ROD; MPCA, 1989) was issued for operable units (OUs) 1 through 4. The 1989 ROD defined four operable units at the Joslyn Site.

- OU1 consists of the upper unit of the unconsolidated aquifer (shallow upper aquifer)
- OU2 consists of the middle unit of the unconsolidated aquifer (middle sands)
- OU3 consists of the accumulation of dense non-aqueous phase liquid (DNAPL) in a subsurface aquitard located near well W251
- OU4 consists of contaminated soil remaining after the completion of the interim response action completed in 1988

The 1989 ROD also specified remedies for the four operable units defined at the Joslyn Site.

- Installation, operation, and maintenance of a groundwater pump-out system (OU1 for shallow groundwater and OU2 for middle-sand groundwater)
- Installation, operation, and maintenance of a DNAPL pump-out system (OU3)
- Onsite biological treatment of the contaminated soil that remained after the 1988 interim response action (OU4)
- Regional groundwater and surface water monitoring (OU1, OU2, and OU3)

The groundwater pump-out system to address OU1 and OU2 began operating in February 1989 and the DNAPL recovery system for OU3 began operating in December 1995. The groundwater and DNAPL remedies (OU1, OU2, and OU3) continue to operate effectively (MPCA, 2009).

The OU4 remedy consisted of excavation of soil contaminated with the wood treating fluids, followed by biological treatment of those soils in an onsite land treatment unit (LTU). The OU4 remedy was targeted at soils in the saturated zone, although excavation occurred below the water table where practicable as required by the 1989 ROD. The 1989 ROD also specified that following soil treatment, the LTU was to be closed. The LTU was constructed in 1989 and treatment of approximately 90,000 cubic yards of soil occurred from 1989 to 1997.

The MPCA approved the cleanup of soils at the Joslyn Site for a general industrial use scenario. With the exception of the West Area, most of the Joslyn Site was redeveloped in three separate phases of redevelopment. Redevelopment activities were undertaken by Real Estate Recycling, Inc. with the cooperation of Joslyn and under the oversight of the MPCA. Since 1999, three buildings for light industrial use, associated parking lots, stormwater ponds, and an extension of Azelia Avenue have been constructed. Site redevelopment and its associated buildings, driveways, and areas of clean-vegetated soil, provided acceptable conditions for the closure of the LTU. After closure of the LTU, the OU4 portion of the remedy was complete on the developed portion of the Joslyn Site resulting in a partial deletion of the site from the MERLA PLP in 2000 (MPCA, 2000) and from the CERCLA NPL in 2002 (EPA, 2002).

Further information regarding enforcement activities at the Joslyn Site related to OU1 through OU4 are available in the 1985 Consent Order, the 1989 ROD, and in Five-Year Reviews completed by MPCA in 1995, 1999, 2004, and 2009 (MPCA, 1995; MPCA, 1999a; MPCA, 2004a; MPCA, 2009).

2.2.3.2 Historical West Area investigations and remedial actions associated with OU4

Portions of the West Area have been investigated and/or remediated as part of the implementation of the OU4 remedy (excavation and onsite land treatment of contaminated soils). Investigations and/or response actions to address portions of the West Area during remedial actions associated with OU4 were conducted in 1981, 1986, 1997, 1998, and 1999. These investigations are described in detail in other documents, but are summarized in the following paragraphs by area and excavation areas are shown on Figure 2. The 1998 and 1999 release sampling investigation is discussed in this section only as it relates to the identification of contaminated soils that were subsequently remediated as part of the OU4 remedy. The release sampling investigation as it relates to OU5 is discussed in Section 2.2.3.3.

Pond C area

An investigation of the Joslyn Site disposal ponds, including Pond C, which was located at the West Area, was conducted in 1981 (Barr, 1981). Hazardous waste, as defined at the time of the investigation, was not observed at Pond C and subsequent investigations and response actions were focused on other areas of the Joslyn Site. The Pond C area was investigated again in 1997 as part of a larger West Area investigation (Barr, 1997). Visually contaminated soil was observed during the 1997 investigation and that soil (approximately 650 cubic yards) was excavated and treated at the onsite LTU later that year (Barr, 1998). The excavation was backfilled with clean soil from an offsite source.

Ice chute and ditch from Pond C

An apparent former ice chute, a manmade ditch that was reportedly used to mine ice blocks from Middle Twin Lake, is located at the northern portion of the West Area. During the use of onsite disposal Pond C, a drainage ditch was reportedly constructed from the northern dike of the pond to the ice chute. Two borings were placed in the former ice chute area and one boring in the drainage ditch during a 1997 investigation (Barr, 1997). Samples were collected from each boring for analysis for PAHs and PCP. Low-level PAHs were observed in one sample obtained from the former ice chute area. All other samples were non-detect for PAHs. PCP was not detected in any of the samples.

Area west of Pond A

An onsite wastewater disposal pond, Pond A, was located immediately east of the West Area. The "Area West of Pond A" was specifically identified in the 1985 Consent Order because the area contained visually impacted soil and debris. Investigations conducted in 1986 in this area were used to delineate contaminated soil extents (Barr, 1986). Approximately 2,500 cubic yards of contaminated soil was removed from this area in 1989 and treated at the onsite LTU (Barr, 1993). Onsite material was used to backfill the excavation.

WA-3 Area excavation

The release sampling investigation of the West Area in 1998 and 1999 indicated that a "hot spot" of visually contaminated soil was present at the southeastern portion of the West Area known as West Area-3 or WA-3 (Earth Tech, 1999a; Earth Tech, 1999b). Approximately 1,000 cubic yards of visually contaminated soil was excavated to a depth of approximately three feet from the "hot spot" area and disposed off site at a RCRA Subtitle C disposal facility (Barr, 1999a). The excavation was backfilled with clean offsite soil.

Western LTU dike excavation

During the WA-3 area excavation described above, an area of visibly contaminated soil was identified beneath the western LTU dike. Approximately 50 cubic yards of this soil was excavated and treated at the onsite LTU (Barr, 1999b). Clean soil obtained from offsite sources was used to backfill the excavation.

2.2.3.3 Investigations associated with OU5

Since wood treating activities were conducted on the now redeveloped portion of the Joslyn Site adjacent to the West Area from approximately 1920 to 1980, concerns were raised regarding the nature and extent of contamination in the West Area and in Middle Twin Lake located immediately adjacent to the West Area. In 1998, the MPCA requested that Joslyn conduct a soil-sampling program to assess the presence of PAHs, PCP, and dioxin/furan compounds (dioxins/furans) in accessible soils across the Joslyn Site, including at the West Area. The prospective site redeveloper conducted this investigation in 1998 and 1999 (Earth Tech, 1999a; Earth Tech, 1999b). As a result of this sampling investigation, the West Area was identified as an area requiring additional investigation and possible remediation. Following completion of the study, redevelopment activities continued, and have since been completed, on the remainder of the Joslyn Site as noted in Section 2.2.3.1.

Prior to 1999, the contaminants of concern (COCs) for the Joslyn Site were listed as PAHs and PCP. Residual soil contamination was identified in West Area surface soils during the 1998 and 1999 release sampling investigation. Varying concentrations of PCP, PAHs, and dioxins/furans were observed in samples of the West Area shallow soil (Earth Tech, 1999a; Earth Tech, 1999b). After the sampling investigation in 1999, dioxin and furans were added as COCs for the West Area. Further investigation of shallow soils in the West Area was conducted in 2000 to fill identified data gaps in the 1998 and 1999 sampling investigation (Barr, 2001).

In 2002 and 2003, an investigation of shallow soils, sediment, and surface water was conducted in the West Area (Barr, 2003). Results of the investigation indicated the presence of COCs at varying concentrations in shallow soils throughout the West Area and in surface water samples. Very low to non-detectable COC concentrations were observed in sediment samples. This investigation is discussed in more detail in Section 2.5.4.1.

A pre-design soil investigation was completed in January 2014 (Barr, 2014) and an additional soil characterization investigation was completed in February 2015 (Barr, 2015a).

Sampling activities were conducted on and adjacent to the Southern Lots in 2003, 2004, 2005, and 2009 (Barr, 2009). Results of the 2003-2005 work showed low-level concentrations of dioxin/furans in portions of the Southern Lots (Barr, 2005a). In 2009, an investigation was conducted to better define the extent of contamination of the north parcel (Barr, 2009). These investigations are discussed in more detail in Section 2.5.4.2.

Data collected from each of the investigations was used to assess remedial action alternatives for OU5.

2.2.3.4 Middle Twin Lake

Due to its location adjacent to the Joslyn Site, numerous investigations have been conducted at Middle Twin Lake to determine whether releases to the lake from the Joslyn Site have occurred, and if so, whether or not there are unacceptable risks to human health and the environment. A new series of studies was triggered when soil contaminated with dioxin/furans was identified in the West Area during the 1998 and 1999 release sampling investigation. This section briefly describes the studies related to Middle Twin Lake that have been conducted since 1999.

In 2003, the MPCA retained an environmental consultant to collect sediment samples from Middle Twin Lake with the primary goal of determining whether COCs had been released from the Joslyn Site. The sampling results were presented in a June 2004 report, which concluded that a release of COCs from the Joslyn Site into Middle Twin Lake sediments had occurred (Bay West, 2004). Joslyn criticized the methodology employed in the study and disputed the conclusions cited in the report (Barr, 2006a; Joslyn, 2006).

In 2004, a fish tissue study was completed on fish collected from Middle Twin Lake to help determine whether COCs had been released from the Joslyn Site, and if so, whether human health could be endangered by the consumption of fish obtained from Middle Twin Lake. The data was presented in 2005 (Barr, 2005b) and reviewed by the MDH in conjunction with the United States Department of Health and Human Services. A Health Consultation was prepared that showed that of the COCs at the Joslyn Site, only dioxin/furans were present at elevated concentrations in the fish tissue (MDH, 2006). The dioxin/furans concentrations in the tissue from Middle Twin Lake fish did not differ significantly from concentrations found by the EPA in a study of 58 lakes in Minnesota. MDH does not consider the dioxin/furans concentrations in fish in Middle Twin Lake to present a public health hazard if fish consumption advice is followed. MDH recommended that additional sediment samples be collected to determine if there is a human health risk from direct exposure to the sediments and to determine if there is a future risk to fish if sediments are disturbed.

Joslyn completed an additional sediment sampling and analysis study in September 2007 and submitted results to the MPCA in a December 2007 report (Barr, 2007). The MPCA concluded that the sampling results confirmed that the concentration of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF) in sediments, both in the beach and non-beach study areas, were below the sediment screening value of 50 parts per trillion (ppt) toxicity equivalency quotient (TEQ) that was proposed by the MDH for the Joslyn Site project, and that no further assessment was necessary.

2.3 Community participation

This section summarizes the community relations activities conducted by MPCA during the investigation and remedy selection process. Community participation activities included community meetings, public meetings and public notices, phone calls and emails with community members, and mailings with fact sheets and site information. Specific community participation activities performed prior to the issuance of the proposed cleanup action for OU5 (Proposed Plan) included:

- Consultation with neighborhood groups
- Consultation with local government agencies (City of Brooklyn Center, Shingle Creek Watershed Management Commission)
- Contact by phone and email with individual community members

The Proposed Plan and a summary of the proposed plan for OU5 were made available to the public in March 2017. These documents were made available on the MPCA website and mailed to citizens within the surrounding area. A public comment period was open from March 27, 2017 to May 19, 2017 and a public meeting was held on April 12, 2017. MPCA received comments from five individuals during the public comment period. MPCA’s response to comments received during this period is included in the Responsiveness Summary, which is part of this ROD.

2.4 Scope and role of operable unit

Due to the complexity of many Superfund sites, remedial actions are often divided into a number of operable units based on factors including geography, specific site problems, and phases of remedial action. As noted in Section 2.2.3.1, the 1989 ROD organized remedial work at the Joslyn Site into four OUs as follows: OU1 consists of the upper unit of the unconsolidated aquifer (shallow upper aquifer);

OU2 consists of the middle unit of the unconsolidated aquifer (middle sands); OU3 consists of the DNAPL pool located near well W251; and OU4 consists of contaminated soil remaining after the completion of the interim response action completed in 1988.

The remedy outlined in the 1989 ROD included onsite biological treatment of contaminated soil (or the offsite disposal of heavily contaminated soil – soil unable to be treated biologically); operation and maintenance of a groundwater pump-out system; operation and maintenance of a DNAPL pump-out system; and regional groundwater and surface water monitoring. As noted in Section 2.2.3.1, the groundwater and DNAPL remedies (OU1, OU2, and OU3) are currently continuing to operate effectively and the OU4 portion of the remedy was complete upon closure of the LTU when portions of the Joslyn Site were redeveloped for light industrial use. OU4 was partially delisted from the Minnesota MERLA PLP on June 1, 2000 (MPCA, 2000), and partially delisted from the federal CERCLA NPL on August 16, 2002 (EPA, 2002).

The subject of this ROD is a new operable unit, OU5, which consists of contaminated soils that remain at the Joslyn Site in the West Area and the Southern Lots. Soils in one or more sub-areas of OU5 exceed the human and/or ecological preliminary remediation goals (PRGs) that have been established for the Joslyn Site (see Table 5 and Section 2.8 for PRG discussion). This fifth operable unit represents the final response action for the Joslyn Site.

2.5 Site characteristics

2.5.1 Conceptual site model

The conceptual site model (CSM) is a tool that helps form a picture of what is known about a site, incorporating information on the potential chemical sources, affected media, release mechanisms, chemical transport, and known or potential human and ecological receptors. Contaminated soils of OU5 exceed the human and/or ecological PRGs established by the MPCA, and therefore pose potential risks to human and ecological receptors via incidental ingestion, direct contact (dermal adsorption), and inhalation exposure pathways. Other exposure pathways, including ingestion or direct contact with both surface water and groundwater, are determined to be incomplete as a result of sampling data and the particular nature of the OU5 soil matrix.

High organic content (OC) of the soil at OU5 reduces the potential magnitude of exposure through both inhalation and incidental soil ingestion. The proportion of dioxins that have the potential to volatilize from the soil matrix is reduced by the strong dioxin-soil OC binding. In addition, dioxins in this soil matrix are less bioavailable upon ingestion than dioxins in low-OC soils (Van der Berg, 2006). Nonetheless, despite the likely reduction in the magnitude of exposure, these pathways are still assumed to be potential contributors to receptor risk.

Contaminated soils at OU5 are accessible to both human and ecological risk receptors, which supports the determination that the direct contact exposure pathways are complete. The MPCA has defined the “accessible” soils in the West Area as the upper three feet of the final grade (MPCA, 1998), or the upper two feet of the final grade if an underlying geotextile fabric was installed. The MPCA has defined the “accessible” soils in the Southern Lots as the upper four feet of the final grade (MPCA, 2005b).

Results of the fish tissue and sediment sampling studies at Middle Twin Lake, described in Section 2.2.3.4, indicate that the surface water exposure pathway is not complete. The groundwater exposure pathway was evaluated by assessing the long-term risk of COCs leaching from contaminated soil in OU5 to groundwater. The presence of a high proportion of natural organic soils (i.e., peat) in the wetland portions of OU5 inhibits infiltration-based transport. Dioxins adsorb strongly to organic materials like peat and other vegetative matter. This reduces the potential for dioxins to dissolve into pore water and ultimately infiltrate groundwater.

The groundwater near Middle Twin Lake flows from the lake area to the east-southeast; therefore, groundwater in the West Area does not discharge into the lake. In addition, the existing groundwater pump-out system at the Joslyn Site collects groundwater flowing from OU5, capturing it for treatment and discharge to the sanitary sewer system.

In summary, throughout OU5, the exposure pathways of concern for human and ecological receptors are ingestion, inhalation, and direct dermal contact with soils that are non-conforming, or exceed the PRGs (see Table 5 and Section 2.8 for PRG discussion). A CSM for OU5 is shown on Figure 3.

2.5.2 Physical site setting

As discussed above, OU5 encompasses two areas of the Joslyn Site: the West Area and the Southern Lots. The West Area consists of wetlands and wooded upland, and abuts Middle Twin Lake to the west. Surface water drains north through the central portion of the Site and flows directly to Middle Twin Lake at the northwest limit of the site. The soils consist of fill soils, native lacustrine fine sand, silts and clays, and peat in the wetland portions. Historic aerial photographs show signs of a pond (former Pond C) in the central portion of the West Area prior to 1950 (Figure 4). A waterway, or ice chute, may have once existed across the northern portion the West Area. In the mid-1960s, an embankment for a railroad spur was placed from west to east across the West Area (Figure 5).

The Southern Lots, which are covered with trees and shrubs, are located south of the West Area. Roughly, half of the areas of both parcels fall within the 100-year flood elevation of Middle Twin Lake (856.0 feet above mean sea level [MSL]). Soils in the Southern Lots consist of fill, as well as native lacustrine fine sands, silts, clays, and peat.

2.5.3 Geology and hydrogeology

The Joslyn Site is underlain by about 100 feet of complex glacial deposits overlying sedimentary bedrock. In general, the West Area and the Southern Lots are underlain by a mix of fill, organic-rich sands and silts, and various sand layers. Further, east, the glacial deposits are more complex, with layers of silts and clays. It appears the chain of Twin Lakes may be in a glacial meltwater channel where older glacial deposits and the St. Peter Sandstone (which underlies the rest of the Joslyn Site) were scoured out and replaced by outwash sands and lake sands.

Groundwater and lake level monitoring have been conducted at the Joslyn Site for over 20 years and, except for a few periods, conditions have been relatively constant. Groundwater levels indicate flow from the area of the lake to the east-southeast.

The groundwater pump-out system at the Joslyn Site to address OUs 1 and 2 captures the groundwater near the water table and in an isolated sand body at an intermediate depth. Routine monitoring of the groundwater laterally downgradient of the Joslyn Site and below the Joslyn Site in the lower aquifer confirms that the lower aquifer is protected and that the COCs are contained within the limits of the site.

2.5.4 Nature and extent of contamination

This section summarizes the nature and extent of soil contamination identified at OU5 as derived from results of previous investigations, describes potential exposure pathways, and includes a discussion of the likelihood for migration of COCs. There are no known specific and confirmed sources of the residual soil contamination identified within OU5. As discussed in Section 2.2.3.2, the OU4 remedy addressed areas of contamination in the West Area resulting from contaminated fill placement and the disposal/burial of wood treating residuals/sludges. Because the former operating portion of the wood treating site is adjacent to the West Area, it is suspected that surface water runoff from the adjacent former wood treating operations may have been the source of contamination to OU5 soils. The COCs for OU5 are therefore the following compounds related to the former wood treating operation at the Joslyn Site:

- carcinogenic PAHs
- PCP
- Dioxins/furans

During previous investigations conducted at the West Area, the following media were sampled: soils, sediment, and surface water. As indicated in Section 2.2.3.4, based on results of recent investigations of sediments and fish tissue conducted at Middle Twin Lake, the MPCA concluded that further assessment of surface water and lake sediments would not be required. It should also be noted that groundwater and DNAPL remedies implemented under OU1, OU2, and OU3 will continue to be operated and maintained and the groundwater will continue to be monitored at the Joslyn Site.

2.5.4.1 Soil contamination – West Area

Soils with elevated PAHs, PCP, and/or dioxins/furans concentrations were detected in shallow soils at the West Area during investigations conducted prior to 1999 (see Section 2.2.3.2 and Barr, 2000 for more details). As part of the release sampling investigation conducted in 1998 and 1999, the West Area was organized into a number of sub-areas (Figure 6a). The delineation of each sub-area was based on topography, history of fill placement as observed in historic aerial photographs, and vegetation patterns. WA-1, WA-2, and WA-3 are generally upland areas on the eastern edge of the West Area, adjacent to the former wood treating areas on the Joslyn Site. Historic fill placement was observed in these three sub-areas during review of Joslyn Site aerial photographs. WA-4 and WA-5 are located on the western edge of the West Area adjacent to Middle Twin Lake and consist primarily of forested upland. WA-6 is located in the south-central portion of the West Area and represents the approximate former location of Pond C. WA-6 was further subdivided into WA-6S, WA-6MID, and WA-6N based on historic site features, including the former railroad spur, which had intersected Pond C. WA-7 is a shallow marsh located in the north-central portion of the West Area. WA-8 is defined as the east-west former rail spur located in the central portion of the West Area.

Joslyn conducted additional soil sampling in 2003 along east-west transects across the West Area to obtain data to more fully characterize the potential ecological and human health risks associated with the soil in the West Area and to aid in identifying appropriate and cost-effective remedial options for the West Area. Soil samples were collected from the surface to four feet below ground surface (bgs). The results of this investigation are presented in another report (Barr, 2003).

A pre-design soil investigation was completed in January 2014 (Barr, 2014) and an additional soil characterization investigation was completed in February 2015 (Barr, 2015). The pre-design soil investigation informed soil management decisions. The additional soil characterization was completed to document soil quality at depths greater than what would be excavated as part of the remedy alternatives being evaluated in the FFS. Generally, TCDD-TEQ concentrations from the composite samples decreased with increasing depth.

Sampling locations from the investigations conducted at the West Area are presented on Figure 6a, and historic shallow soil data from the West Area used in the risk assessment described in Section 2.7 are presented on Figure 6c and in the tables in Appendix A. As shown on Figures 6a and 6c, historical soil sampling results show significant differences in the concentrations of COCs within the sub-areas of the West Area. Figure 7 summarizes dioxin concentrations within sub-areas of OU5. Sub-areas WA-4 and WA-5 have not been significantly impacted by former operations at the Joslyn Site. Conversely, surface soils within sub-areas WA-6MID and WA-6S have been impacted. Concentrations of COCs in soil samples collected from sub-areas WA-1, WA-2, WA-3, WA-6N, WA-7, and WA-8 are generally less than those measured in wetland surface soil samples collected from sub-areas WA6-MID and WA-6S. Taken together, COC concentrations in individual West Area surface soil samples were within the following ranges:

- Dioxin/furan (expressed as the tetrachlorodibenzo-p-dioxin [TCDD] Toxicity Equivalency Quotient [TEQ], or TCDD-TEQ): non-detectable to 176,621 ng/kg (parts per trillion)
- Carcinogenic PAHs (expressed as benzo(a)pyrene equivalents [BaP]): non-detectable to 350 mg/kg (parts per million)
- PCP: non-detectable to 450 mg/kg (parts per million)

2.5.4.2 Soil contamination – Southern lots

At the request of the MPCA, Joslyn conducted an investigation for dioxin/furans in shallow soils at the Southern Lots in 2005. The purpose of the investigation was to determine dioxin/furans concentrations in the upper four feet of soil at portions of the Southern Lots located within the 100-year flood elevation of Middle Twin Lake. Soil samples were collected from zero to four feet bgs to delineate the lateral and vertical extent of dioxin/furans contamination. The dioxin/furans concentrations reported for individual samples collected from the north parcel of the Southern Lots ranged from 7.61 ng/kg (ppt) to 772 ng/kg (ppt) reported as TCDD-TEQ. The dioxin/furans concentrations reported for individual samples collected from the south parcel of the Southern Lots ranged from 3.08 ng/kg (ppt) to 5.34 ng/kg (ppt) reported as TCDD-TEQ. The highest dioxin/furans concentration was observed in native peat underlying fill material on the north parcel of the Southern Lots. The results of the 2005 investigation of the Southern Lots are presented and discussed in more detail in another report (Barr, 2005a). Investigation locations are shown on Figure 6b.

An additional investigation was completed in 2009 to (1) identify areas where soil on the north parcel could be included into the West Area remedy and (2) generate soil quality data for both the north and south parcels that could be used to prepare environmental covenants. The results of the 2009 investigation confirmed that the upper four feet of soil located within the 100-year flood elevation on the north parcel will need to be remediated as part of the OU5 remedy. Data reported for four composite soil samples collected from the south parcel confirmed that dioxin/furans are present in the native peat layer. However, the results of the 2005 sampling demonstrated dioxin/furans in shallow soils at levels below the PRGs/RGs, therefore remediation will not be required (Barr, 2009). Figure 7 summarizes dioxin concentrations within OU5.

In 2004, an investigation was completed of the soils beneath the roadway to the west of the Southern Lots. The roadway investigation demonstrated that concentrations of TCDD-TEQ observed on the Southern Lots did not extend to the roadway corridor to the west of the Southern Lots.

2.5.4.3 Potential for migration and the identification of potential exposure pathways

One site-specific factor that influences the likelihood of migration and the completion of potential exposure pathways is the presence of a high proportion of natural organic soils (i.e., peat) in the wetland portions of OU5. PAHs and PCP are hydrophobic in nature and thus are relatively insoluble in water and have an affinity to adsorb to particles. Dioxins/furans have also been well documented to be both hydrophobic (extremely low water solubility) and to have a strong affinity for organic matter, such as the high organic matter present in OU5 soils. Dioxins/furans have a low potential for volatilization due to a low vapor pressure. Due to their relative insolubility and strong affinity to adsorb to soil particles, the COCs are generally immobile in soils. Therefore, the potential for migration of COCs from soil to groundwater via leaching and the volatilization of dioxins/furans from the soil to air is considered low.

As noted in Section 2.5.1, the findings of recent studies conducted at Middle Twin Lake, in combination with the fact that the groundwater flow direction is *away* from Middle Twin Lake and *towards* the Joslyn Site, provide assurance that the surface water migration/exposure pathway is not complete. In addition, the groundwater exposure pathway is not complete because the groundwater pump-out system at the Joslyn Site captures and treats groundwater located underneath OU5. Furthermore, the area around the Joslyn Site is served by municipal water supply and no longer, uses private wells for drinking water.

Since the potential for migration of COCs to other locations or to other media (i.e., groundwater or surface water) is low, and since there is an existing groundwater pump-out and treatment system, direct contact with contaminated soil is the current and potential future surface and/or subsurface routes of human or environmental exposure for OU5. As noted in Section 2.5.1, human exposure through direct contact with soil may occur through dermal contact with contaminated soil, incidental ingestion of contaminated soil, and/or inhalation of dust derived from contaminated soil (i.e., contaminants adsorbed onto soil particles).

2.5.5 Regulatory classification of OU5 soils

The regulatory classification of OU5 soils is a critical element in evaluating and selecting an appropriate remedy. The MPCA determination regarding the classification of OU5 soils allows for two general remedial alternative scenarios: (1) excavate, consolidate, and cover; and (2) excavate for offsite treatment/disposal.

2.5.5.1 Onsite consolidate and cover

The EPA's area of contamination (AOC) policy (EPA 1996) states that consolidation and in-situ treatment of hazardous waste within the AOC does not create a new point of hazardous waste generation for purposes of RCRA. Essentially, the AOC policy allows soils to be consolidated or treated in-situ without triggering land-disposal restrictions or minimum technology requirements. Therefore, excavated soils from within OU5 can be consolidated within the AOC.

The EPA equates an AOC as a discrete area of generally dispersed contamination to a RCRA unit. An AOC is a RCRA unit where contamination is contiguous and of similar nature, but not necessarily homogenous. Under this definition, the entire Joslyn Site is considered an AOC. Therefore, consolidation locations considered appropriate for OU5 soils include the West Area (Alternatives 5 and 8) and portions of the Joslyn Site located outside of the West Area where contaminated soil consolidation occurred previously (Alternatives 6 and 7).

2.5.5.2 Offsite treatment and/or disposal

If soils excavated from OU5 are to be treated and/or disposed offsite (outside of the AOC), the soils must be classified for proper management under federal and state regulations.

Approximately 40% of the OU5 soils planned for excavation contain a listed waste. According to MPCA policies, soils containing a listed waste must be managed as a hazardous wasted if they are disposed offsite. For those soils, RCRA requires that the soils be treated to meet 90% contaminant reduction capped by 10 times the universal treatment standards (10xUTS) for hazardous constituents prior to disposal in a Subtitle C landfill. The only effective and commercially available treatment alternative for these soils is incineration.

Under MPCA policies, about 60% of the OU5 soils planned for excavation do not contain a listed waste. For these soils, MPCA policy for disposal of dioxin-contaminated soil in a Subtitle D landfill applies. Since these soils meet MPCA criteria (must contain less than 10,000 ng/kg TCDD-TEQ), they can be disposed of in a Subtitle D landfill.

Offsite disposal of all contaminated OU5 soils was considered (Alternative 3), as well as combination offsite disposal/onsite consolidation remedies where soils that contain a listed waste are consolidated on site, and soils that do not contain a listed waste, and also meet MPCA dioxin criteria, are disposed offsite at a Subtitle D landfill (Alternatives 7 and 8).

2.5.6 Determination of principal threats

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site whenever practicable. In general, "principal threat" wastes are those source materials that contain hazardous substances that act as a reservoir for migration of contaminants to groundwater, surface water, or air, and which cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur.

The soils in OU5 are a combination of low-level and principal threat waste. As discussed in Section 2.5.4.3, the mobility of the contaminants associated with OU5 soils is extremely low. However, the toxicity of the soils in sub-area WA-6 would present a significant risk to human health or the environment should exposure occur and, thus, this soil is considered a principal threat waste.

2.5.7 Wetland and floodplain impacts and mitigation

The majority of the West Area is located within the 100-year floodplain of Middle Twin Lake and a significant portion is delineated wetland as described in Section 2.1 and shown on Figure 8. Wetlands within the West Area were delineated in 2012 according to United States Army Corps of Engineers methods (Barr, 2012). One wetland (Wetland 1), approximately 9.0 acres in size and located in the West Area and Southern Lots, was identified as part of this effort. The delineated wetland is shown on Figure 8. The terms "northern wetland" and "southern wetland" will be used in this ROD to describe those portions of the wetland located north and south of the former rail spur shown on Figure 8, although it is acknowledged that both areas are hydrologically connected. Wetland and floodplain impacts and mitigation will affect both implementability and the cost of the remedial alternatives for OU5 as described below:

- Substantial permitting efforts with numerous federal, state, and local regulatory agencies will be required, including coordination of their regulation and policies regarding the wetland and floodplain.
- Wetland restoration will be required where wetlands are disturbed (e.g., remedial alternatives requiring soil to be excavated from the West Area and the excavation to be backfilled to original grade).

- Wetland replacement will be necessary to offset permanent impacts to wetland areas (e.g., remedial alternatives where wetland will need to be filled due to creation of soil covers and/or consolidation).
- Floodplain mitigation, including the creation of floodplain at either an onsite or offsite location, or a request for a variance will be required if the implementation of the selected remedial alternative results in a loss of floodplain (e.g., remedial alternatives where floodplain will be filled due to creation of soil covers or consolidation).

2.6 Current and potential future land and water use

2.6.1 Land use

Open space is the current land use of the West Area. The area consists of wetland and forested upland, much of which is within the 100-year frequency floodplain of Twin Lakes. Joslyn owns the West Area and maintains a fence to make the West Area inaccessible to the general public.

The Southern Lots are two lots, owned by Joslyn and zoned for residential land use, located adjacent to the southern boundary of the West Area. Open space is the current land use for the Southern Lots.

The West Area abuts Middle Twin Lake on the west and a residential area on the south. An active railroad track runs immediately adjacent to the West Area on the north with wetlands located north of the tracks. The redeveloped portion of the Joslyn Site adjoins the West Area to the east. The redeveloped portion of the Joslyn Site is also used for the operation and maintenance of the groundwater recovery and treatment, and DNAPL recovery and treatment systems for OU1-OU3, and the maintenance of the cover for onsite soil treatment for OU4. The surrounding land use is generally residential to the north and the south and commercial to the east.

The MPCA has determined that the reasonably anticipated land use for the West Area is industrial with the possibility that the West Area will remain as open space in the future. The West Area is zoned “industrial” and is identified as open space on the City of Brooklyn Center’s Comprehensive Plan for 2030 (City of Brooklyn Center, 2010). Because much of the West Area falls below the 100-year flood level of Middle Twin Lake, it is not expected that it could ever reasonably be developed for industrial purposes. Joslyn has stated their intention is for the West Area to remain as open, undeveloped space with a perimeter fence to protect and prevent access to the general public or trespassers.

The Southern Lots are zoned for residential use and are shown as residential on the City of Brooklyn Center’s Comprehensive Plan for 2030 (City of Brooklyn Center, 2010). Joslyn anticipates continued ownership of these two parcels with the use of institutional controls so that they will remain undeveloped (Barr, 2005a).

2.6.2 Groundwater and surface water use

The shallow groundwater aquifer below the West Area and the Southern Lots is not used for drinking water and is not anticipated to be used for drinking water in the future. The shallow groundwater aquifer downgradient (to the east) of the West Area is undergoing remediation as a part of the groundwater pump-out system for OU1 and OU2. The potential for COCs to migrate from the OU5 contaminated soils to groundwater is extremely low; however, additional protection is provided by the fact that groundwater below OU5 contaminated soils is captured and treated by the groundwater pump-out system as described above.

The runoff from the West Area currently drains to north and northwest to the adjacent Twin Lakes, a public recreational chain of lakes. As noted in Section 2.2.3.4, investigations at the Twin Lakes have shown that no significant migration of COCs from contaminated OU5 soils has occurred.

2.7 Summary of site risks

The section provides a baseline risk assessment that estimates the risks posed by OU5 if no remedial action is taken. It establishes the basis for remedial action at OU5, identifies the contaminants and exposure pathways that need to be addressed by the remedy, and summarizes future exposure pathways and risks to human and ecological receptors in the absence of any remedial action.

2.7.1 Summary of human health risk assessment

This section of the ROD summarizes the baseline human health risks at OU5 of the Joslyn Site. A comprehensive site-specific baseline risk assessment (i.e., an assessment of both the West Area and Southern Lots) was not conducted for OU5 prior to this ROD; however, a comprehensive screening-level assessment based on Minnesota and federal media-specific concentration guidelines was conducted. The results reported in this section are based on the following risk-based concentration guidelines:

- Chemical-specific soil and sediment PRGs developed by the MPCA using conservative exposure assumptions for residents, industrial workers, and recreational users of Middle Twin Lake; and
- Chemical-specific fish tissue standards developed by the EPA and based on human health risk assessment guidance.

The MPCA PRGs used as screening-level risk characterization tools are based on methods and assumptions drawn from established EPA and general risk assessment guidance. Soil reference values (SRVs), which are applicable to sites where direct contact with soil is expected to take place, are chemical-specific soil concentrations above which an unacceptable risk to human health may exist. The SRVs referenced in this ROD are generic guidelines that are derived by the MPCA using a mixture of central tendency and conservative assumptions about exposure to various types of receptors (MPCA, 1999b). The sediment screening value (SSV) is a site-specific value advanced by the MDH for use at Middle Twin Lake (MPCA, 2006c). The EPA fish tissue guidance, which was reported in the Final Report of the National Study of Chemical Residues in Lake Fish Tissue, is based on regular, long-term ingestion of predator fish tissue (EPA, 2009).

In addition to the application of guideline concentrations to site-specific concentrations, this section of the ROD draws on findings from a number of targeted assessments generated for OU5:

- A Public Health Assessment of the West Area, which did not calculate site-specific risk but catalogued the human health risk issues at the Site (MDH, 2002)
- A Public Health Assessment of Middle Twin Lake, which examined human health risk through fish tissue ingestion (MDH, 2006)
- Other communications among Joslyn, the Minnesota state agencies (MDH, MPCA, and the Minnesota Department of Natural Resources [DNR]), and other stakeholders (Barr, 2005a; Joslyn, 2004; MPCA, 2004b; 2006a; 2006b)

Four steps were conducted to assess screening-level risk to future human receptors in OU5:

1. Evaluation of data and identification of the COCs (hazard identification)
2. Identification of exposure pathways of concern and potential future receptors (exposure assessment)

3. Identification and description of COC toxicity (toxicity characterization)
4. Characterization of potential human health risks for current and future receptors (risk characterization)

2.7.1.1 Data evaluation and identification of contaminants of concern (COCs)

Soil, sediment, surface water, and fish tissue samples collected and analyzed during previous investigations were used to characterize risk to future receptors in the absence of remedial action. Soil samples used for risk characterization were collected from the OU5 "accessible" zone (upper three feet at the West Area and upper four feet of the Southern Lots) and collected in accordance with MPCA-approved sampling and quality assurance project plans. As noted in Section 2.2.1, creosote and PCP were historically used as wood preservatives at the facility.

The COCs associated with historical wood treatment activity at the Joslyn Site are carcinogenic polynuclear aromatic hydrocarbons (cPAHs), which are constituents of creosote; PCP; and polychlorinated dibenzo-*p*-dioxins/furans (dioxins), which were minor contaminants in the commercial formulation of PCP.

The reported concentrations of dioxins and furans were determined using EPA Method 4425, a high-resolution gamma spectroscopy (HRGS) screening of total planar compound concentrations, which allows for an estimate of dioxin/furan concentrations, and EPA Method 8290, a high-resolution gas chromatographic analysis that can determine concentrations of individual congeners of dioxins and furans. Both methods are considered reliable tools for assessing dioxin and furan concentrations, subject to the limitations inherent with each method. Method 8290 is a screening tool that uniquely identifies individual congeners, whereas Method 4425 is a screening tool that identifies a class of compounds and provides an estimate of TCDD equivalence. In addition, Method 4425 may be adversely affected by interferences that respond similarly to target PCDDs and PCDFs (such as PCBs and PAHs), which may bias the results. Because Method 8290 selectively identifies individual congeners, this analytical methodology provides a more representative account of concentrations of target PCDDs and PCDFs. Between 1999 and 2003; both methods were used to analyze samples. The majority of the samples were analyzed by Method 4425, and approximately 10% of samples underwent conformational analysis by Method 8290.

Data were evaluated following standard operating procedures (SOPs) based on the respective guidance documents published by the EPA and available at the time of analysis. Any qualifiers applied to the sample results were specified in the Quality Assurance Project Plan. TCDD-equivalencies included in the tables in this report have been calculated based on the most recent World Health Organization (WHO) toxicity equivalency factors (TEFs), published in 2005. This includes samples collected prior to the publication of the 2005 TEF values.

All samples were collected using established SOPs for field sample collection and have been evaluated for usability by collecting masked duplicates and equipment blanks where applicable. In general, the data collected for this project is considered representative of OU5, subject to the qualifications applied to the associated data.

Table 1 highlights the COCs in soil, sediment, and fish tissue from the various sections of OU5 and Middle Twin Lake. A risk screening was conducted using a screening level equal to one-tenth of the corresponding media-specific screening values (at the time of the screening) to identify the COCs and to identify the significant sources of COCs.

From the risk screening presented in Table 1, OU5 can be separated into three distinct groupings of sub-areas, representing different magnitudes of COC concentrations in soil:

- The group that includes WA-1 through WA-3 and WA-6 through WA-8 borders the remediated Joslyn Site and has a higher concentration of site COCs than elsewhere in OU5. For surface soils in this section of the West Area, all COCs have maximum concentrations exceeding the selection cutoff, as shown in Table 1.
- The forested upland sub-areas (WA-4 and WA-5) bordering Middle Twin Lake to the east have substantially lower COC soil concentrations than the rest of the West Area.
- The Southern Lots have low surficial soil dioxin concentrations but higher underlying soil concentrations. The other COCs were not assessed on these lots, as their concentrations on the southern border of the West Area were low and not of human health concern (Barr, 2009).

Surface water was not included as a significant source of COCs in Table 1. This is attributed both to the low solubility of the COCs in water and the assessment of sediment and fish tissue, which both preferentially accumulate these COCs. As such, sediment and fish tissue concentrations act as proxies for surface water contamination.

Groundwater was also not included as a significant source of COCs in Table 1. This is attributed to groundwater flow direction (from lake area to the east), and the groundwater pump-out system currently in operation on the remediated portion of the Joslyn Site.

2.7.1.2 Exposure assessment

In this section, the completeness of the exposure pathways are screened and assessed. All of the PRGs and guideline values used in the screening-level risk characterization for OU5 were calculated using standardized exposure assessment data and equations that are made publicly available by the authoring agency. Complete exposure pathways (sequences of events leading to receptor contact with a chemical) were defined by the following four elements:

1. A source and mechanism of release
2. A transport medium and mechanisms of migration through the medium
3. The presence or potential presence of a receptor at the exposure point
4. A route of exposure

2.7.1.2.1 Current and future land use

The completeness of exposure pathways is contingent on the future land use assumptions for OU5. Details of the current and potential future land use are in Section 2.6.1. Joslyn intends to retain ownership of both the West Area and the Southern Lots and to maintain them in their current undeveloped condition as open space. However, the MPCA considers that there is the potential for future industrial use at the West Area and residential use at the Southern Lots based on the current City of Brooklyn Center zoning regulations. Therefore, the following conservative assumptions were used for purposes of the risk assessment:

- Industrial worker receptor for the West Area
- Residential receptor for the Southern Lots

2.7.1.2.2 Pathway assessment

An evaluation was undertaken of all potential future exposure pathways that could connect sources at OU5 with receptors. Potential pathways were first hypothesized and evaluated for completeness using the four criteria listed in Section 2.7.1.2. The pathways examined represent potential future exposure pathways in the absence of OU5 cleanup.

The incomplete exposure pathways that were excluded from consideration include ingestion of, dermal absorption from, and vapor inhalation from direct exposure to groundwater. As described in Section 0, the groundwater flows from the Middle Twin Lake area to the east. In addition, a pump-out system is currently in operation at the Joslyn Site. The present/future exposure pathway involving trespassers who gain access to OU5 has also been excluded from consideration because the exposure to such trespassers would be significantly less than that to workers or recreational users, who were included in the analysis. Therefore, any remedy that minimizes risk to those receptors would also protect trespassers.

Direct exposure of receptors to surface water is not assessed explicitly but is represented by proxy. Both fish tissue and sediment concentrations are indicators of contamination of site surface water as they both preferentially accumulate hydrophobic compounds, such as the OU5 COCs. Therefore, exposure to these media acts as a conservative proxy for direct exposure to surface water.

The potentially complete exposure pathways are shown in Table 2 and are visually summarized in the CSM (Figure 3).

In the SRV and SSV screening-level risk methodology, human exposure to COCs through each of the pathways shown in Table 2 is implicitly calculated using a mixture of central tendency and conservative assumptions. The objective is the calculation of the reasonable maximum exposure (RME) for each receptor class. The RME represents a high-end (conservative) exposure that could reasonably be expected to occur in a population. The RME-based equations used to calculate chemical-specific SRVs for soil are documented in the *"Risk-Based Guidance for the Soil Human Health Pathway, Volume 2: Technical Support Document"* (MPCA, 1999b). For each of the COCs assessed, incidental ingestion of site soil is the driving exposure pathway in the calculation of the SRV. The RME-based equations used to calculate the dioxin recreational exposure SSV can be found in two memoranda from the MDH to the MPCA regarding the derivation of site-specific sediment screening levels (MPCA, 2006a; 2006b). Dermal absorption from contact with sediment during recreational use of the lake represents over half of the estimated dioxin exposure in the calculation of this site-specific SSV.

Exposure to media-specific concentrations at or above the SRV/SSV does not necessarily mean that the effective lifetime risk to receptors at this particular site would exceed the state guideline value of 1 in 100,000 lifetime excess cancer risk. It does mean, however, that in the absence of remedial action, a site-specific risk assessment would be conducted to establish a level of risk lower than the target guideline.

2.7.1.3 Toxicity assessment

The COCs identified as potential drivers of risk in OU5 all are regulated as carcinogens. However, the only specific compound within the list of OU5 COCs that the EPA has unequivocally judged to be a human carcinogen is 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). The COCs and a brief summary of their carcinogenicity are detailed in Table 3.

The carcinogenicity of mixtures of dioxins is established by the use of TEFs, which normalize the carcinogenicity of each dioxin to that of the reference compound, TCDD. Once the TEFs are applied to media concentrations, they can be summed to establish the TCDD Toxic Equivalent concentration (TCDD-TEQ). The TEF scheme used to characterize dioxin concentrations in this assessment is the WHO 2005 dioxins/furans weighting scheme. The same has been done with PAHs, using an MDH weighting scheme based on that used by the California EPA to normalize the carcinogenicity of these compounds. Concentrations of PAHs are thus expressed as BaP equivalents.

Dioxins and PCP also demonstrate non-cancer toxicity over chronic exposure periods. Dioxins are known to cause effects on immune function, reproduction and development, diabetes, thyroid function, and lipid levels in both animals and humans (EPA, 2003). The EPA's Integrated Risk Information System (IRIS) documents only one chronic feeding study for PCP, which found that the compounds causes pigmentation in the liver and kidneys of male and female rats. Despite this, non-cancer impacts are only evident at substantially higher levels of chronic exposure than lifetime cancer risk for both dioxins and PCP. For PCP, the state cancer guideline is reached at a chronic daily exposure 125 times lower than that needed to reach the non-cancer guideline for an RME industrial worker receptor, and 80 times lower for an RME residential or recreational receptor. As a consequence, non-cancer risk is not used in the development of the SRVs/SSV.

2.7.1.4 Risk characterization

Risk characterization is defined as the process by which the nature and magnitude of potential human health risks and the associated uncertainty are assessed. The risk characterization for OU5 is based on the screening-level risk assessment methodologies developed by the MPCA and EPA and represented by the SRV and SSV PRGs and national fish tissue guidelines. Rather than explicitly characterizing the lifetime excess cancer risk to receptors by combining chronic levels of exposure with toxicity information in the form of a dose-response curve, this method compares medium-specific guideline concentrations to site concentrations in order to identify the COCs and sub-areas of the site that may pose future risks to specific receptor types. The guideline concentrations used in this risk assessment were generated using the assumption of RME receptors and are based on generally accepted guidance for exposure and risk assessment. The MPCA generated the SRVs and SSV by setting the risk to the state cancer guideline of 1 in 100,000, or 1×10^{-5}, excess cancer cases. Risks above this level are generally deemed unacceptable by the state and require remediation. The EPA also generated their fish tissue dioxin guidance by setting the risk level to 1 in 100,000, or 1×10^{-5}, excess cancer cases (EPA, 2000).

The Tier 1 (resident) and Tier 2 (industrial worker and recreational user) SRVs were developed for generalized use by the MPCA, and as such are not site-specific. Calculation of these guideline soil concentrations combines three exposure pathways: incidental soil ingestion, inhalation of COC vapor, and dermal exposure. As stated in Section 2.7.1.2, incidental soil ingestion is the driving exposure pathway for all three COCs. The EPA fish tissue guideline concentration for dioxins was also meant for broad, screening-level application to ingestion of predator fish tissue. The SSV for dioxins, on the other hand, was developed for a site-specific assessment of sediment on the east side of Middle Twin Lake (MPCA, 2006a; 2006b).

The results of the screening-level risk characterization for COCs are given in Table 4. The results demonstrate the varying soil conditions across OU5. The WA-4 and WA-5 sub-areas have a low level of dioxin contamination, straddling the MPCA's industrial SRV. Alternatively, the other sub-areas within the West Area show relatively higher levels of dioxin and PAH contamination, well above their respective industrial SRVs for a number of samples. Sampling from the Southern Lots shows dioxin concentrations that exceed the residential SRV; however, the samples are composites of underlying peat, which is both a large sink for dioxins as well as an immobilizer for these compounds.

The results in Table 4 and on Figures 6c and 7 confirm that dioxins are the driver for human health risk in areas where there are substantial exceedances of SRVs (i.e., in the WA-1 to WA-3 and WA-6 to WA-8 cluster of sub-areas as well as on the Southern Lots). Any remedy that addressed dioxin concentrations would also address other COCs; therefore, analysis of human health risk of the other COCs is not necessary.

Industrial worker exposure to soils in the WA-4 and WA-5 sub-areas as characterized by MPCA's industrial SRV is not suggestive of risk beyond the state guideline of 1 in 100,000. The one composite sample from the WA-5 sub-area is slightly higher than the 35 parts per trillion (ppt) SRV for dioxins. However, there are a number of reasons that the dioxin concentration of the composite sample is not suggestive of excess risk to workers in this area. The SRV was calculated using assumptions of RME receptors and soils that are generally lower in organic content than those found at OU5; thus, some of the parameters used over-estimate the exposure and consequent risk to a typical worker. These parameters include job tenure of 25 years, and absorption of dioxins in the gut from incidentally ingested soil of 55%. The job tenure assumption represents the 95th percentile occupational tenure without regard to the type of job and location in which the job is done (e.g., outdoor construction, office work). This implies that only 5% of all workers will have job tenure at least as long as this. The proportion of dioxins absorbed in the gut is based on the proportion of TCDD absorbed from dietary sources in humans versus laboratory animals used to test the toxicity of TCDD. Absorption from ingested soil is thought to range widely as a function of soil organic content, aging, and other factors (Van den Berg et al., 2005). The experimentally determined range of bioavailabilities is from 0.5% to 43% (EPA, 2003). The MPCA's RME SRV assumes 30% bioavailability (MPCA, 1999b). Dioxins in soils with high organic content like the soil in this site sub-area typically show very low bioavailability. As a result of these and other considerations, the WA-5 soil does not pose an unacceptable health risk.

The sediment samples from the eastern shore of Middle Twin Lake have dioxin concentrations well below the PRG as represented by the site-specific SSV. Accordingly, the risk to a future recreational user of Middle Twin Lake is below the state target of 1 in 100,000.

The fish tissue dioxin concentrations found in Middle Twin Lake fall below the EPA fish tissue guideline concentration of 0.15 ppt in predator fish tissue—a standard developed using an exposure assumption of one eight-ounce fish meal per week over a 70-year lifetime. The median concentration of dioxin found in northern pike tissue from the lake is approximately an order of magnitude below this guideline value (Barr, 2006b). The MDH found in their Health Consultation for Middle Twin Lake that human health risk from fish ingestion was controlled by exposure to mercury and PCB—chemicals not associated with past site activity—and not dioxins (MDH, 2006). Recently, new fish consumption guidance was released by the MDH for Middle Twin Lake (DNR, 2009). Similar to past guidance, the northern pike consumption advisories for Middle Twin Lake are based on tissue mercury concentrations (DNR, 2009). These advisories suggest limiting intake to one eight-ounce meal per week for the general population, and one eight-ounce meal per week of less than 24-inch long fish and one eight-ounce meal per month of greater than 24-inch long fish for pregnant women. Given the relatively low levels of dioxin detected in northern pike tissue, these recommendations are protective for dioxin-specific lifetime cancer risk.

The 2009, fish consumption guidance also indicated that the fluorosurfactant and emerging industrial contaminant perfluorooctane sulfonate (PFOS) now drives risk from the ingestion of panfish and largemouth bass. The release of PFOS, which has been found in fish tissue in a number of lakes in the Twin Cities (MDH, 2009), is not connected with past activity at the site.

Taken in combination, the fish tissue and sediment findings at the WA-5 sub-area confirm that COC concentrations in Middle Twin Lake have been very slightly affected, if at all, by proximity to OU5. The potential connection from the southern wetland to the northern wetland and then to Middle Twin Lake via the former ice chute appears to be a small to negligible source of COCs for the lake. The hydrophobic nature of the COCs and presence of soils with high organic content likely prevent significant site mobilization. Additionally, the preferential flow of groundwater to the east and southeast towards the groundwater pump-out minimizes shallow groundwater infiltration into the lake. In general, direct exposure to surface water is considered an incomplete exposure pathway and consequently is determined not to be a human health concern.

The soil dioxin concentrations in the Southern Lots may be indicative of future risk to human health; however, the issue is complicated by the dioxin concentration gradient seen in sampling. Dioxin concentrations in the surficial soils (0 – 0.5 feet in depth) meet MPCA's residential SRV of 20 ppt, while dioxin concentrations in deeper samples (0.5 – 4 feet in depth) exceed the SRV. The likelihood of future exposure to soil deeper than 0.5 feet is low in the absence of construction activity. Additionally, though these lots are zoned residential by the City of Brooklyn Center, they are unlikely to be developed into residences in the future due to their location within the 100-year floodplain of Middle Twin Lake. As such, there is a low probability of future exposure of the underlying soils from construction activity, and institutional controls would likely be sufficient to prevent the emergence of any exposure pathways. However, the MPCA conservatively determined that "accessible" soils in the Southern Lots should be defined as the upper four feet of the final grade (MPCA, 2005b), thus categorizing the soil in the Southern Lots as non-conforming.

2.7.1.5 Human health risk assessment conclusions

Risk from direct exposure to soils containing elevated concentrations of dioxins/furans is the driver of remedial action in OU5. These soils have not been and are not anticipated to be sources for migration of COCs into other media such as surface water, sediment, or fish tissue. Excavation or isolation of these soils would interrupt the potential for direct receptor contact and consequent risk.

Industrial worker screening-level cancer risk from direct exposure to soil exceeds the Minnesota guideline of 1 in 100,000 excess cases for the WA-1 to WA-3 and WA-6 to WA-8 sub-areas within the West Area. This is driven primarily by dioxin soil concentrations, and not by cPAHs or PCP. Though the industrial worker SRV utilizes a generally conservative approach to the characterization of risk, the dioxin concentrations in these areas are substantially elevated above the SRV and above EPA's higher interim PRG for industrial worker receptors of 950 ppt. Therefore, a remedial action in this portion of the West Area is required. The remedial action alternatives considered were evaluated based on their ability to eliminate or significantly reduce this exposure pathway for future workers.

Industrial worker screening-level cancer risk from direct exposure to soil slightly exceeds the Minnesota guideline of 1 in 100,000 excess cases for the WA-5 sub-area within the West Area. This is not anticipated to translate into effective future risk above this guideline because of the generally conservative exposure factor assumptions used to characterize the risk to a typical worker, including job tenure and percent of dioxins absorbed in the gut from soils. Accordingly, the human health risk from exposure to soil in this area is likely to be low and does not require action.

For the Southern Lots, resident screening-level cancer risk from direct exposure to dioxin-containing soils would be considered to exceed the Minnesota guideline of 1 in 100,000 excess lifetime cancer risk. However, the TCDD-TEQ concentrations in the surficial samples of these lots are well below the residential SRV. In addition, there is a very low to negligible likelihood that these lots will be developed residentially because half of their area is below the 100-year flood elevation of Middle Twin Lake, and Joslyn's intent to maintain ownership of the lots. However, "accessible" soils, as currently defined, are non-conforming. Accordingly, the human health risk from exposure to soil in this area is low but uncertain.

Other risks examined here are anticipated to be substantially lower than the state cancer guideline and do not require further action.

2.7.1.6 Uncertainty characterization

Uncertainty exists in the characterization of risk to receptors from exposure to COCs in OU5. Some contributors to human health risk uncertainty (and indicators of their impact on overall uncertainty) include:

- Sampling and analytical methods (low-medium impact)
- Sample location/sample size for each medium (low-medium impact)
- Assumption of constant COC concentration over time (low impact)
- Use of generic guideline values for the characterization of risk (medium-high impact)
- Use of industrial worker receptor to characterize risk at West Area and resident receptor to characterize risk on the Southern Lots (medium-high impact)

Given the uncertainties associated with the human health risk assessment and the purposeful bias towards risk over-estimation in a screening-level analysis, it is expected that the identification of areas where cancer risk from direct exposure to soil exceeds the state guideline of 1 in 100,000 is more inclusive than a site-specific risk assessment might identify.

2.7.2 Summary of ecological risk assessment

The ecological PRGs for the West Area were developed from sediment quality criteria from multiple sources (CCME, 2002; Crane et al., 2000) and are shown in Table 5. Because a significant portion of the West Area falls below the OHWL, the MPCA determined that separate terrestrial PRGs were not needed (MPCA, 2005a). These criteria extend to the Southern Lots, of which a significant proportion of the surface area falls below the OHWL. Therefore, the ecological PRGs can be applied to soil and sediment across OU5.

2.7.3 Basis for the response action

Risk from direct exposure to soils containing elevated concentrations of dioxins/furans is the basis for remedial action in OU5. The OU5 response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 Remedial action objectives

Remedial action objectives (RAOs) for OU5 of the Joslyn Site were developed based on a review of investigation data; site-specific risk and fate/transport evaluations; applicable, or relevant, and appropriate requirements (ARARs); and to be considered (TBC) requirements. The primary COC for OU5 is dioxin/furans. The selected remediation goals (RGs) for human and ecological receptors for OU5 are the same as the previously determined PRGs, and are shown in Table 5.

The RGs selected for surface soil is 35 ppt for the West Area and 20 ppt for the Southern Lots. The RGs were selected based on SRVs established by MPCA that are protective for use by industrial workers for the West Area and protective for residential use for the Southern Lots. This conforms to the current zoning designation of these areas; however, the areas are planned to remain as open space for the future. The RG for sediment in Middle Twin Lake is 50 ppt based on SRVs and for aquatic/terrestrial ecological receptors, the RG is 11.2 ppt based on Aquatic sediment quality values.

The RAOs specifically developed for OU5 of the Joslyn Site are as follows:

- Prevent incidental ingestion and direct contact with surface soils that contain concentrations of COCs above the soil cleanup goals noted in Table 5.
- Control future releases of contaminants to ensure protection of human health and the environment.

2.9 Description of alternatives

Eight alternatives for remediating OU5 soils were evaluated in the FFS (Barr, 2013). Below are summaries and brief descriptions of the alternatives evaluated in the FFS. Also provided for each alternative are capital costs, O&M costs, and present worth cost. Present worth cost was developed using an O&M period of 30 years. Detailed descriptions, figures, and cost estimate tables for each alternative can be found in the FFS.

A number of alternatives listed below include excavating and/or covering soils; the excavation depths vary based on a comparison of existing soil quality data to the human health and ecological screening values for each of the sub-areas within OU5.

2.9.1 Alternative 1 – No action

The NCP requires that a no action alternative be evaluated as part of the screening process, in order to provide a baseline for comparison to other alternatives. Under this alternative, no further actions would be taken to address the soils in OU5 of the Joslyn Site. Costs shown are for fence maintenance, inspection, monitoring and reporting.

Estimated Capital Cost:	$ 0
Estimated O&M Cost:	$ 530,000
Estimated Present Worth Cost:	$ 530,000
Estimated Implementation Time:	On going

2.9.2 Alternative 2 – Stormwater management modifications

Modification of the current path of stormwater flow adjacent to and through OU5 can aid in meeting the RAO of removing the ongoing threat of COC transport to Middle Twin Lake. This section describes the existing stormwater management system at the Joslyn Site, as well as a conceptual plan for both interim and permanent stormwater management that has been developed as either a stand-alone remedial alternative or for use in conjunction with Alternatives 3 through 5.

There are currently three different potential stormwater inflows to the West Area from detention ponds located on the developed portion of the Joslyn Site. Surface water in the West Area drains via two pathways into Middle Twin Lake: through the former ice chute located in the northern portion of the West Area or via the diffuse connection through the emergent vegetation in the northwestern portion of the West Area (northwest of the northern wetland). The wetland located in the southern portion of the West Area (the southern wetland) does not currently have a direct pathway for stormwater flow to Middle Twin Lake; it must overflow into the northern wetland prior to discharging to the lake.

The conceptual stormwater management plan is designed to redirect runoff during implementation of the Selected Remedy, with the reintroduction of flow to the northern wetland of the West Area following site restoration activities. This would be accomplished through a combination of construction of stormwater treatment best management practices, new storm sewers, and temporary sheet piling.

Estimated Capital Cost:	$ 1,700,000
Estimated O&M Cost:	$ 624,000
Estimated Present worth Cost:	$ 2,320,000
Estimated Implementation Time:	Less than 1 year

2.9.3 Alternative 3 – Excavation for offsite treatment and disposal

This alternative combines the stormwater management modifications of Alternative 2 with the excavation of one to four feet of contaminated soil from OU5. The depth of soil excavation will vary by sub-area. It was conservatively assumed that soils would not be segregated during excavation and that all excavated soils would require treatment by incineration at a permitted hazardous waste incinerator followed by disposal of incineration residuals at a Subtitle C landfill.

This alternative includes the following primary components:

- Removal and disposal of vegetation, including brush and trees
- Temporary and permanent stormwater management
- Excavation and load-out of contaminated soil (35,000 cubic yards or approximately 49,000 tons)
- Placement of non-woven geotextile in excavated areas and subsequent backfill with clean soil as required (24,000 cubic yards of soil)
- Transportation, treatment, and disposal of excavated soil (35,000 cubic yards or approximately 49,000 tons)
- Wetland mitigation (on site or off site as needed)
- Site restoration – planting and establishing vegetation
- Post-construction maintenance and monitoring
- Placement of institutional controls

This alternative may require excavating soil below the water table in some locations. The excavated soil will be dewatered as necessary and then transported via trucks with covered beds to a staging facility for transfer into bulk transport vehicles (likely gondola rail cars) and transport to a permitted hazardous waste incinerator.

Since there would be minimal net change in existing grade, no significant floodplain mitigation would be required as part of this remedial alternative. Although the existing wetlands in OU5 would be restored following the excavation and backfill undertaken as part of this alternative, additional wetland mitigation may be required by the applicable regulatory agencies. Institutional controls would be put in place to restrict future land use as necessary. Long-term inspections of the stormwater management system, surface soil erosion, and wetland vegetation monitoring and maintenance would be required.

This alternative can be implemented only if the excavated soil can be accepted at an offsite location for treatment and/or disposal in accordance with the applicable rules for waste disposal.

Estimated Capital Cost: $ 67,350,000

Estimated O&M Cost: $ 624,000

Estimated Present worth Cost: $ 67,970,000

Estimated Implementation Time: Less than 1 year

2.9.4 Alternative 4 – In-place soil cover

This alternative involves combining the stormwater management modifications of Alternative 2 with the placement of two feet of clean cover over the entire West Area. Contaminated soils excavated from the Southern Lots and other areas as part of stormwater management modifications would be consolidated into the West Area prior to capping. The West Area cap would consist of a non-woven geotextile fabric overlaid with 1.5 feet of clean cover soil and 0.5 feet of topsoil.

The primary work tasks needed to cap contaminated soils with a vegetated soil cover include the following:

- Removal and disposal of vegetation, including brush and trees
- Temporary and permanent stormwater management
- Excavation and consolidation of contaminated soils from the Southern Lots and other areas required for stormwater management modifications into the West Area (3,000 cubic yards)
- Placement of a non-woven geotextile prior to clean cover soil placement (19,000 cubic yards of cover soil)
- Floodplain and wetland mitigation (off site as needed and/or available)
- Site restoration – planting and establishing vegetation
- Post-construction maintenance and monitoring

This alternative would require both floodplain and wetland mitigation for that lost through the placement of the soil cover. If sufficient mitigation could not be obtained to offset the net volume of floodplain filled as part of this alternative, a variance would be required.

Estimated Capital Cost: $ 14,590,000

Estimated O&M Cost: $ 624,000

Estimated Present worth Cost: $ 15,210,000

Estimated Implementation Time: Less than 1 year

2.9.5 Alternative 5 – Onsite consolidation with soil cover at West Area

This alternative involves combining the stormwater management modifications of Alternative 2 with the excavation of contaminated soil from the north portion of the West Area and from the Southern Lots for onsite placement and management. The excavated materials would be placed into an onsite consolidation area constructed over the contaminated soil that remains in place in the southern part of the West Area. A small strip of land south of the consolidation area and north of the Southern lots would also be excavated and consolidated. This onsite consolidation area would be capped with a vegetative soil cover. The cap will consist of a non-woven geotextile fabric overlaid with 1.5 feet of clean cover soil and 0.5 feet of topsoil.

The scope of work for this alternative includes the following tasks:

- Removal and disposal of vegetation, including brush and trees
- Temporary and permanent stormwater management
- Excavation of contaminated soils and placement within the consolidation area (22,000 cubic yards)
- Placement of a non-woven geotextile prior to clean cover soil placement at the onsite consolidation area (6,000 cubic yards of cover soil)
- Placement of non-woven geotextile in excavated areas and subsequent backfill with clean soil as required (12,000 cubic yards of soil)
- Floodplain and wetland mitigation (on site and/or off site as needed and/or available)
- Site restoration – planting and establishing vegetation
- Post-construction maintenance and monitoring

This alternative would require mitigation for both the Middle Twin Lake floodplain and wetlands that would be lost through the construction of the onsite consolidation area.

Estimated Capital Cost:	$ 4,330,000
Estimated O&M Cost:	$ 624,000
Estimated Present worth Cost:	$ 4,950,000
Estimated Implementation Time:	Less than 1 year

2.9.6 Alternative 6 – Onsite consolidation with soil cover at Azelia Avenue Pond

This alternative consists of the excavation of contaminated soil from OU5 and the consolidation of the contaminated soils east of Building 1 within the Joslyn Site. Consolidation would be done at the current location of a stormwater pond (known as the Azelia Avenue Pond) and adjacent to a contaminated soil consolidation area used during redevelopment of the Joslyn Site (Geomatrix, 2001 and 2002).

Excavation of contaminated soils at OU5 would proceed similarly to that proposed for Alternative 3. The depth of soil excavation would vary by sub-area. The stormwater management modifications for Alternative 6 vary from Alternatives 2 through 5 as an existing stormwater pond would be filled with soils excavated from OU5 as part of this alternative. Stormwater management modifications for this alternative are significant and include the construction of a new stormwater pond with retaining walls at the south swale.

The excavated soils would be consolidated at the location of the current Azelia Avenue Pond, filling in the pond and creating an aboveground consolidation area that abuts the existing contaminated soil consolidation area located north of the pond. This consolidation area would be capped with a vegetative soil cover that consists of a non-woven geotextile overlaid with 1.5 feet of clean cover soil and 0.5 feet of topsoil.

Several modifications to existing monitoring and pump-out wells located within or near the proposed consolidation area would need to be completed under this alternative. Two monitoring wells (W300SPN and W7) would require abandonment and replacement, and the well casings of one monitoring well (W254) and two pump-out wells (U4 and U5) would need to be extended.

The scope of work for this alternative includes the following primary tasks:

- Removal and disposal of vegetation, including brush and trees

- Temporary and permanent stormwater management
- Excavation of contaminated soils and placement within the consolidation area (35,000 cubic yards or approximately 49,000 tons)
- Modifications to existing groundwater pump-out system
- Placement of a non-woven geotextile prior to clean cover soil placement at the onsite consolidation area y (6,000 cubic yards of cover soil)
- Placement of non-woven geotextile in excavated areas and subsequent backfill with clean soil to original grade as required (27,000 cubic yards of backfill soil)
- Wetland mitigation (on site or off site as needed)
- Site restoration – planting and establishing vegetation
- Post-construction maintenance and monitoring

Because there would be minimal net change in existing grade within OU5, it is anticipated that no significant floodplain mitigation would be required as part of this remedial alternative. The need for floodplain mitigation would be determined during final design. Although the existing wetlands in OU5 would be restored following the excavation and backfill undertaken as part of this alternative, additional wetland mitigation may be required by the applicable regulatory agencies.

Estimated Capital Cost:	$ 4,740,000
Estimated O&M Cost:	$ 1,131,000
Estimated Present worth Cost:	$ 5,870,000
Estimated Implementation Time:	Less than 1 year

2.9.7 Alternative 7 – Onsite consolidation with soil cover at Building 1A Pond

Alternative 7 consists of the excavation of contaminated soil from OU5 and the consolidation of a portion of the excavated soils at a designated location north of Building 1 within the Joslyn Site and disposal of a portion of the excavated soils off site in a Subtitle D landfill. The proposed consolidation site is the current location of the stormwater pond known as the Building 1A Pond, directly adjacent to the West Area.

Excavation of contaminated soil at OU5 would proceed similarly to that proposed for Alternative 3 of the FFS, with the depths of soil excavation varying by sub-area. Excavated soils would either be transported off site to a Subtitle D landfill as described in Section 2.5.5.2, or they would be consolidated in the location of the current Building 1A Pond, filling in the pond and creating an aboveground consolidation area. This consolidation area would be capped with a vegetative soil cover that consists of a non-woven geotextile overlaid with 1.5 feet of clean cover soil and 0.5 feet of topsoil. Stormwater management modifications for this alternative are significant and include modifications to the Azelia Avenue Pond to replace the functions of the filled Building 1A Pond.

An existing monitoring well (W2N) located in the vicinity of the Building 1A Pond would need to be abandoned under this alternative.

The scope of work for this alternative is assumed to include the following primary tasks:

- Removal and disposal of vegetation, including brush and trees
- Temporary and permanent stormwater management
- Excavation of contaminated soils (35,000 cubic yards)

- Placement of selected excavated soils within the consolidation area (15,000 cubic yards)
- Transportation and disposal of selected excavated soil at a Subtitle D landfill (20,000 cubic yards or approximately 27,000 tons)
- Abandonment of an existing monitoring well
- Placement of a non-woven geotextile prior to clean cover soil placement at the consolidation area (5,000 cubic yards of cover soil)
- Placement of non-woven geotextile in excavated areas and subsequent backfill with clean soil as required (26,000 cubic yards of soil)
- Floodplain and wetland mitigation
- Site restoration – planting and establishing vegetation
- Post-construction maintenance and monitoring

Alternative 7 would require mitigation for floodplain and wetlands that will be lost through construction of the onsite consolidation area and for stormwater management modifications.

Estimated Capital Cost:	$ 4,600,000
Estimated O&M Cost:	$ 780,000
Estimated Present worth Cost:	$ 5,380,000
Estimated Implementation Time:	Less than 1 year

2.9.8 Alternative 8 – Limited onsite consolidation with soil cover at West Area

Alternative 8 consists of the excavation of contaminated soil from OU5 and the consolidation of a portion of the excavated soils within an onsite consolidation area (constructed over contaminated soil that remains in place in the southern part of the West Area) and disposal of a portion of the OU5 soils off site in a Subtitle D Landfill.

Excavation of contaminated soil at OU5 would proceed similarly to that proposed for Alternative 3 of the FFS, with the depths of excavation for contaminated soils located outside of the consolidation area footprint varying by sub-area. The excavated soils would either be transported off site to a Subtitle D landfill as described in Section 2.5.5.2, or they would be consolidated in the southern part of the West Area. This consolidation area would be capped with a vegetative soil cover that consists of a non-woven geotextile overlaid with 1.5 feet of clean cover soil and 0.5 feet of topsoil.

The scope of work for this alternative is assumed to include the following primary tasks:

- Removal and disposal of vegetation including brush and trees
- Temporary and permanent stormwater management
- Excavation of contaminated soils (30,000 cubic yards)
- Placement of selected excavated soils within the consolidation area (10,000 cubic yards)
- Transportation and disposal of selected excavated soil at a Subtitle D landfill (20,000 cubic yards or approximately 27,000 tons)
- Placement of a non-woven geotextile prior to clean cover soil placement at the consolidation area (4,000 cubic yards of cover soil)
- Placement of non-woven geotextile in excavated areas and subsequent backfill with clean soil as required (28,000 cubic yards of soil)
- Floodplain and wetland mitigation

- Site restoration – planting and establishing vegetation
- Post-construction maintenance and monitoring

Alternative 8 would require mitigation for floodplain and wetlands that would be lost through construction of the onsite consolidation area and stormwater management modifications. Two options for obtaining the floodplain mitigation necessary to implement Alternative 8 were evaluated. The first option was to create additional floodplain at an offsite location (Alternative 8A) and the second option was to create additional floodplain within the West Area and the Southern Lots (Alternative 8B). Costs for each Alternative 8 floodplain mitigation option are shown below.

Alternative 8A – Offsite floodplain mitigation

Estimated Capital Cost:	$ 4,730,000
Estimated O&M Cost:	$ 624,000
Estimated Present worth Cost:	$ 5,350,000
Estimated Implementation Time:	Less than 1 year

Alternative 8B – Onsite floodplain mitigation

Estimated Capital Cost:	$ 4,160,000
Estimated O&M Cost:	$ 624,000
Estimated Present worth Cost:	$ 4,780,000
Estimated Implementation Time:	Less than 1 year

2.10 Comparative analysis of alternatives

This section of the ROD provides the basis for the determining which alternative provides the best balance with respect to the statutory balancing criteria in Section 121 of CERCLA and in Section 300.430 of the NCP. The remedial alternatives selected from the screening process were evaluated using the following nine criteria:

- Overall protection of human health and the environment
- Compliance with applicable and/or relevant and appropriate Federal and State public health or environmental standards (ARARs)
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume of hazardous substances through treatment
- Short-term effectiveness
- Implementability
- Cost-effectiveness
- Acceptance by support agency (EPA)
- Acceptance by Community

The NCP categorizes the nine criteria into three groups:

1. **Threshold criteria** – overall protection of human health and the environment and compliance with ARARs (or invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection.

2. **Primary balancing criteria** – long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; and cost are primary balancing factors used to weigh major trade-offs among alternatives.
3. **Modifying criteria** – state and community acceptances are modifying criteria that are formally taken into account after public comment is received on the Proposed Plan and incorporated into the ROD.

Two additional criteria were used to evaluate the remedial alternatives:

- Principal threat waste considerations
- Floodplain and wetland mitigation

2.10.1 Threshold criteria

2.10.1.1 Overall protection of human health and the environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls. All of the alternatives except Alternative 1 and Alternative 2 are protective of human health and the environment by reducing or eliminating exposure pathways.

Alternative 1 and Alternative 2 (as stand-alone alternatives) are therefore removed from further consideration.

2.10.1.2 Compliance with ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as “ARARs,” unless such ARARs are waived under CERCLA Section 121(d)(4).

2.10.1.2.1 Definition of ARARs and TBCs

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

TBCs are criteria, advisories, guidance, and proposed standards developed by government agencies that are not legally enforceable but contain information that would be helpful in carrying out, or in determining the level of protectiveness of, selected remedies. TBCs are meant to complement the use of ARARs, not replace or compete with them.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for a invoking a waiver of specific ARARs.

Tables 6-1 through 6-5 summarize the federal and state ARARs and TBCs compiled for this project and if/when, they apply.

2.10.1.2.2 Comparison to ARARs and TBCs

Each of the alternatives evaluated, with appropriate design and planning, meet ARARs and TBCs.

2.10.2Primary balancing criteria

2.10.2.1 Long-term effectiveness and permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on site following remediation and the adequacy and reliability of controls.

Alternative 2 would result in very limited to no long-term effectiveness in reducing the exposure pathways for contaminated soil, because little or no contaminated soil will be removed or covered as part of this option. With Alternative 2, only the potential for future erosion of contaminated soil is reduced. Alternative 3 would result in the greatest long-term effectiveness by removing contaminated soils from the Joslyn Site and permanently eliminating the exposure pathways associated with the contaminated soil. Alternatives 4, 5, and 6 provide better long-term effectiveness in reducing the exposure pathways than Alternative 2, by covering the contaminated soil. Alternatives 7 and 8 provide better long-term effectiveness and permanence in reducing the exposure pathways for contaminated soil than Alternatives 4, 5, and 6 because Alternatives 7 and 8 include removing a portion of the contaminated soil from the Joslyn Site; however, this removal would not be as effective as Alternative 3.

Reviews will be required at least every five years to evaluate the effectiveness and permanence of any of these alternatives because hazardous substances will remain on site in concentrations above health-based screening levels.

2.10.2.2 Reduction of toxicity, mobility, and volume through treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternatives 2, 4, 5, and 6 do not include treatment as a component of the remedy. Therefore, these alternatives would not significantly alter the toxicity or volume of contamination at the Site. Alternative 2 would not reduce mobility. Alternatives 4, 5, 6, 7, and 8 would reduce mobility by capping contaminated soils. Alternatives 7 and 8 remove a portion of the contaminated soil from the Joslyn Site and would therefore lessen the toxicity and volume of contamination at the Site.

Alternative 3 reduces toxicity and volume through treatment.

2.10.2.3 Short-term effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Significant stormwater events during periods of contaminated soil excavation could result in erosion and/or potential releases of contaminated soil or runoff to Middle Twin Lake. Under Alternatives 2, 3, 4, 5, 6, 7, and 8, scheduling the contaminated soil excavation for a late fall or winter period would reduce the potential for significant stormwater events that could affect remedial operations.

Alternatives 3, 6, and 7 involve excavating soils with the highest levels of contamination and staging them. Under Alternative 3, the excavated soils would be staged for loading for off-site transportation; under Alternatives 6 and 7, the excavated soils would be staged for consolidation at the Joslyn Site. Staging the excavated contaminated soils could result in longer potential exposure to higher concentrations of COCs for workers, residents of the local neighborhoods, and to surface water, as compared to Alternatives 2, 4, 5, or 8.

2.10.2.4 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Each of the eight alternatives can be implemented using generally available construction methods, equipment, and materials. However, there are several implementability issues that pertain to the specific alternatives:

- Alternatives 2 through 8 would require work in wetlands and the associated regulatory agency coordination and permitting.
- The regulatory permitting potentially required to implement Alternative 3 increases the administrative and logistical complexity of this remedy and makes it less certain that it could be implemented.
- Alternative 5 requires significant floodplain mitigation. Floodplain mitigation requires additional coordination and permitting with state and federal agencies, which increases the technical and administrative complexity of the remedy. Alternatives 7 and 8 also require floodplain mitigation, but less than required by Alternative 5.
- Alternative 8A requires coordination with offsite property owner(s) to obtain necessary floodplain mitigation. Alternative 8B creates a floodplain within OU5 of the Joslyn Site.
- Alternatives 6 and 7 would require coordination with the lessee of the developed portion of the Joslyn Site and significant stormwater management changes due to the proposed filling of the Azelia Avenue Pond.

2.10.2.5 Cost

The estimated present worth cost for each alternative, including the No Action alternative, are summarized in Table 7. Detailed cost spreadsheets for each remedial alternative are included in the FFS (Barr, 2017).

Capital cost estimates include the estimated construction cost; the cost of engineering, design, permitting, and construction observation; and contingencies specific to each alternative. Operation and maintenance cost estimates assume a project duration of 30 years, but do not reflect a discount rate.

2.10.3 Modifying criteria

2.10.3.1 Support agency acceptance

Pursuant to the 1995 Deferral Pilot Agreement, the MPCA is the lead agency for remedy decisions and enforcement of Superfund cleanup requirements for the Joslyn Site. Although not required by the agreement, MPCA has provided the proposed remedy to EPA for review, and has received no notification that the selected remedy is inconsistent with the requirements of CERCLA or the NCP.

2.10.3.2 Community acceptance

MPCA sought community input throughout the remedy selection process, including informal neighborhood meetings, a formal public meeting, and by providing a public comment period. Several comments were received stating a preference for no additional remedial action to be completed. The stated reasons for the preference for no additional remedial action were primarily related to concerns with the loss of trees and habitat, and the resulting potential impacts to property values. A summary of the comments received and MPCA's responses to the comments is included in Section 3.1.

2.10.4 Other considerations

2.10.4.1 Principal threat wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site whenever practicable. Alternative 3 meets this expectation by the excavation and offsite treatment/disposal of contaminated OU5 soils. Alternatives 4, 5, 6, 7, and 8 do not meet the NCP's expectation of treating principal threat waste, but would utilize containment and would effectively eliminate the potential exposure pathway for human and ecological receptors. The NCP also states that treatment should be used to address principal threat wastes wherever *practicable*. As shown in the cost estimates in Table 7, the implementation of Alternative 3 is significantly more costly than Alternatives 4, 5, 6, 7, and 8 and is not practicable. Alternatives 5, 6, 7, and 8 provide a better balance of tradeoffs with respect to the other balancing criteria evaluated.

2.10.4.2 Wetland and floodplain mitigation

Alternatives 2 through 8 would require mitigation of both temporary and/or permanent wetland impacts created by the selected remedial alternative. Alternatives 4, 5, and 8 would also require significant mitigation of the floodplain impacts to Middle Twin Lake.

2.11 Selected remedy

2.11.1 Summary of the rationale for the Selected Remedy

Based on CERCLA requirements, the NCP, and detailed analysis of the remedial alternatives, **Alternative 8B— Limited Onsite Consolidation with Soil Cover at West Area (Onsite Floodplain Mitigation)**, constitutes the best overall remedial action for operable unit OU5 at the Joslyn Site.

Alternative 8B provides protection of public health and the environment and is in compliance with ARARs. Alternative 8B represents the best balance of tradeoffs with respect to the five balancing criteria for the following reasons:

- Alternative 8b will provide long-term effectiveness and permanence in reducing the exposure pathways by removing a portion of the contaminated soil and covering the remaining contaminated soils at the site.
- the contaminant mobility will be reduced by capping contaminated soils, and a portion of the contaminated soil will be removed from the Site and will therefore lessen the toxicity and volume of contamination at the site.
- contaminated soils will be excavated and staged, potentially resulting in longer exposure to COCs for workers, residents of the local neighborhoods, and to surface water; Alternative 8b will include staging less contaminated soils compared to other alternatives.
- Alternative 8b will have fewer implementability constraints compared to other alternatives.

2.11.2 Detailed description of the Selected Remedy

The Selected Remedy includes removal and offsite disposal of a portion of contaminated soil and the establishment of a consolidation area at the Joslyn Site featuring a multi-layer vegetated soil cover. The consolidation area will be located on the southern part of the West Area over contaminated soil (Figure 9a). The depth of excavation of contaminated soil will vary by sub-area as shown on Figure 9a. As described in Section 2.5.5.2, excavated contaminated soils that do not "contain" a listed waste and contain less than 10,000 ng/kg dioxin will be disposed offsite at a Subtitle D landfill, and those soils that "contain" a listed waste will be consolidated into the onsite consolidation area. The excavated areas will be backfilled to original grades with soil types similar to native soils for each area. Geotextile fabric will be placed in excavated areas prior to backfilling. An engineered cover consisting of a geotextile fabric layer, a 1.5-foot soil layer, and a 0.5-foot topsoil layer will be constructed over the consolidated soils (Figure 9b).

Interim and permanent stormwater management modifications will also be designed to ensure that stormwater runoff will be appropriately routed and treated for existing and future needs (Figure 9c). Generalized stormwater drainage patterns at OU5 under current conditions, during remedial action construction activities, and following the implementation of Alternative 8B are shown on Figures 10a, 10b, and 10c, respectively. Wetland and floodplain mitigation will be required for implementation of this alternative and floodplain mitigation will be obtained on site within OU5.

The selected remedy will be protective for use consistent with current zoning designation (industrial use for the West Area and residential use for the Southern Lots); however, the anticipated future land use for both areas is open space. Institutional controls are therefore necessary to prevent the possibility of direct exposure to COCs through unplanned development or unscheduled intrusive activities. Long-term inspection activities will be required to ensure the soil cap and stormwater features maintain their integrity.

In summary, the selected remedy will include the following components:

- Engineering controls to control surface water runoff, groundwater, dust, and air quality and to ensure that RAOs are met during and after the remedy is in place.
- Clearing and shredding of trees from the work area.
- Consolidation of a portion of the excavated soils (approximately 10,000 cubic yards) in the southeastern portion of the West Area.
- Containment and isolation of contaminated soil within an onsite consolidation area using a non-woven geotextile fabric overlaid with a two-foot thick vegetative soil cover.
- Offsite disposal of a portion of the excavated soils (approximately 20,000 cubic yards) at a Subtitle D landfill.
- Site restoration of each sub-area: covering the contaminated excavated areas with a four-layer cover system including 0.5 feet of clean soil, geotextile fabric, additional clean soil, and a final top layer of surface soil. In particular.
    - The surface soil will either be topsoil or wetland-like soil, depending on the existing designation as upland or wetland.
    - The total depth of clean soil and surface soil placed in the excavated areas will be equivalent to the excavated depth to bring the areas back up to existing grade.

- Construction of the consolidation cover consisting of a non-woven geotextile overlaid with 1.5 feet of clean cover soil and 0.5 feet of topsoil, and permanent drainage features at the onsite consolidation area.
- Wetland and floodplain mitigation and restoration. Wetland restoration will include planting native shrubs trees that were chosen based on their ability to thrive, growth rate, size and shape, leaf type, and color.
- Preservation of existing trees in non-excavated areas, to the extent feasible and planting of new trees and shrubs to provide limited screening for residential areas and a portion of the lakeshore.
- Implementation of post-construction site inspections, maintenance, and contingency action plans to protect the remedy.
- Establishment of institutional controls (i.e., restrictive covenant) to restrict future land use and groundwater use.
- Five-year reviews of the remedy to ensure protectiveness is maintained.

2.11.3 Cost estimate of Selected Remedy

The estimated present worth cost of the Selected Remedy is $4,780,000. A detailed cost breakdown for the Selected Remedy is presented in Appendix B. The information in this cost table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial action. Major changes may be documented in the form of a memorandum in the Administrative Record file, and by an explanation of significant differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +30% to -15% of the actual project cost.

2.11.4 Estimated outcomes of Selected Remedy

The results from implementation of the Selected Remedy include the containment and isolation of contaminated soil that may pose a threat to human health and the environment. The Selected Remedy is fully compatible with and complementary to the remedies for OU1, OU2, OU3, and OU4.

The land uses of the West Area and the Southern Lots will be restricted following implementation of the remedy. The West Area and Southern Lots are planned to remain undeveloped and used as open space with the use of institutional controls. Implementation of the remedy will resolve long-standing issues associated with a Superfund site located adjacent to residential properties and commercial development. The Selected Remedy includes a restoration plan designed to restore wetlands and provide habitat to native plants and animals, including pollinators.

Implementation of the Selected Remedy will not impact groundwater use. The shallow groundwater aquifer below the West Area and the Southern Lots is not used for drinking water and is not anticipated to be used for drinking water in the future. The OU1, OU2, and OU3 groundwater and DNAPL pump-out systems would continue to operate until groundwater cleanup levels are met.

Implementation of the Selected Remedy will have a minimal impact, if any, on surface water quality of Middle Twin Lake, and may provide a benefit by reducing suspended solid or phosphorous loading.

The final cleanup goals and the basis for the cleanup goals are discussed further in Section 2.8. These cleanup goals are also protective of ecological receptors.

2.12 Statutory determinations

2.12.1 Protection of human health and the environment

The Selected Remedy for OU5 of the Joslyn Site satisfies the statutory requirement for protection of human health and the environment through containment, engineering controls, and/or institutional controls. The Selected Remedy achieves substantial risk reduction and protects human receptors because direct contact or ingestion of contaminated soil would be prevented through the isolation and containment of contaminated soil. Institutional controls would also be implemented to ensure appropriate future land use. The Selected Remedy would reduce the risks to both human and ecological receptors and is anticipated to manage short-term risks and cross-media impacts.

2.12.2 Compliance with applicable or relevant and appropriate requirements

Tables 6-1 through 6-5 summarize the federal and state ARARs and TBCs compiled for this project. The Selected Remedy would comply with all ARARs and TBCs in Tables 6-1 through 6-5 as shown in the "Potential ARAR/TBC Evaluation" column.

2.12.3 Cost effectiveness

The cost effectiveness of the Selected Remedy was assessed by comparing the "overall effectiveness" of the remedy (i.e., long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; and short-term effectiveness) to the other alternatives. The cost effectiveness of the Selected Remedy and the other alternatives are evaluated in a cost effectiveness matrix in Table 8. The Selected Remedy is determined to be cost effective because it reduces human health and ecological risks to acceptable levels, and because the overall protectiveness of the remedy is proportional to the overall cost of the remedy.

2.12.4 Permanent and alternative treatment solutions

The Selected Remedy for OU5 soils represents the optimal extent to which permanent solutions and treatment technologies can be utilized in a practical and cost-effective manner. Of those alternatives that are protective of human health and the environment, and comply with ARARs, the Selected Remedy provides the best balance of tradeoffs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and in consideration of community input.

2.12.5 Preference for treatment as a principal element

The Selected Remedy represents a permanent solution with respect to the principal threats posed by OU5 soils. However, the principal threats are being contained without treatment. The rationale for not choosing alternative remedial actions that would completely satisfy this statutory preference is based upon technical feasibility, consideration of short-term risk to human and ecological receptors, and a high cost.

2.12.6 Five-year review requirements

Since this remedy would result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of remedial action, and every five years thereafter, to ensure that the remedy is, or will be, protective of human health and the environment.

2.13 Documentation of significant changes for preferred alternative of proposed plan

The MPCA issued a Proposed Plan to implement Alternative 8B in March 2017. Following publication of the Proposed Plan, MPCA administered a public comment period and held a public meeting. The Selected Remedy does not differ significantly from the Proposed Plan. However, though not necessary as part of the remedy, MPCA requested that Joslyn reconsider the post-remedy restoration plan based on comments received during the public comment period. In response, Joslyn agreed to increase the number of trees and shrubs that would be planted following remedy implementation.

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Part 3: Responsiveness summary

3.1 Stakeholder issues and lead agency responses

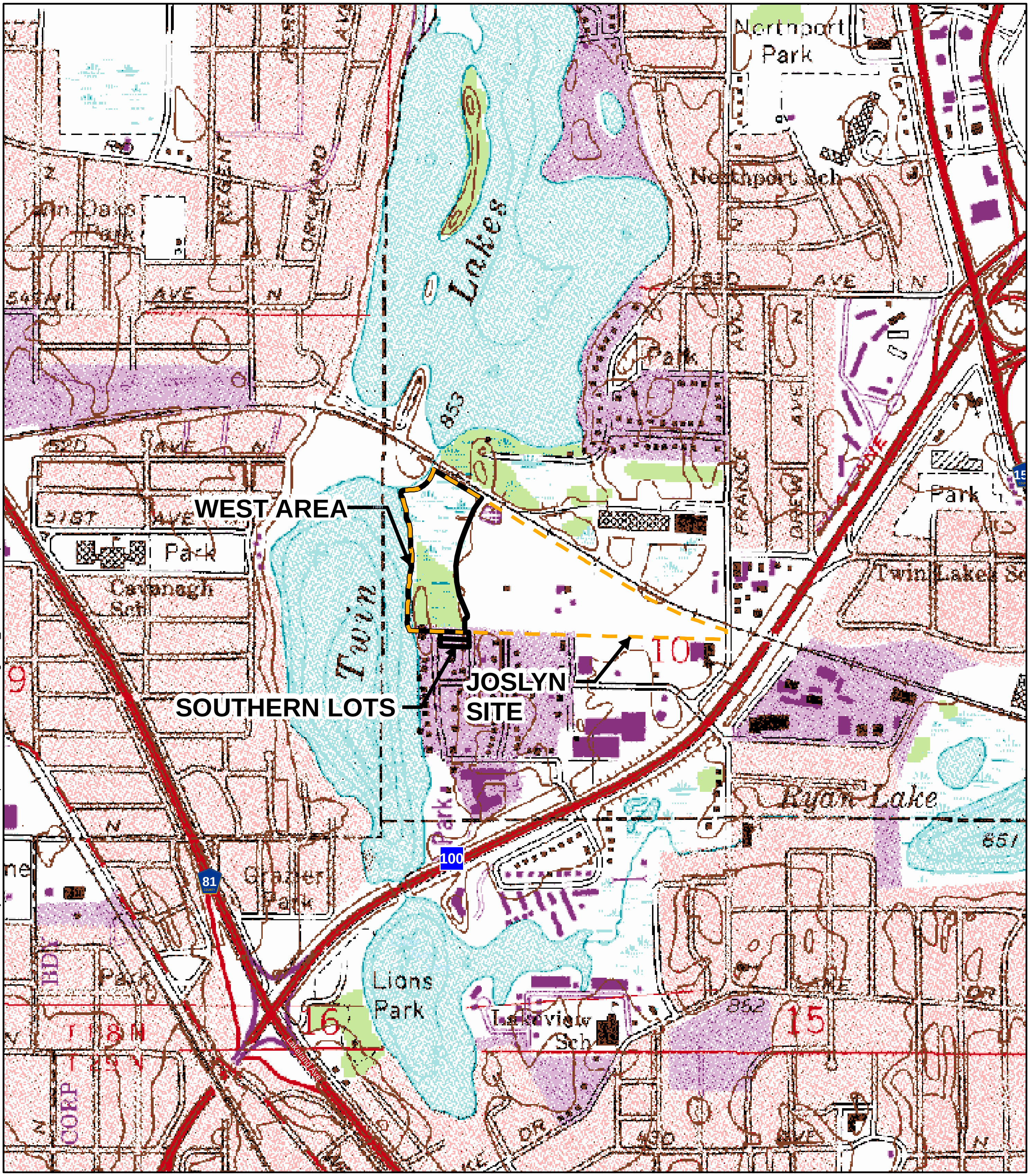
The MPCA received several comments as part of the public comment period. Summaries of the main comments and MPCA's responses are provided below.

- Comment – the cleanup would not result in an environmental benefit, or might make things worse.
  - MPCA response – dioxins, which are extremely toxic, are present at elevated concentrations in the soil and present a risk of exposure. The goal of the cleanup plan is to protect human health and the environment.
- Comment – an environmental impact statement is needed.
  - MPCA response – the cleanup plan does not meet any of the thresholds that would trigger an environmental impact statement. Further, the cleanup plan was developed under Superfund criteria, which follows much of the same process as would be followed during an environmental impact statement.
- Comment – the residential streets are not suitable for heavy construction traffic.
  - MPCA response – the MPCA agrees that construction vehicles should not use the residential streets and instead should access the site from the adjacent commercial development and associated streets.
- Comment – Middle Twin Lake could become impacted during cleanup activities. The wetlands need to be properly protected and restored.
  - MPCA response – the MPCA, like the surrounding community, is concerned about protecting Middle Twin Lake and the site wetlands. The majority of the excavation will occur at a distance from the shoreline and protective measures will be in place to control sediment. Wetland restoration, both through onsite restoration and through offsite mitigation credit purchase, is a key component of the cleanup plan.
- Comment – more trees should be planted for screening and wildlife.
  - MPCA response – trees play a significant role at the site. The restoration plan includes planting native seed mixes and a variety of trees and shrubs. The species planned are varied and have been selected based on their ability to thrive and their variety in appearance, size and shape, leaf type, and color.

3.2 Technical and legal issues

Since the publication of the Proposed Plan, Joslyn has submitted a Joint Permit Application for Stormwater, Floodplain, and Wetland Alteration. The permit application was submitted to the Minnesota Department of Natural Resources (DNR), the U.S. Army Corps of Engineers (USACE), and the Shingle Creek Watershed Management Commission (SCWMC). The DNR issued an approval for work in public waters, the USACE confirmed that a permit was not required, and the SCWMC issued an approval for watershed commission requirements. The SCWMC also issued a Notice of Decision pursuant to the Minnesota Wetland Conservation Act approving the wetland replacement plan. Approval of these permits indicates that the Selected Remedy is administratively implementable.

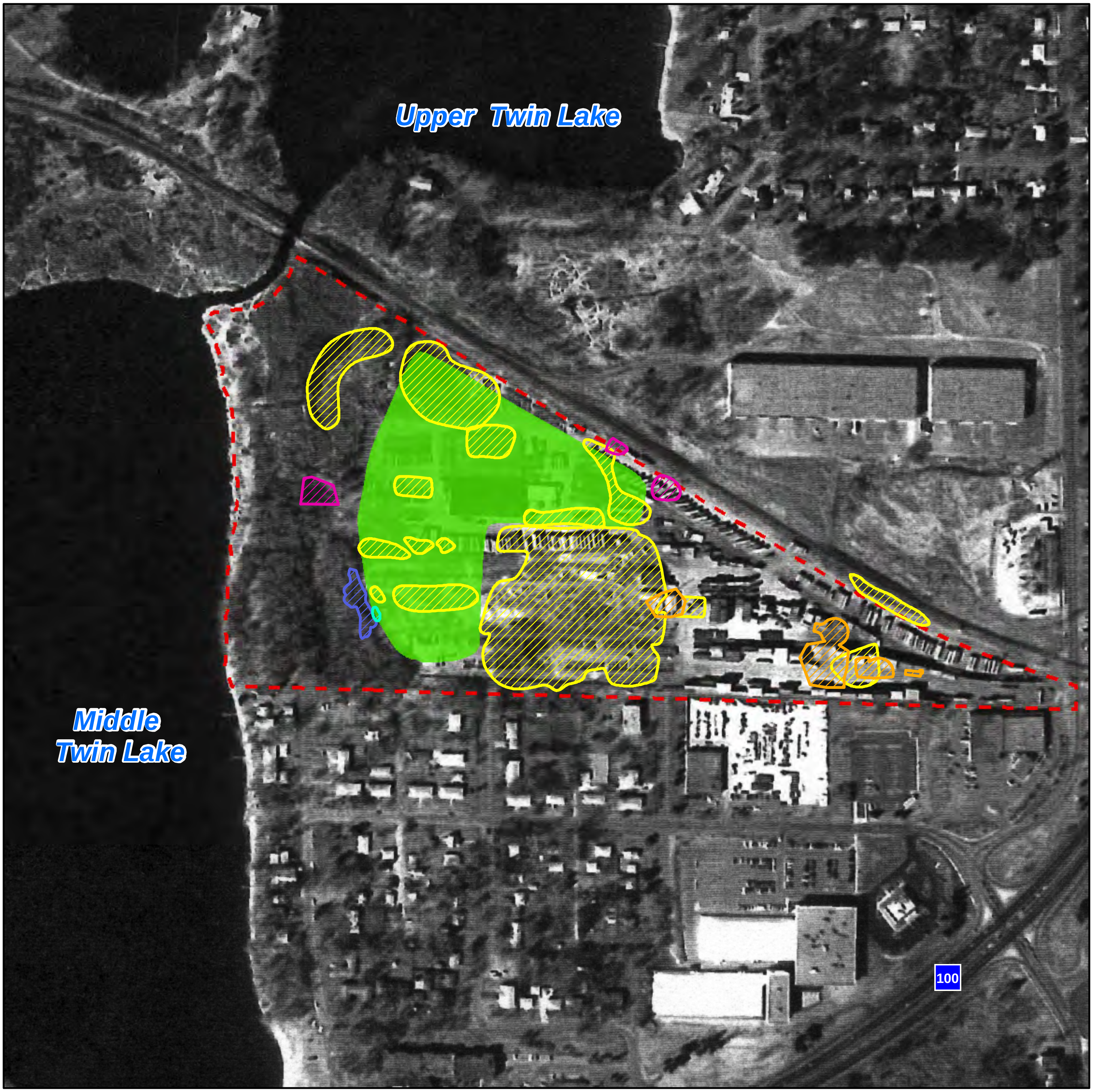
Barr Footer: Date: 9/3/2010 12:11:25 PM File: I:\Projects\23\27\110\GIS\Maps\Record of Decision\Figure 1_Site Location Map.mxd User: ss1



Feet

1,000 0 1,000 2,000

FIGURE 1
SITE LOCATION MAP
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA



Barr Footer: ArcGIS 10.0, 2012-06-08 08:48 File: I:\Projects\23\27\110\GIS\Maps\Record of Decision\Figure 2_Historical Excavation Areas.mxd User: cls

1987 Aerial

Legend

Historic Joslyn Site

LTU Area

Historical Excavation Areas

1988-1992	Source: Barr, 1993. *Response Action Final Report Part I (Excavation) and 1992 Annual Report Operable Unit 4-Contaminated Soil*. November 1993.
1996	Source: Barr, 1997. *1996 Annual Operations and Monitoring Report Operable Unit 4.* August 1997.
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April 1999	Source: Barr, 1999a. *West Area-3 Excavation.* May 1999.
June 1999	Source: Barr, 1999b. *Western LTU Soil Excavation.* June 1999.

N

Feet

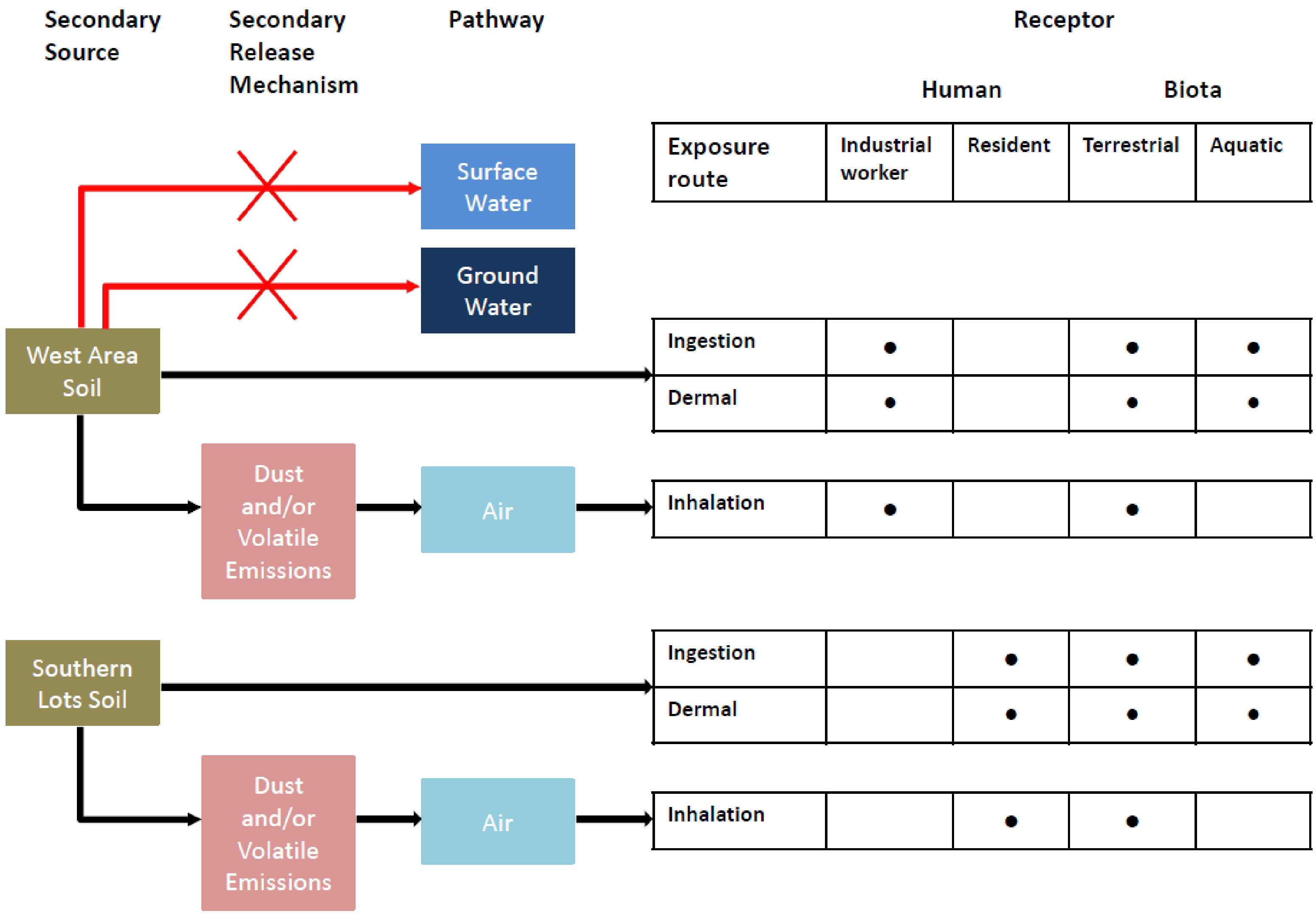
400 0

FIGURE 2
HISTORICAL EXCAVATION AREAS
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

Figure 3

Conceptual Site Model for OU5

Joslyn Manufacturing & Supply Co.
Brooklyn Center, Minnesota



Legend

OU5 Parcels

N

Feet

200 0 200

FIGURE 4
1945 AERIAL IMAGERY
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

Barr Footer: Date: 9/3/2010 3:49:28 PM File: I:\Projects\23\27\110\GIS\Maps\Record of Decision\Figure 4_1945 Aerial Imagery.mxd User: ss1

Legend

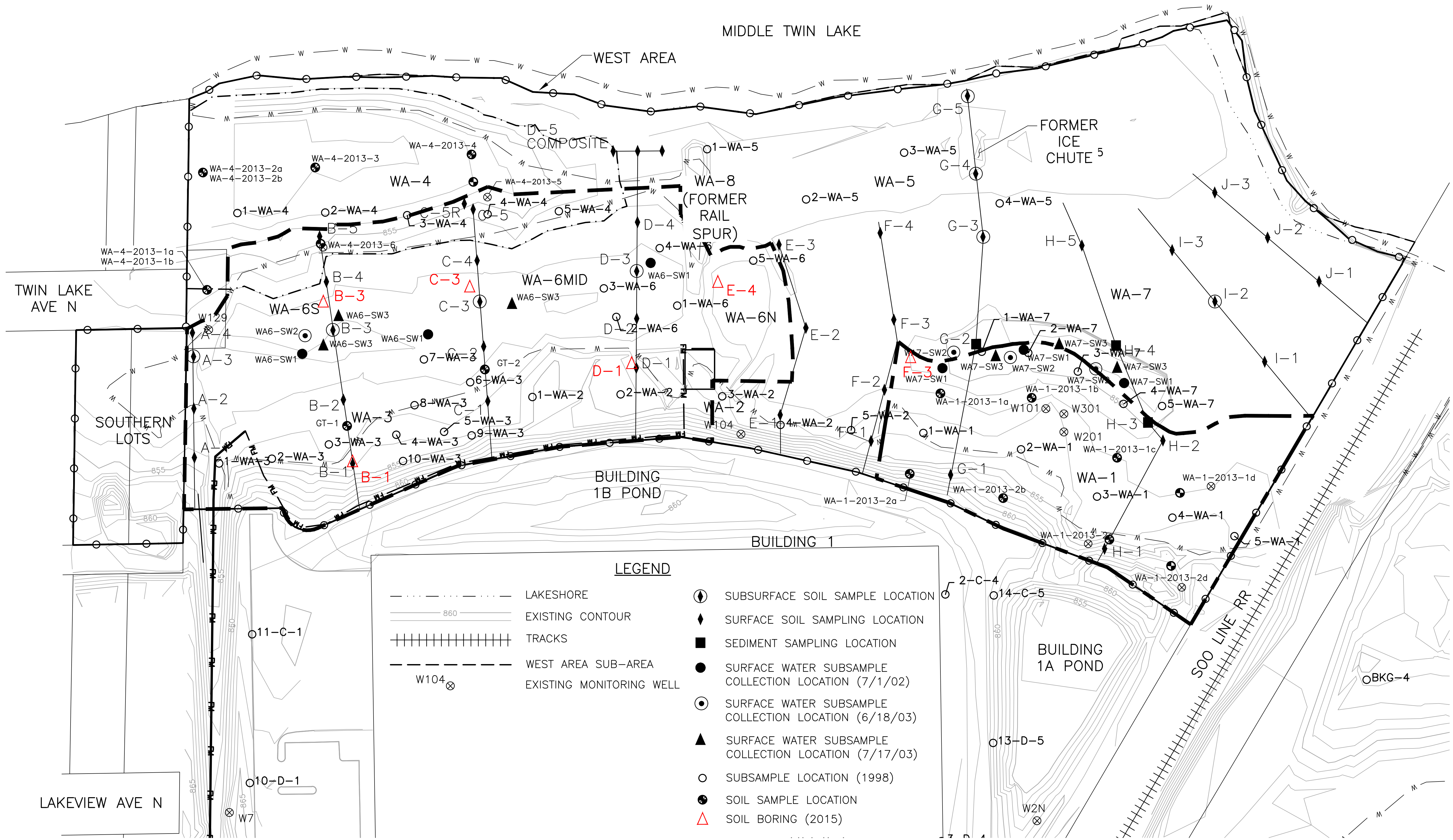
OU5 Parcels

N

Feet

200 0 200

FIGURE 5
1971 AERIAL IMAGERY
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA



1 PLAN: SITE LAYOUT

0 100 200
SCALE IN FEET

FIGURE 6a
RECORD OF DECISION
HISTORICAL SOIL SAMPLING LOCATIONS
WEST AREA
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

CADD USER: Randy R Roberts FILE: M:\DESIGN\23270110.00\23270110000_ROD_FIGURE 6A.DWG PLOT SCALE: 1:2 PLOT DATE: 9/21/2017 4:44 PM

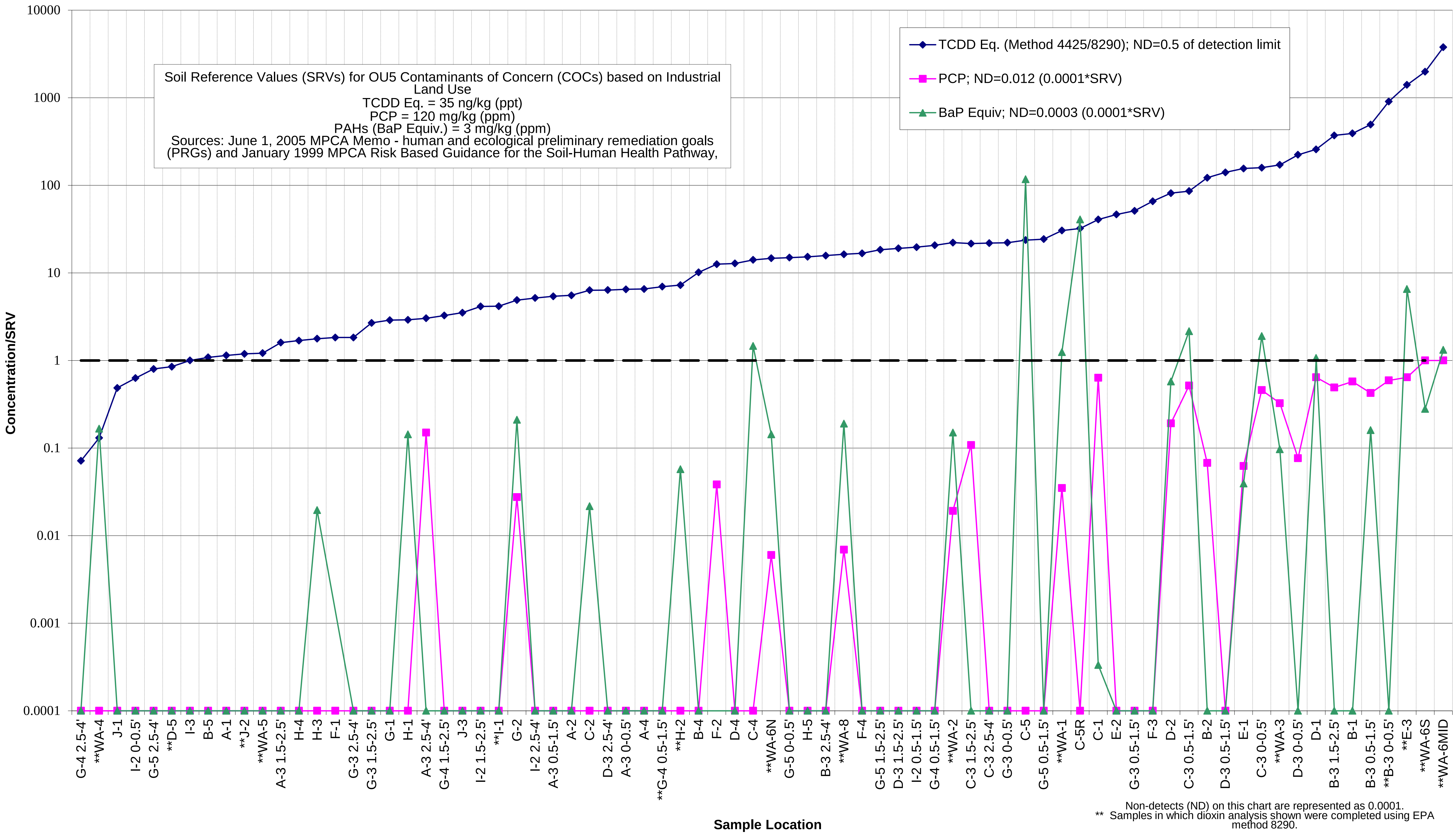
PLAN: SITE LAYOUT

LEGEND

- ▷ SAMPLING LOCATION (2009)
- • SAMPLING LOCATION (2005)
- ● GEOPROBE COMPOSITE SUBSAMPLE LOCATION (2004)
- × 30' RADIUS COMPOSITE SUBSAMPLE LOCATION (2009)
- ◉ 45' RADIUS COMPOSITE SUBSAMPLE LOCATION (2009)
- □ NORTH/SOUTH PARCEL BOUNDARY SAMPLING LOCATION (2009)

FIGURE 6b
RECORD OF DECISION
HISTORICAL SOIL SAMPLING LOCATIONS
SOUTHERN LOTS AND ROADWAY
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

Figure 6c
West Area Risk Assessment Soil Quality Data
Joslyn Manufacturing & Supply Co.
Brooklyn Center, Minnesota



Non-detects (ND) on this chart are represented as 0.0001.
** Samples in which dioxin analysis shown were completed using EPA method 8290.

10/26/2017 4:03 PM
P:\Mpls\23 MN\27\2327110\WorkFiles\West Area\Regulatory Classification of WA Soils\2012-02-16_8_Normalized chart for TCDD_PCP_BaP Equiv_10262017.xls

Barr Footer: Date: 3/17/2011 4:04:13 PM File: I:\Projects\23\27\110\GIS\Maps\Record of Decision\Figure 7_Targeted Cleanup Area.mxd User: ss1

Legend

- Historic Joslyn Site
- Targeted Cleanup Area
- OU5 Parcels

TCDD-Eq Concentration (ng/kg)

- <100
- 101 - 1000
- 1001 - 5000
- >5000

N

Feet

300 0 300

FIGURE 7
TARGETED CLEANUP AREA
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

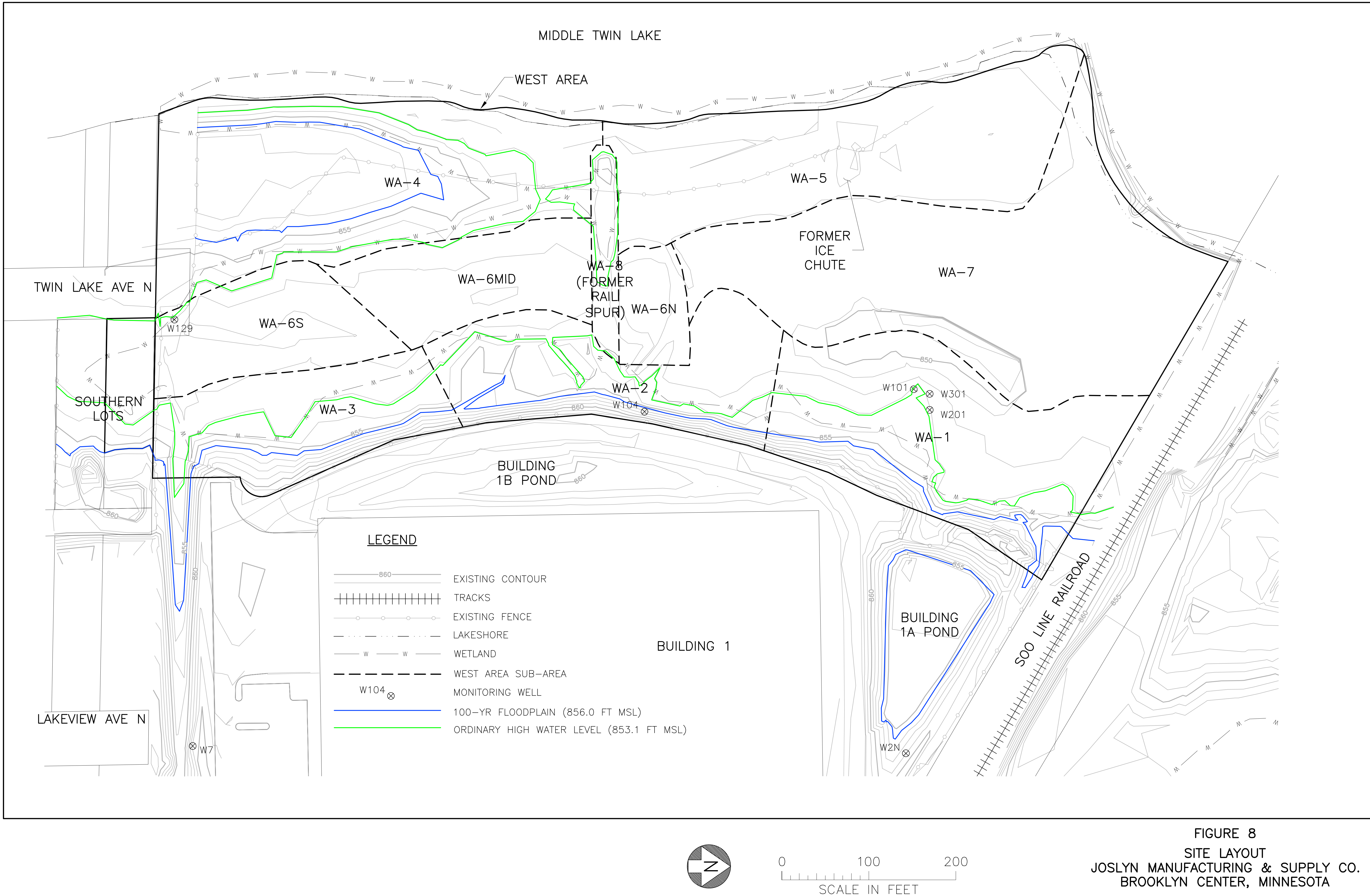
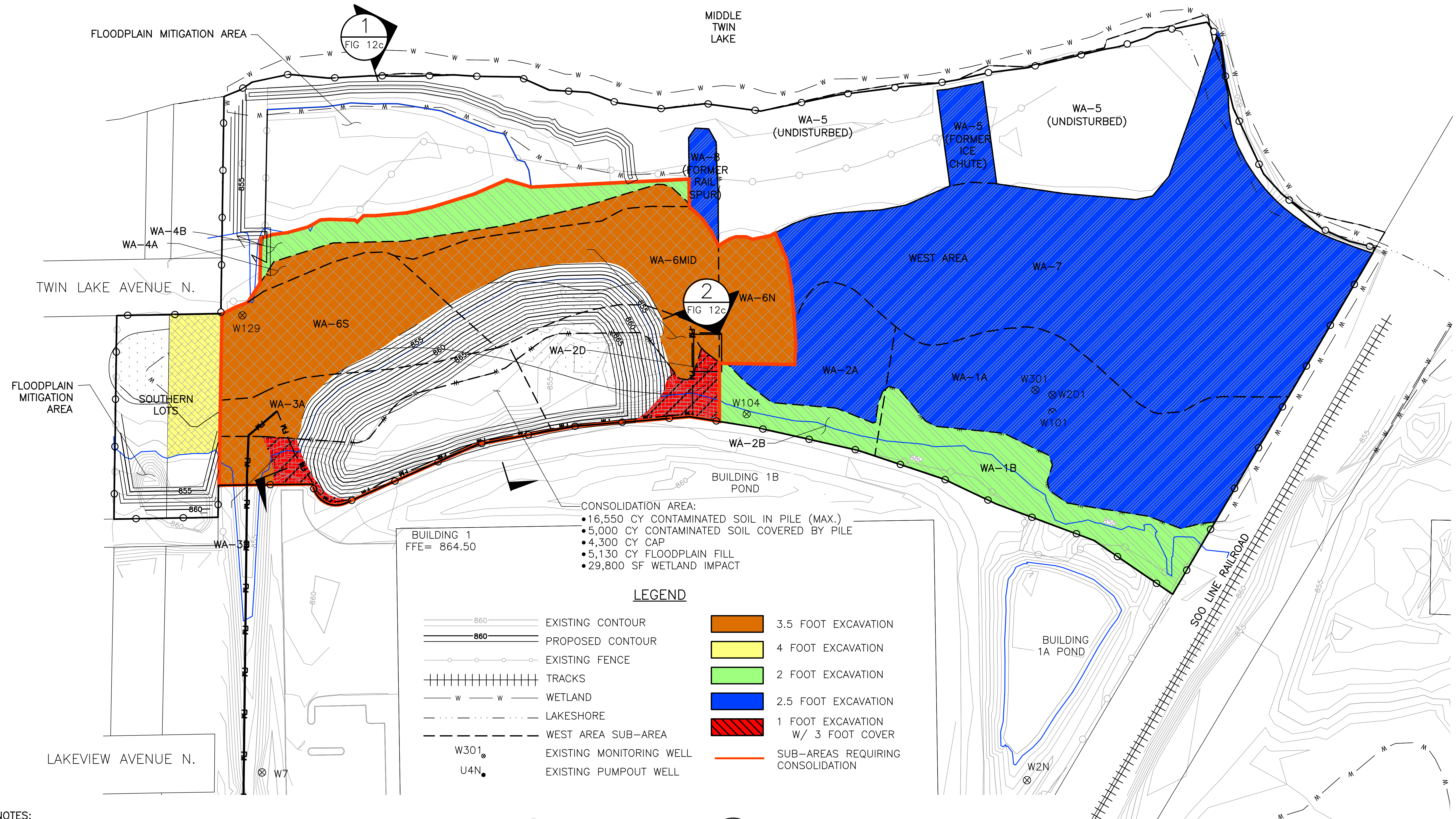


FIGURE 8

SITE LAYOUT
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA



NOTES:

1. ALL EXCAVATED AREAS TO BE BACKFILLED WITH SAME DEPTH OF COVER EXCEPT AS NOTED.
2. SOIL EXCAVATED FROM OUTSIDE SUB-AREAS REQUIRING CONSOLIDATION WILL BE TRANSPORTED AND DISPOSED AT A SUBTITLE D LANDFILL

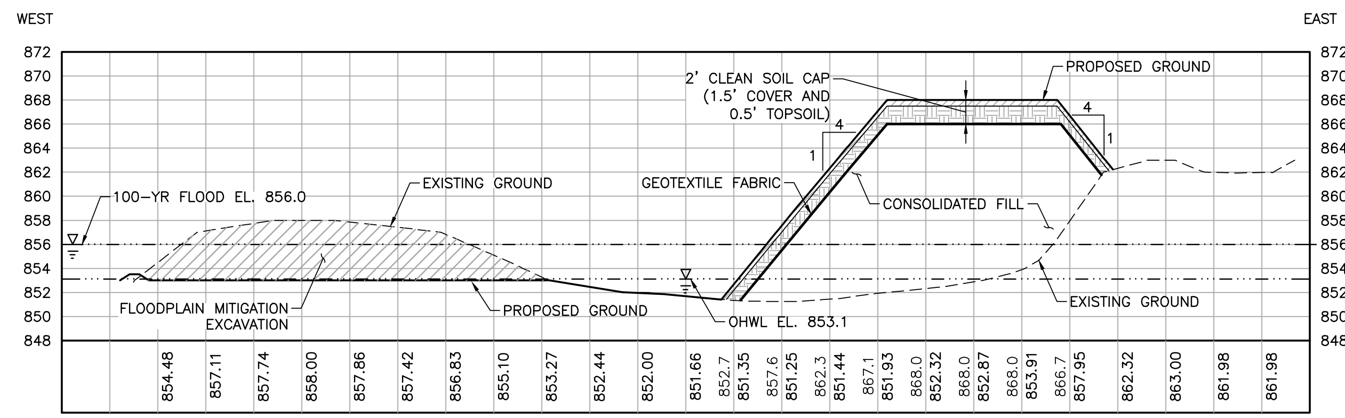
1 PLAN: SITE

N

0 100 200
SCALE IN FEET

FIGURE 9a
RECORD OF DECISION
SITE PLAN
LIMITED ONSITE CONSOLIDATION WITH SOIL COVER
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

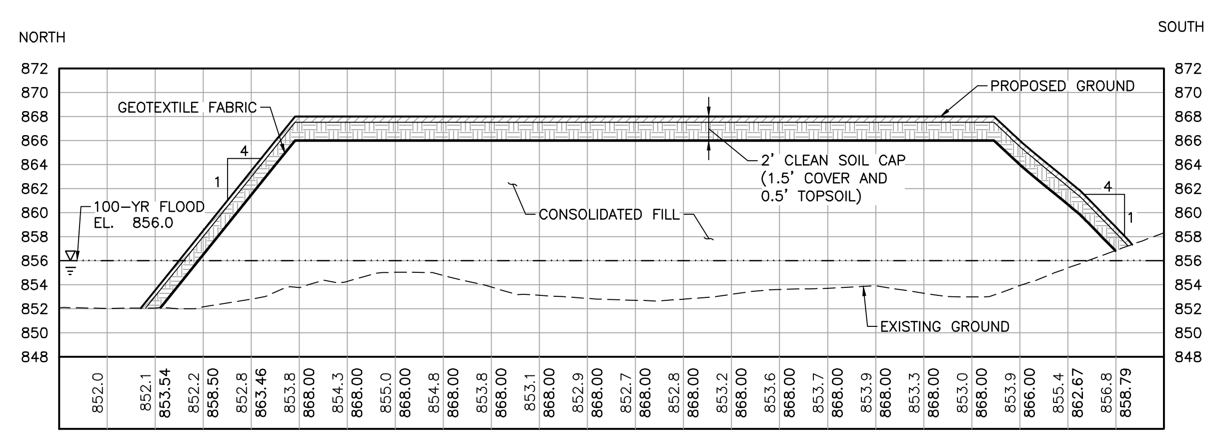
CADD USER: Randy R Roberts FILE: M:\DESIGN\23270110.00\2327011000_ROD_FIGURE 9A.DWG PLOT SCALE: 1:2 PLOT DATE: 11/3/2017 11:46 AM
ss1 M:\DESIGN\23270110.00\2327011000_FFS_Figure 11a.dwg Plot at 1 01/30/2012 15:45:22



1 FIG 12b SECTION: 2' SOIL CAP OVER CONSOLIDATED FILL

0 8 16 24 32 VERTICAL SCALE IN FEET

0 80 160 HORIZ. SCALE IN FEET



2 FIG 12b SECTION: 2' SOIL CAP OVER CONSOLIDATED FILL

0 8 16 24 32 VERTICAL SCALE IN FEET

0 80 160 HORIZ. SCALE IN FEET

FIGURE 9b
RECORD OF DECISION
CROSS SECTIONS
LIMITED ONSITE CONSOLIDATION WITH SOIL COVER
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

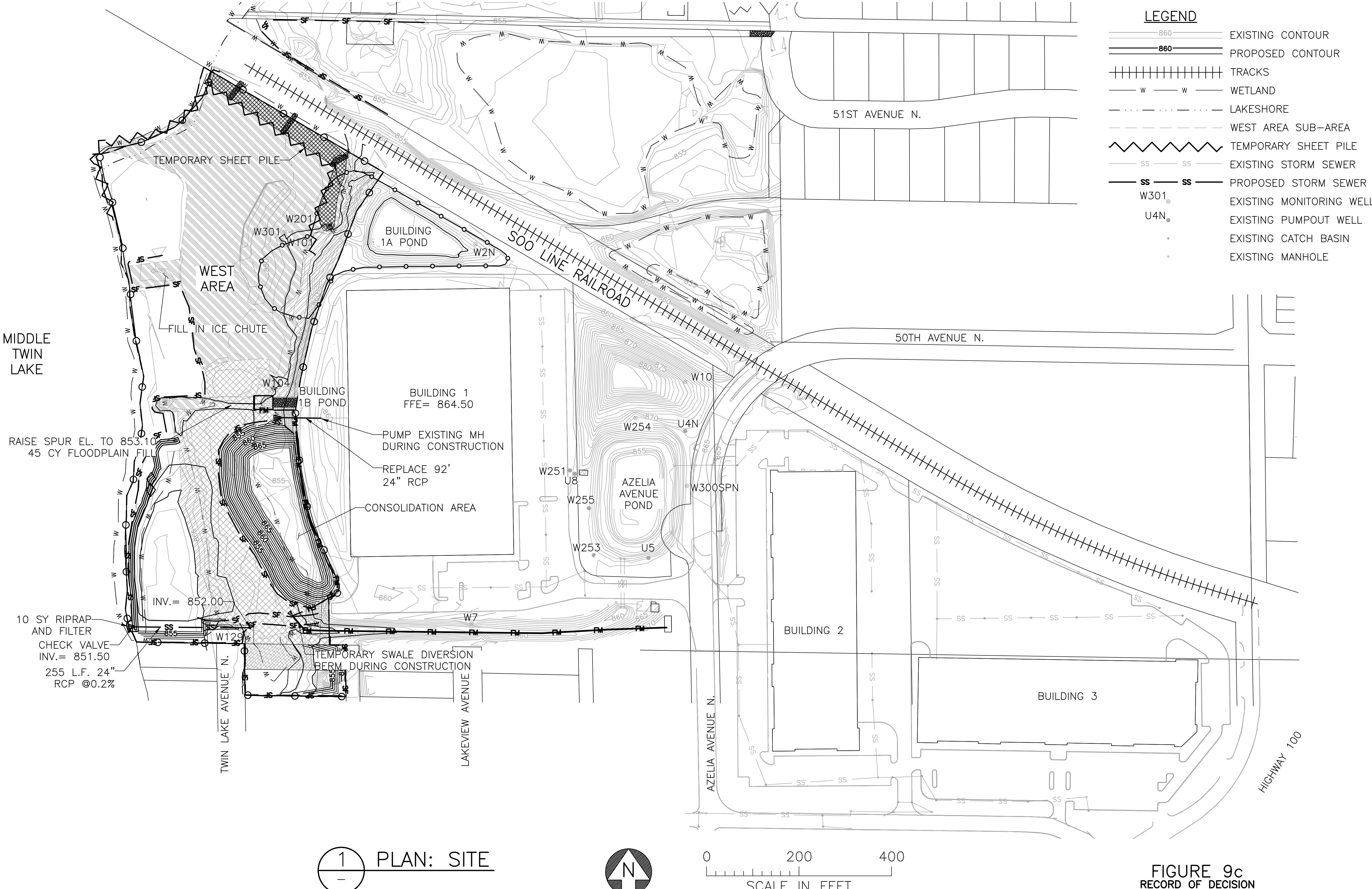
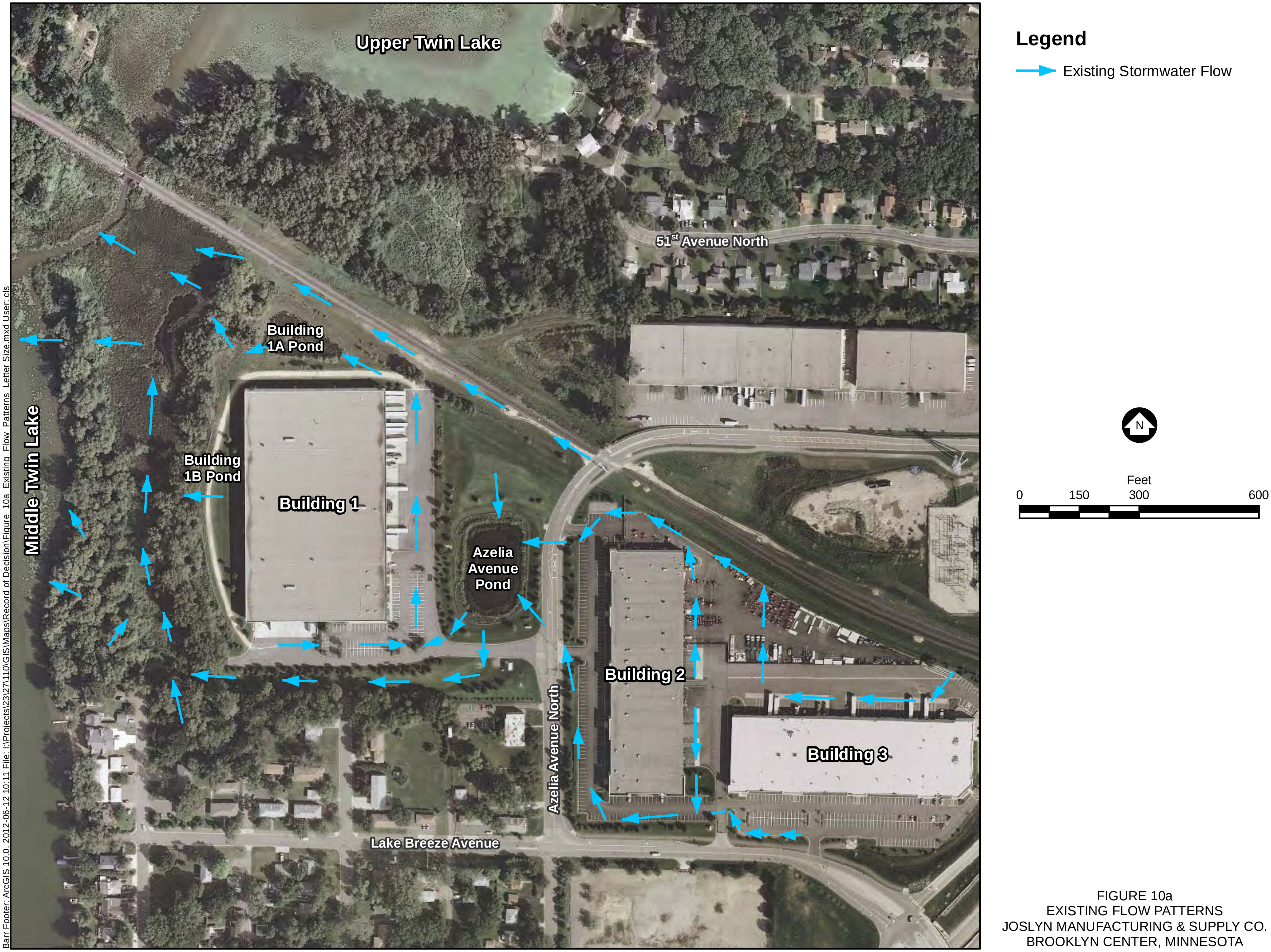


FIGURE 9c
RECORD OF DECISION
STORMWATER MANAGEMENT PLAN
LIMITED ONSITE CONSOLIDATION WITH SOIL COVER
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

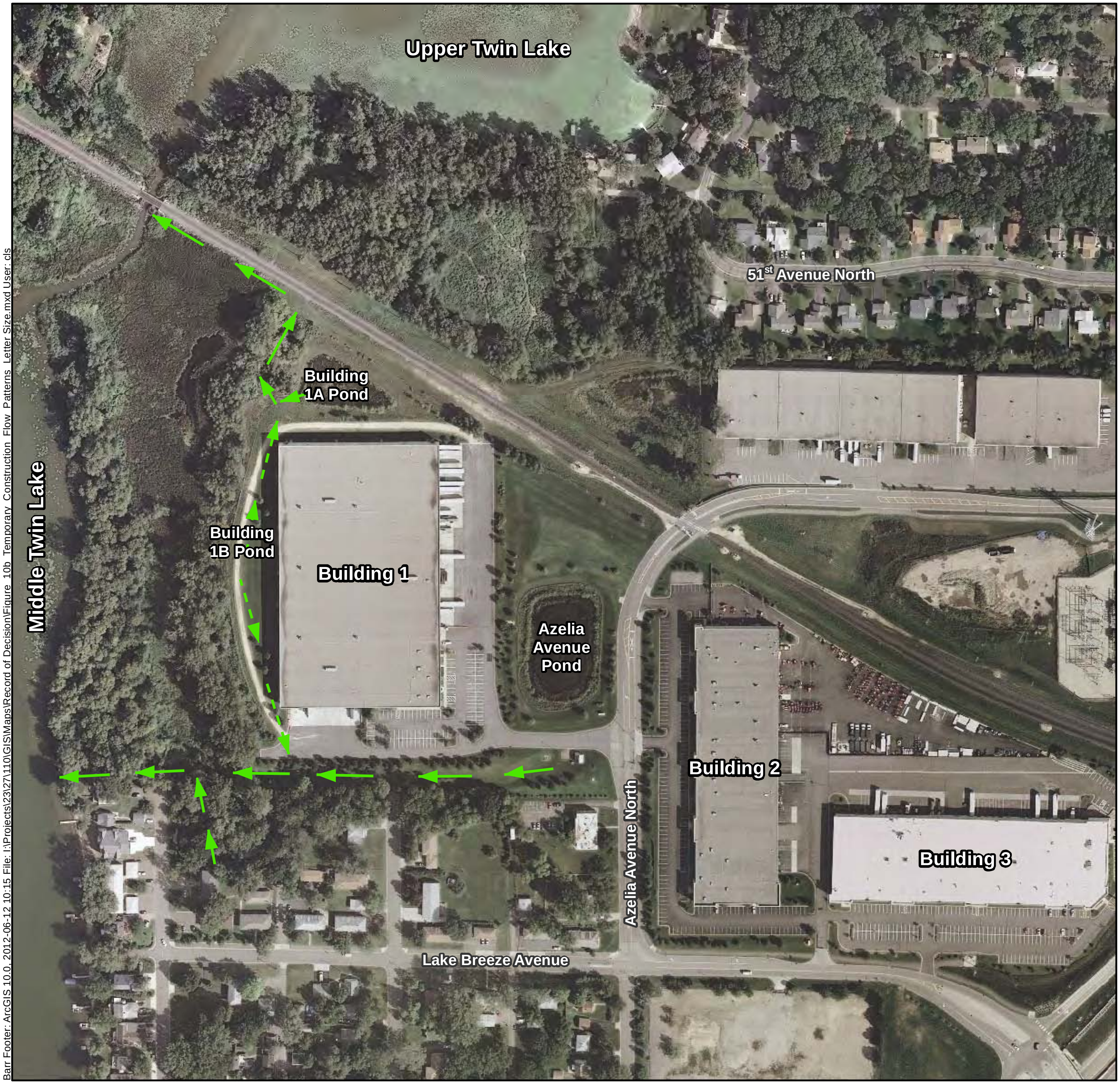
CADD USER: Randy R Roberts FILE: M:\DESIGN\23270110.00\2327011000_ROD_FIGURE 9C.DWG PLOT SCALE: 1:2 PLOT DATE: 11/3/2017 11:45 AM

ss1 M:\Design\23270110.00\2327011000_FIG_Alternative 8 Plan.dwg Plot at 1 09/27/2011 00:30:49



Barr Footer: ArcGIS 10.0, 2012-06-12 10:11 File: I:\Projects\23\27\110\GIS\Maps\Record of Decision\Figure 10a Existing Flow Patterns Letter Size.mxd User: cls

FIGURE 10a
EXISTING FLOW PATTERNS
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA



Legend

Temporary Construction Stormwater Flow

Gravity Flow

Pumped Flow

N

Feet

0 150 300 600

FIGURE 10b
TEMPORARY CONSTRUCTION
FLOW PATTERNS
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

Barr Footer: ArcGIS 10.4.1, 2017-09-25 08:18 File: I:\Projects\23\27\110\GIS\Maps\Record of Decision\Figure 10c Alternative 8 Flow Patterns Letter Size.mxd User: rcs2

Legend

Alternative 8b Stormwater Flow

N

Feet

0 150 300 600

FIGURE 10c
ALTERNATIVE 8b FLOW PATTERNS
JOSLYN MANUFACTURING & SUPPLY CO.
BROOKLYN CENTER, MINNESOTA

Table 1

Contaminants of Concern and Sources
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Site Sub-Areas	COCs	Media	Units	Maximum Site Concentration	Screening Level	Source of Screening Level
WA-1 to WA-3, WA-6 to WA-8	Dioxins	Soil	ng TCDD-TEQ/kg (ppt)	176,621	3.5	Industrial SRV (MPCA, 1999b)
	cPAHs	Soil	mg B[a]P-equivalents/kg (ppm)	350	0.3	Industrial SRV (MPCA, 1999b)
	PCP	Soil	mg/kg (ppm)	450	12	Industrial SRV (MPCA, 1999b)
WA-4 and WA-5	Dioxins	Soil	ng TCDD-TEQ/kg (ppt)	42	3.5	Industrial SRV (MPCA, 1999b)
Southern Lots	Dioxins	Surficial Soil (<0.5 ft bgs)	ng TCDD-TEQ/kg (ppt)	7.61	2	Residential SRV (MPCA, 1999b)
		Underlying Soil (>0.5 ft bgs)	ng TCDD-TEQ/kg (ppt)	772	2	Residential SRV (MPCA, 1999b)
Middle Twin Lake	Dioxins	Fish tissue	ng TCDD-TEQ/kg (ppt)	0.242	0.015	U.S. EPA, 2009
		Sediment (WA-5)	ng TCDD-TEQ/kg (ppt)	6.0	5	Site-specific SSV (MPCA, 2006c)

*Screening level was set at 0.1 x industrial SRV/SSV/fish tissue guideline concentration; given reasonable maximum exposure assumptions, this corresponds to 1 x 10^{-6} excess lifetime cancer risk.

TCDD-TEQ = tetrachlorodibenzo-p-dioxin [TCDD] Toxicity Equivalency Quotient [TEQ], or TCDD-TEQ

SRV = Soil Reference Value

SSV = Sediment Screening Value

B[a]P = Benzo(a)pyrene

ppt = parts per trillion

ppm = parts per million

Table 2

Potential Exposure Pathways
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Site Sub-Areas	Media Source	Receptor	Potential Exposure Route	Included/ Excluded
WA-1 to WA-3, WA-6 to WA-8	Soil	Industrial worker	Incidental ingestion, dermal absorption, inhalation of vapor	Included
WA-4 and WA-5	Soil	Industrial worker	Incidental ingestion, dermal absorption, inhalation of vapor	Included
Southern Lots	Soil	Resident	Incidental ingestion, dermal absorption, inhalation of vapor	Included
Middle Twin Lake	Fish tissue	Fisher, recreational user	Ingestion of predator fish, incidental ingestion of surface water, dermal absorption from surface water	Included
	Sediment	Recreational user	Incidental ingestion, dermal absorption from sediment, inhalation of vapor, surface water ingestion	Included
Entire West Area	Groundwater	Resident	Ingestion of tap water, dermal absorption from tap water, inhalation of vapor from tap water	Excluded
	Soil	Trespasser	Incidental ingestion, dermal absorption, inhalation of vapor	Excluded

Table 3

Toxicity Characterization
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

COC	Toxicological endpoint driving PRG	Weight of evidence for carcinogenicity	Source
Dioxins/furans	Cancer (cellular growth and differentiation; induction)	Likely human carcinogen	U.S. EPA, 2003
cPAHs	Cancer (nonspecific tumor increases at site of exposure)	B2, probable human carcinogen	U.S. EPA IRIS, 1994
PCP	Cancer (liver, adrenal gland, connective tissue)	B2, probable human carcinogen	U.S. EPA IRIS, 1993

Table 4

Screening-Level Risk Assessment for Current and Potential Future Land Use
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Site Sub-Areas	Media	Receptor	COC	Risk Guideline	Units	Guideline Value	Concentration Range	N of site samples > Guideline/Total
WA-1 to WA-3, WA-6 to WA-8	Soil	Industrial worker	Dioxins	MPCA SRV	ng TCDD-TEQ/kg (ppt)	35	ND - 176,621	90/99
			cPAHs	MPCA SRV	mg B[a]P-equivalents/kg (ppm)	3	ND - 350	10/76
			PCP	MPCA SRV	mg/kg (ppm)	120	ND - 450	2/79
WA-4 and WA-5	Soil	Industrial worker	Dioxins	MPCA SRV	ng TCDD-TEQ/kg (ppt)	35	4.5 - 42	1/13
Southern Lots	Soil	Resident	Dioxins	MPCA SRV	ng TCDD-TEQ/kg (ppt)	20	0.5 - 772	7/11
Middle Twin Lake	Predator fish tissue	Fisher	Dioxins	U.S. EPA Fish Tissue Guideline	ng TCDD-TEQ/kg (ppt)	0.15	0.005 - 0.242[1,2]	1/10
	Sediment	Recreational user	Dioxins	MPCA SSV	ng TCDD-TEQ/kg (ppt)	50	0.02 - 6.0	0/4

Gray rows indicate where concentrations have exceeded guideline values.

[1] One fish sample showed a TCDD-TEQ value of 0.242 ppt when values below the detection limit (DL) were set to ½ DL; however, when values below the DL were set to 0, the value was 0.034 ppt, well below the guideline fish tissue value. In this assessment it is assumed that this concentration is not of human health concern.

[2] Dioxin concentrations in fish tissue from reference lakes in the Twin Cities were lower than those seen in Middle Twin Lake; however, fish tissue data from other urban Midwest lakes sampled in the National Study of Chemical Residues in Lake Fish Tissue show similar dioxin concentrations (Barr, 2006b).

Table 5

Preliminary Remediation Goals (PRGs) / Remediation Goals (RGs)
Joslyn Manufacturing & Supply Co.
Brooklyn Center, Minnesota

PRG / RG Classification	Applicable site sub-areas	Media	COCs	Units	Value	Sources
Industrial worker receptor SRV	West Area	Soil	Dioxins	ng TCDD-TEQ/kg (ppt)	35	MPCA, 1999b; MPCA, 2005a
			cPAHs	mg B[a]P-equivalents/kg (ppm)	3	MPCA, 1999b; MPCA, 2005a
			PCP	mg/kg (ppm)	120	MPCA, 1999b; MPCA, 2005a
Resident receptor SRV	Southern Lots	Soil	Dioxins	ng TCDD-TEQ/kg (ppt)	20	MPCA, 1999b
Recreational use receptor SSV	Middle Twin Lake	Sediment	Dioxins	ng TCDD-TEQ/kg (ppt)	50	MPCA, 2006b
Aquatic and terrestrial ecological receptor*	OU5, Middle Twin Lake	Soil, sediment	Dioxins	ng TCDD-TEQ/kg (ppt)	11.2	CCME, 2002; MPCA, 2005a
			cPAHs	mg B[a]P-equivalents/kg (ppm)	12.2	Crane et al., 2000; MPCA, 2005a
			PCP	mg/kg (ppm)	0.785	MPCA, 2005a

*Aquatic sediment quality values are assumed to be applicable as terrestrial values, given the paucity of OU5 surface area above the OHWL

TCDD-TEQ = tetrachlorodibenzo-p-dioxin [TCDD] Toxicity Equivalency Quotient [TEQ], or TCDD-TEQ

SRV = Soil Reference Value

SSV = Sediment Screening Value

B[a]P = Benzo(a)pyrene

ppt = parts per trillion

ppm = parts per million

Table 6-1

Potential Federal Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
Federal Environmental Laws (except RCRA)					
CERCLA	Addresses investigation and remediation of a release of a hazardous substance.	Release of a hazardous substance.	42 USC 9601 et seq.	Applicable	
NCP	Provides organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.	Release of a hazardous substance.	40 CFR 300	Applicable	
Safe Drinking Water Act	Protects the quality of public drinking water supplies from source to tap.		42 USC 300f et seq.	Does not apply to OU being evaluated in this FS report.	
Clean Water Act	Establishes structure for regulating discharges of pollutants and regulating surface water quality.	Activities that affect or may affect surface water.	33 USC 1251 et seq.	Applicable	Surface water management would be required during construction activities.
Clean Water Act	Surface water quality requirements for discharges of pollutants to federally-regulated waters.	Discharge of pollutants to federally-regulated waters.	33 USC 1342 40 CFR 129	Applicable	Surface water management would be required during construction activities.
Clean Air Act	Regulates air emissions from stationary and mobile sources.	Stationary or mobile source air emissions.	42 USC 7401 et seq.	Applicable	Only mobile sources will be excavation and trucking equipment. No stationary sources anticipated.
Section 10 (Rivers and Harbors Act of 1899)	Applies to activities that will obstruct or alter any navigable water of the United States.	Construction activities that will potentially obstruct or alter navigable waters.	33 USC 403	Not an ARAR	No activities are contemplated that would obstruct or alter any navigable waters of the United States.
Resource Conservation and Recovery Act (RCRA) 42 USC 6901 et seq.					
Onsite waste generation	Waste generator shall determine if the waste is hazardous waste.	Generation of waste.	40 CFR 261 Subparts A through D	Applicable	Applicable for any operation where waste would be generated.
Generators of Hazardous Waste	Generation of contaminated soils that are characterized as hazardous wastes.	Management of hazardous waste	40 CFR 262	Applicable to contaminated soil that is a hazardous waste.	Applicable for any operation where hazardous waste would be generated.
Transporters of Hazardous Waste	Transportation of hazardous waste to off-site facilities.	Transportation of hazardous waste to off-site facilities	40 CFR 263	Applicable to contaminated soil that is a hazardous waste.	Applicable for any operation where hazardous waste would be transported off-site.
Owners and Operators of Hazardous Waste Treatment, Storage	Management of hazardous waste.	Operations that include the management of hazardous waste.	40 CFR 264	Applicable to contaminated soil that is a hazardous	Applicable for any operation where hazardous waste would be treated, stored or disposed of. Only the substantive portions would be

Table 6-1

Potential Federal Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
and Disposal Facilities				waste.	ARARs.
Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	Management of hazardous waste at interim status facilities.	Operations that include the management of hazardous waste at interim status facilities.	40 CFR 265	Applicable to contaminated soil that is a hazardous waste.	40 CFR 264 may supersede this regulation.
Management of Specific Hazardous Waste and Specific Types of Facilities	Management of specific hazardous wastes	Operations involving recyclable materials, reclamation of lead-acid batteries, hazardous waste burned in boilers and industrial furnaces, munitions, or low level mixed wastes.	40 CFR 266	Does not apply to OU being evaluated in this FS report.	These standards do not apply to contaminated soils at the site.
Land Disposal Restrictions	Restricts certain hazardous wastes from land disposal.	Placement or disposal of soil that is a hazardous waste.	40 CFR 268	Applicable to contaminated soil that is a hazardous waste.	Applicable to any operation where hazardous waste is land disposed.
Disposal of Solid Waste that is not a Hazardous Waste	Generator of RCRA Subtitle D regulated waste.	Placement of RCRA Subtitle D waste in a landfill.	40 CFR 257	ARAR for landfill disposal or generated RCRA Subtitle D waste	Applicable to onsite land disposal if RCRA Subtitle D waste is generated.

Table 6-1

Potential Federal Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
U.S. Department of Transportation					
General Information, Regulations and Definitions	Requirements for packaging, labeling, marking, placarding, and motor vehicles used for transportation of hazardous materials.	Offering of hazardous materials for transportation.	49 CFR 171	Applicable	The contaminated soil properties will determine which regulations are applicable.
Hazardous Materials Table, special provisions, communications, emergency response, training and security plans	Each person who offers hazardous material for transportation or each carrier that transports it shall mark each package, container, and vehicle in the manner required.	Offering of hazardous materials for transportation.	49 CFR 172	Applicable	The contaminated soil properties will determine which regulations are applicable.
Requirements for Shipments and Packagings	Definitions of hazardous materials for transportation purposes; requirements for preparing hazardous materials for shipment	Shipment of hazardous materials to off-site facilities	49 CFR 173	Applicable	The contaminated soil properties will determine which regulations are applicable.
Occupational Safety and Health Administration (OSHA)					
Work on Contaminated Sites	Requirements for workers on uncontrolled hazardous waste sites such as training, personal protective equipment, recording and reporting work-related fatalities/injuries/illnesses.	Work on uncontrolled hazardous waste sites, RCRA CA sites, and emergency response sites.	29 CFR 1904 - Recording and Reporting Occupational Injuries and Illnesses 29 CFR 1910 - Occupational Safety and Health 29 CFR 1926 – Safety and Health Regulations for Construction	Applicable	The remedial action at the Site would involve work on a CERCLA NPL site; therefore, the requirements of these OSHA standards must be met.
Management Certain Toxic Substances					
Remediation of release of polychlorinated biphenols	Requirements governing the remediation, release, and disposal of PCBs must be met.	Remediation, release, and disposal of PCBs.	40 CFR 761	Does not apply to OU being evaluated in this FS report.	PCBs are not potential contaminants of concern for the OU currently under evaluation.
Dibenzo-para-Dioxins/Dibenzofurans	Requirements governing the testing and reporting of chemical substances containing dibenzo-para-dioxins / dibenzofurans	Manufacturing (and/or importing), or processing, a chemical substance identified under §766.25	40 CFR 766	Does not apply to OU being evaluated in this FS report.	Remediation of contaminated soil does not involve the manufacturing or processing of the regulated chemical substances.

Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that the entire statutes or policies are considered as potential ARARs; only substantive requirements of the specific citations are considered potential ARARs. Specific potential ARARs are addressed in the table below each general heading.

Table 6-2

Potential State and Local Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
State Environmental Laws					
Water Pollution Control Act	Administration and enforcement of laws relating to the pollution of any waters of the state.	Release of pollutants to Minnesota waters.	Minnesota Statute 115	Applicable	
Pollution Control Agency	Provides organizational structure and procedures for responding to problems relating to water, air, and land pollution.	Release of hazardous substance in Minnesota.	Minnesota Statute 116	Applicable	
Water Law	Provides regulations pertaining to any waters of the state, including surface water, wetlands and groundwater.	Release of pollutants to Minnesota waters or activities that affect bed, banks or cross section of Minnesota waters.	Minnesota Statute 103A, 103B, 103C, 103D, 103E; 103F, 103G, 103H	Applicable	
Permits and Certifications					
Permits and certification for regulated activities	General requirements for obtaining MPCA permit for regulated activities.	Work involving a regulated activity.	Minnesota Rules Ch. 7001.0010 through 7001.0210	Applicable to regulated activities	Substantive permit requirements would need to be met for regulated activities.
Hazardous waste facility permit	Requirements for hazardous waste facility permit.	Construction of a hazardous waste management facility in Minnesota.	Minnesota Rules Ch. 7001.0500 through 7001.0730	Applicable to regulated activities	Substantive permit requirements would need to be met for regulated activities.
NPDES Permits	Requirements for treatment and monitoring of discharges to waters of the state.	Discharge of a pollutant to waters of the state.	Minnesota Rules Ch. 7001.1000 through 7001.1150	Applicable to regulated activities	Substantive permit requirements would need to be met for regulated activities. Surface runoff would be managed with a Storm Water Pollution Prevention Plan (SWPPP).
Certifications	Requirements for certification for regulated activities.	Requirement to obtain certification by section 401 of the Clean Water Act.	Minnesota Rules Ch. 7001.1400 through 7001.1470	Does not apply to OU being evaluated in this FS report.	
Solid Waste Management Facility	Requirements for permitting a soil waste management facility.	Construction of a solid waste management facility in Minnesota	Minnesota Rules Ch. 7001.3000 through 7001.3550	Applicable to regulated activities	Substantive permit requirements would need to be met for regulated activities.

Table 6-2

Potential State and Local Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Hazardous Waste Regulations					
Onsite waste generation	Waste generator shall determine if the waste is hazardous waste.	Generation of waste.	Minnesota Rules Ch. 7045.0102 through 7045.0155	Applicable	Applicable for any operation where waste would be generated.
Generators of Hazardous Waste	Generation of contaminated soils that are characterized as hazardous wastes.	Management of hazardous waste	Minnesota Rules Ch. 7045.0205 through 7045.0325	Applicable to contaminated soil that is a hazardous waste.	Applicable for any operation where hazardous waste would be generated.
Transporters of Hazardous Waste	Transportation of hazardous waste to off-site facilities.	Transportation of hazardous waste to off-site facilities	Minnesota Rules Ch. 7045.0450 through 7045.0397	Applicable to contaminated soil that is a hazardous waste.	Applicable for any operation where hazardous waste would be transported off-site.
Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	Management of hazardous waste.	Operations that include the management of hazardous waste.	Minnesota Rules Ch. 7045.0450 through 7045.0551	Applicable to contaminated soil that is a hazardous waste.	Applicable for any operation where hazardous waste would be treated, stored or disposed of. Only the substantive portions would be ARARs.
Owners and Operators of Interim Status Hazardous Waste Treatment, Storage and Disposal Facilities	Management of hazardous waste at interim status facilities.	Operations that include the management of hazardous waste at interim status facilities.	Minnesota Rules Ch. 7045.0552 through 7045.0686	Applicable to contaminated soil that is a hazardous waste.	Minnesota Rules 7045.0450 through 7045.0551 may supersede this regulation.
Management of Specific Hazardous Waste and Specific Types of Facilities	Management of specific hazardous wastes	Operations involving recyclable materials, reclamation of lead-acid batteries, hazardous waste burned in boilers and industrial furnaces, munitions, or spent or waste household batteries.	Minnesota Rules Ch. 7045.0652 through 7045.0686	Does not apply to OU being evaluated in this FS report.	These regulations do not apply to contaminated soils at the site.

Table 6-2

Potential State and Local Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Management of Used Oil	Management of used oil	Operations involving management of used oil.	Minnesota Rules Ch. 7045.0692 through 7045.0990	Does not apply to OU being evaluated in this FS report.	These regulations do not apply to contaminated soils at the site.
County Regulation of Hazardous Waste Management	Procedures for the MPCA's overview of county hazardous waste programs	MPCA approved county ordinance describing their Hazardous Waste Programs	Minnesota Rules Ch. 7045.1000 through 7045.1030	Applicable to regulated activities.	Hennepin County has an MPCA approved county ordinance detailing their hazardous waste programs.
Land Disposal Restrictions	Restricts certain hazardous wastes from land disposal.	Placement or disposal of soil that is a hazardous waste.	Minnesota Rules Ch. 7045.1390 through 7045.1400	Applicable to contaminated soil that is a hazardous waste.	Applicable to any operation where hazardous waste is land disposed.
Solid Waste					
General requirements for management of solid waste.	Requirements and standards for solid waste	Generation of a solid waste	Minnesota Rules Ch. 7035.0300 through 7035.0605	Applicable to regulated activities	Solid waste requirements would be applicable for storage, transport and disposal of contaminated soils generated during remedial activities.
Individual Properties	Responsibility for management of solid waste	Generation of solid waste	Minnesota Rules Ch. 7035.0700 through 7035.0805	Applicable to regulated activities	Solid waste requirements would be applicable for storage, transport and disposal of contaminated soils generated during remedial activities.
Industrial Solid Waste Land Disposal Facilities	Requirements for industrial solid waste land disposal facilities	Generation and management of an industrial solid waste	Minnesota Rules Ch. 7035.1590 through 7035.2500	Applicable to regulated activities	Solid waste requirements would be applicable for storage, transport and disposal of contaminated soils generated during remedial activities.
Solid Waste Management Facilities Financial Requirements	Requirements for cost estimates and financial assurances documentation	Construction of a industrial solid waste land disposal facility	Minnesota Rules Ch. 7035.2665 through 7035.2805	Applicable to regulated activities	Solid waste requirements would be applicable for storage, transport and disposal of contaminated soils generated during remedial activities.

Table 6-2

Potential State and Local Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Solid Waste Management Facility Specific Technical Requirements	Requirements for facilities that dispose of mixed municipal solid waste in or on the land.	Management of a mixed municipal waste landfill	Minnesota Rules Ch. 7035.2815 through 7035.2915	Does not apply to OU being evaluated in this FS report.	Soil remediation would not involve management of mixed municipal waste.
Abandonment of motor vehicles and scrap metal	Requirement for disposal and reuse of abandoned motor vehicles and other scrap metal	Disposal and reuse of abandoned motor vehicles and other scrap metal	Minnesota Rules Ch. 7035.3000 through 7035.3600	Does not apply to OU being evaluated in this FS report.	Soil remediation would not involve disposal or reuse of abandoned motor vehicles or scrap metal.
Solid Waste Programs and Projects	Requirements for application procedure for grants-in-aid, state requirements, approval of applications, and payments for programs or projects which will encourage both the reduction of the amount of material entering the solid waste stream and the reuse and recycling of solid waste.	Plan for facility meeting requirements	Minnesota Rules Ch. 7035.4000 through 7035.6000	Does not apply to OU being evaluated in this FS report.	Soil remediation project would likely meet requirements.
Infectious Waste	Requirements for owners and operators of facilities, commercial transporters and all infectious waste.	Generation and management of infectious waste	Minnesota Rules Ch. 7035.9100 through 7035.9150	Does not apply to OU being evaluated in this FS report.	Soil remediation would not involve infectious waste.
Disposal of Dioxin Contaminated Soil in Subtitle D Landfills	Provides conditions for disposal of dioxin contaminated soil in a Minnesota Subtitle D landfill. Dioxin-contaminated soil may be placed in a Minnesota "Subtitle D" facility if $TEQ_{DF} \leq$ 10 µg/kg.	Disposal of dioxin-contaminated soil in a MPCA-permitted Subtitle D landfill.	MPCA Office Memorandum to Remediation Division from Stephen Thompson and Elizabeth Gawrys. August 29, 2006	TBC	MPCA policy statement. Some of the soils considered in the FS exceed the 10 µg/kg TEQ_{DF} requirement. In addition, the MPCA concluded that: "If soils are not allowed to be disposed of in a Subtitle D Landfill, the only other viable option is to leave the contamination in place, which makes for more potential future human health exposure as compared to managing the soil in a landfill."

Table 6-2

Potential State and Local Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Remediation of Residential and Commercial/Industrial Property under MPCA VIC Program	MPCA VIC guidance	Contaminated site – enrollment in MPCA VIC program	http://www.pca.state.mn.us/cleanup/vic-guidedoc.htm.	TBC	Applicable to remediation of brownfield sites under MPCA VIC program.
Water Supply Regulations					
Connection to public sewer	State Plumbing Code (MDH)	Use of public sewer and water systems and plumbing materials and methods	Minnesota Rules Ch. 4715	Does not apply to OU being evaluated in this FS report.	A plumbing connection would not be expected for the remedial activities.
Public Water Resource	Water appropriation permitting, standards and criteria for alterations to structure of public water (DNR).	Plans to appropriate water or alter structure of public water	Minnesota Rules Ch. 6115	Does not apply to OU being evaluated in this FS report.	No plans to appropriate water.
New well construction in contaminated area	Allows for designation of special Well Construction Area (MDH)	Conditions requiring Special Well Construction Area designation	Minnesota Rules Ch. 4725.3659	Does not apply to OU being evaluated in this FS report.	A special Well Construction Area will not be designated as part of a remedial action.
Monitoring well installation or abandonment	Well and boring construction, use, maintenance, and sealing information (MDH)	Water Well Code	Minnesota Rules Ch. 4725	Applicable	Wells may be installed or abandoned as part of remedial activities.
Certification of Environmental Laboratories	Laboratory accreditation requirements for the State of Minnesota (MDH).	Requirement that analyses be conducted by a certified lab.	Minnesota Statute 144.97 through 144.98 Minnesota Rules Ch. 4740 Minnesota Rules Ch. 4740.2010 through 4740.2040	Applicable	Laboratories that provide services for this project would be accredited for the appropriate testing methods.
Surface Water Quality					
Water Pollution Control Act	Regulates point source discharges to waters of the state.	Point source discharges to waters of the state	Minnesota Statute 115	Applicable	

Table 6-2

Potential State and Local Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Water of the State	Classifies waters of the state and establishes standards	Standards for Surface Waters	Minnesota Rules Ch. 7050	Applicable	
Groundwater Quality					
Discharge to groundwater	Nondegradation goal, prohibition of discharge to saturated zone, limitation on discharge to unsaturated zone, remediation requirements.	Discharges to underground waters	Minnesota Rules Ch. 7060	Applicable	Best management practices would be applicable during remediation to prevent degradation of groundwater quality.
Groundwater use or contact	Establishes human health based groundwater standards (MDH)	Release of hazardous substances to drinking water aquifer	Minnesota Rules Ch. 4717.7500 and 4717.7801 to 4717.7900	Not an ARAR for pathways of concern	
Air Quality					
Air emissions	Duty to notify and abate excessive or abnormal unpermitted air emissions	Abnormal unpermitted air emissions	Minnesota Statute 116.061	Applicable	These regulations would be applicable in connection with activities that disturb soil and result in emissions during remedial activities.
Air emissions	Air quality rules	Air emissions	Minnesota Rules Chs. 7005, 7007, 7017	Applicable	These regulations would be applicable in connection with activities that disturb soil and result in emissions during remedial activities.
Air emissions	Standards of performance and emissions inventory	Stationary emission source	Minnesota Rules Chs. 7019	Does not apply to OU being evaluated in this FS report.	These regulations would be applicable to emissions from stationary sources and no stationary source is anticipated with remediation.
Air emissions	Air emissions and waste management permits	Requires permits for air emission sources	Minnesota Statute 116.081	Does not apply to OU being evaluated in this FS report.	The remedial actions would not involve the construction or modification of air or waste treatment facilities.

Table 6-2

Potential State and Local Action-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Noise Pollution Control					
Sound generation	Standards for noise generated during operations.	Generation of noise during site activities	Minnesota Rules Ch. 7030	Applicable	May need a waiver of this requirement if operation of construction equipment exceeds noise standards.
Health and Safety					
Worker protection	Standards for worker health, safety and training	Health and Safety	Minnesota Rules Ch. 5205	Applicable	Requirements would be met for health and safety of workers.
Property Use in Superfund Remedial Action Decisions					
Property use	Incorporating property use into cleanup decisions	Need for remedial action decision. Use of institutional controls as part of remedial actions.	MPCA Guidance on Incorporation of Planned Property Use into Site Decisions	TBC	Useful in setting PRGs and in defining the appropriate use of institutional controls.
Shingle Creek Watershed Management Organization Rules and Standards					
Stormwater Management	Manage subwatershed discharge rates and flood storage volumes to be consistent with the Commission’s and local water resources management plans.	Plans for land or site development adjacent to or within a lake, wetland, or natural or altered watercourse as listed in the final inventory of Protected Waters and Wetlands, as prepared by the DNR.	Shingle Creek WMO, Rule D	Applicable	A stormwater management plan will be prepared and submitted for review and approval
Erosion and Sediment Control	Control runoff and erosion during land disturbing activities	Plans for projects covered by Rule D.	Shingle Creek WMO, Rule E	Applicable	An erosion and sediment control plan will be prepared and submitted for review and approval

Table 6-3

Potential Federal Location-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
National Archaeological and Historical Preservation Act					
Within area where action may cause irreparable harm, loss, significant artifacts.	Construction on previously undisturbed land would require an archaeological survey to the area.	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data.	Substantive requirements of 36 CFR 65, National Historic Landmarks Program.	Not an ARAR	There are no known archaeological or historical sites located within the OU boundaries.
Federal National Historic Preservation Act, Section 106					
Historic project owned or controlled by federal agency.	Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing or the National Register of Historic Places.	Property included or eligible for the National Register of Historic Places.	Substantive Requirements of 36 CFR 800, Protection of Historic Properties; 16 USC 470	Not an ARAR	There are no known archaeological or historical sites located within the OU boundaries.
Historical Sites, Buildings, and Antiquities Act					
Historic sites	Avoid undesirable impacts on landmarks.	Areas designated as historic sites.	16 USC 461-467; 40 CFR 6.3, Requirements for Environmental Information Documents and Third-Party Agreement for EPA Actions Subject to NEPA	Not an ARAR	There are no known archaeological or historical sites located within the OU boundaries.
Endangered Species Act of 1973					
Critical habitat upon which endangered species or threatened species depend.	Action to conserve endangered species or threatened species, including consultation with the Department of the Interior. Reasonable mitigation and enhancement measures must be taken, including live propagation, transplantation and habitat acquisition and improvement.	Determination of effect upon endangered or threatened species or its habitat by conducting biological assessments.	16 USC 460 et seq. 16 USC 1531; 16 USC 1536(a) 50 CFR 81, Conservation of Endangered and Threatened Species of Fish, Wildlife, and Plant – Cooperation with the States 50 CFR 402, Interagency Cooperation – Endangered Species Action of 1973, as amended	Applicable	There are no records of endangered plant or animal species located on the portions of the Site where remedial actions would be conducted.

Table 6-3

Potential Federal Location-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
Migratory Bird Treaty Act of 1972					
Migratory bird area	Protects almost all species of native birds in the U.S. from unregulated “take” which can include poisoning at contaminated sites.	Presence of migratory birds.	16 USC 703	Applicable if ground nesting birds present in remediation area.	Response activities would be scheduled such that it is unlikely that ground nesting birds would be affected. Survey of ground nesting birds will be completed prior to remediation.
Wilderness Act					
Wilderness Area	Area must be administered in such a manner as will leave it unimpaired as wilderness and preserve its wilderness character.	Federally-owned area designated as wilderness area.	16 USC 1131 et seq.; 50 CFR 35.1 et seq.	Not an ARAR	Remedial actions are not planned in areas located in or adjacent to an area designated as part of the National Wildlife Refuge System.
National Wildlife Refuge System					
Wildlife Refuge	Only actions allowed under the provisions of 16 USC Section 688 dd(c) may be undertaken in areas that are part of the National Wildlife Refuge System.	Areas designated as part of National Wildlife Refuge System.	16 USC 668; 50 CFR 27	Not an ARAR	Remedial actions are not planned in areas located in or adjacent to an area designated as part of the National Wildlife Refuge System.
Fish and Wildlife Coordination Act, Fish and Wildlife Improvement Act of 1978, Fish and Wildlife Conservation Act of 1980					
Area affecting stream or other water body	Provides protection for actions that would affect streams, wetlands, other water bodies or protected habitats. Any action taken should protect fish or wildlife.	Diversion, channeling or other activity that modifies a stream or other water body and affects fish or wildlife.	16 USC 661; 16 USC 662 16 USC 742a; 16 USC 2901; 50 CFR 83	Applicable	Measures would be taken to protect water bodies that would be potentially affected.
Procedures for Implementing Requirements of the Council on Environmental Quality on the National Environmental Policy Act and Executive Order 11990, Protection of Wetlands					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands. Wetlands of primary ecological significance must not be altered so that ecological systems in the wetlands are unreasonably disturbed.	Wetlands as defined by Executive Order 11990 Section 7.	40 CFR 6, Appendix A excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Applicable	There is wetland within OU5.

Table 6-3

Potential Federal Location-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
Upper Mississippi River Management					
To ensure the coordinated development and enhancement of the Upper Mississippi River system.	Cooperative effort and mutual assistance on the comprehensive planning of the use, protection, growth, and development of the Upper Mississippi River System	Actions that may affect river reaches that have commercial navigation channels on the Mississippi River.	33 USC 652	Applicable	Water bodies adjacent to the Site are part of the Upper Mississippi River system.
Clean Water Act, Section 404					
Wetland	The degradation Section requires degradation or destruction of wetlands and other aquatic sites to be avoided to the extent possible. Dredged or fill material must not be discharged to navigable waters if the activity contributes to the violation of Maryland water quality standards CWA Sec. 307; jeopardizes endangered or threatened species; or violates requirements of the Title III of the Marine Protection, Research and Sanctuaries Act of 1972.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 230.10; 40 CFR 231 231.1, 231.2, 231.7, 231.8)	Applicable	There is wetland within OU5.
Wild and Scenic Rivers Act					
Within area affecting national wild, scenic, or recreational rivers.	Avoid taking or assisting in action that will have direct adverse effect on national, wild or scenic recreational rivers.	Activities that affect or may affect any of the rivers specified in Section 1276(a).	16 USC 1271 et seq. and Section 7(a); 36 CFR 297; 40 CFR 6.302(e)	Not an ARAR	There are no designated wild, scenic, or recreational areas within OU5.

Table 6-3

Potential Federal Location-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
Coastal Zone Management					
Within coastal zone	Regulates activities affecting the coastal zone including lands thereunder and adjacent shoreline. Must conduct activities in a manner consistent with the approved State management programs.	Activities affecting the coastal zone including lands thereunder and adjacent shoreland.	Section 307(c) of 16 USC 1456(c); 16 USC 1451 et. seq.; 15 CFR 930; 15 CFR 923.45	Not an ARAR	The Site is not located within a designated coastal zone.
Coastal Barrier Resources Act, Section 3504					
Within designated coastal barrier	Prohibits any new federal expenditure within the Coastal Barrier Resource System.	Activity within the Coastal Barrier Resource System	16 USC 3504	Not an ARAR	The Site is not located within a designated coastal zone.
Navigation and Navigable Waters					
Navigable waters	Establishes regulations pertaining to activities that affect the navigation of the waters of the United States.	Activities affecting navigable waters.	33 CFR 320-329 33 USC 1341	Not an ARAR	Response activities would not affect navigation of waters of the United States.
Magnuson Fishery Conservation and Management Act					
Managed Fisheries	Provides for conservation and management of specified fisheries within specified fishery conservation zones (in federal waters).	Presence of managed fisheries in federal waters.	16 USC 1801, et seq.	Not an ARAR	Response activities would not affect fisheries.
Hazardous Waste Control Act (HWCA)					
Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage or disposal of hazardous waste prohibited.	Resource Conservation and Recovery Act (RCRA) hazardous waste; treatment, storage or disposal of hazardous waste	40 CFR 264.18 (a)	Not an ARAR	The Site is not known to be within 61 meters of a fault displaced in the Holocene time.
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste.	40 CFR 264.18(b)	Not an ARAR	Portions of the OU included in this proposed action are within a 100-year floodplain.
Within salt dome formation, underground mine, or cave	Placement of noncontainerized or bulk liquid hazardous waste prohibited.	RCRA hazardous waste placement.	40 CFR 264.18(c)	Not an ARAR	The Site is not located within a salt dome, underground mine, or cave.
Executive Order 11988, Protection of Floodplains					

Table 6-3

Potential Federal Location-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR /TBC Evaluation	Comments
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Not an ARAR	Portions of the OU included in this proposed action are within a designated floodplain.
Rivers and Harbors Act of 1972					
Navigable waters	Permits are required for structures or work affecting navigable waters.	Activities affecting navigable waters.	33 USC 403	Not an ARAR	Response activities would not affect navigable waters.

Table 6-4

Potential State and Local Location-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Endangered Species					
Endangered Species	Protection of endangered species (DNR)	Endangered Species	Minnesota Rules Ch. 6134, Endangered, Threatened, Special Concern Species	Applicable	There are no records of endangered plant or animal species located on the portions of the OU that would be remediated.
Protected Waters/Water Appropriation					
Surface Water	Classifies lakes and wetlands, appropriation permitting (DNR)	Protected Waters/Water Appropriation	Minnesota Rules Ch. 6115, Public Water Resources	Applicable	Surface water bodies would be protected during remedial action.
Surface Water	Shoreland alterations or structures (DNR)	Shoreland Management	Minnesota Rules Ch. 6120, Shoreland and Floodplain Management	Applicable	Surface water bodies would be protected during remedial action.
Wetlands Conservation Act					
Wetlands	Protection of wetlands	Presence of wetlands	Minnesota Statute 103G.221-2373	Applicable	There is wetland within OU5.
Wetlands conservation	Protection of wetlands, wetland functions for determining public values.		Minnesota Rules 8420, Wetland Conservation	Applicable	There is wetland within OU5.
State Advisories					
Fish Consumption Advisories	Consumption guidelines for lakes and rivers where fish have been tested for contaminants.	Advisories established by Minnesota Department of Health	Fish Consumption Advice (MDH Website)	TBC	Fish consumption advisories have been established for Middle Twin Lake but are not applicable or relevant to remedial actions.
Shingle Creek Watershed Management Organization Rules and Standards					
Floodplain Alteration	Requires compensatory storage for floodplain fill.	Alteration or filling of land below the 100-year critical flood elevation of any public waters	Shingle Creek WMO, Rule F	Applicable	Portions of OU5 are within the 100-year floodplain.
Wetland Alteration	Requires replacement of affected wetlands where avoidance is not feasible and prudent.	Presence of wetlands	Shingle Creek WMO, Rule G	Applicable	There is wetland within OU5.
City of Brooklyn Center Ordinances					
Zoning Ordinance	Restricts use of property that is inconsistent with the City's designated uses.	Land development in Brooklyn Center	City of Brooklyn Center Code of Ordinances, Chapter 35	Applicable within City of Brooklyn Center	Designates land use classifications for the City of Brooklyn Center – would apply to future use of site.

Table 6-5

Potential Federal and State Chemical-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Soil					
Addressing dioxin in soil at CERCLA and RCRA sites.	Recommend preliminary PRGs of starting points for cleanup levels at CERCLA and RCRA sites.	CERCLA/RCRA site with dioxin contamination.	OSWER Directive 9200.4-26, April 13, 1998	Potential ARAR/TBC	Considered in development of risk-based soil PRGs.
Evaluating human health risk caused by exposure to contaminated soil.	Tier 1 and Tier 2 Soil Reference Values (SRVs)	Incidental soil ingestion, dermal contact with soil, and inhalation of outdoor vapors and particulates from soil.	Risk-Based Guidance for the Soil – Human Health Pathway, MPCA Risk-Based Site Evaluation Manual	TBC	Considered in development of risk-based soil PRGs.
Evaluating the risk to groundwater at sites form the soil-to-groundwater pathway	Tier 1 and Tier 2 Soil Leaching Values (SLVs)	Contaminants leaching to groundwater and potential exposure to groundwater.	Risk-Based Guidance for Evaluating the Soil Leaching Pathway, MPCA Risk-Based Site Evaluation Manual	TBC	Considered in development of risk-based soil PRGs.
Groundwater					
Groundwater, public water supplies	Meet National Primary Standards for maximum contaminant levels (MCLs)	Drinking water source at tap	Safe Drinking Water Act (SDWA); 40 CFR 141 40 CFR 142 40 CFR 143	Does not apply to OU being evaluated in this FS report.	Groundwater remediation underway under existing ROD.
Hazardous substances in groundwater	Establishes human health based groundwater standards (MDH) known as Health Risk Limits (HRLs)	Potential exposure to groundwater	Minnesota Rules Ch. 4717.7500 and 4717.7801 to 4717.7900	Does not apply to OU being evaluated in this FS report.	Groundwater remediation underway under existing ROD.

Table 6-5

Potential Federal and State Chemical-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Hazardous substances in groundwater	Framework for evaluating groundwater contamination and managing remediation decisions.	Use of groundwater for domestic purposes.	Groundwater Guidance Document, MPCA Risk-Based Site Evaluation Manual Drinking Water Criteria Spreadsheet (rev. 9/08)	Does not apply to OU being evaluated in this FS report.	Groundwater remediation underway under existing ROD.
Surface Water					
Surface Water	Ambient Water Quality Criteria established to protect aquatic life and human consumers of water or aquatic life.	Activities that affect or may affect surface water.	40 CFR 131, Water Quality Standards	Applicable	Remedial actions need to protect surface waters.
Surface Water Screening Criteria	Establishes human health-based and ecological surface water criteria	Activities that affect or may affect the surface water.	Surface Water Pathway Evaluation User's Guide, Tables 1 and 11, MPCA Risk-based Site Evaluation Manual	TBC	Considered in development of alternatives. Remedial actions need to protect surface water.
Air					
Ambient Air Quality Standards	Establishes acceptable air concentrations	Activity affects air quality.	Minnesota Rules Ch. 7009	Applicable	Applies to site activities.
Standards for Stationary Sources	Compliance with applicable state air pollution control rules for new and existing emission facilities	Emission from stationary sources.	Minnesota Rules Ch. 7011 (except 7011.0150 and 7011.8010)	Does not apply to OUs being evaluated in this FS report.	No emission facilities are planned at the Site.
Standards for Stationary Sources	Limits on visible emissions beyond the property boundary.	Activities that generate fugitive dust.	Minnesota Rules Ch. 7011.0150	Applicable	Implement reasonable measures as necessary to prevent particulate matter from becoming airborne.

Table 6-5

Potential Federal and State Chemical-Specific ARARs and TBCs
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Standard	Requirement	Prerequisite	Citation	Potential ARAR/TBC Evaluation	Comments
Standards for Hazardous Air Pollutants: Site Remediation	Establishes emissions limitations and work practice standards for hazardous air pollutants emitted from site remediation activities.	Emission of hazardous air pollutant.	Minnesota Rules Ch. 7011.8010, adopts 40 CFR 63 Subpart GGGGG, by reference	Not an ARAR	Site remediation in not subject to this subpart since the site remediation will be performed under the authority of CERCLA (*See* 40 CFR 63.7881 (b) (2)).
Intrusion Screening Values (ISV) (September 24, 2008)	For evaluating the potential risks to human health caused by exposure to volatile compounds in buildings	Presence of volatile compounds in soil or shallow groundwater.	Risk-Based Guidance for the Vapor Intrusion Pathway, MPCA Risk-Based Site Evaluation Manual	Not an ARAR	No volatile compounds are present in soil or shallow groundwater.
All Media					
Carcinogenic PAHs in media	Estimating health risks from carcinogenic PAHs.	Potential PAH exposure to humans	MDH guidance Document, July 2, 2004.	TBC	Considered in development of risk-based soil PRGs.
Dioxin-like compounds in media	Estimating health risks from dioxin- like compounds.	Potential dioxin-like compound exposure to humans	MDH Guidance Document October 2006.	TBC	Considered in development of risk-based soil PRGs.
Hazardous substances in media	Guidelines and criteria for screening human health and ecological risks.	Potential hazardous substance exposure to humans and ecology	April 26, 1996 Working Site Screening Evaluation Guidelines. MPCA Risk-Based Site Evaluation Manual	TBC	Considered in development of risk-based soil PRGs.

Table 7

Summary of Remedial Alternative Costs
Joslyn Manufacturing & Supply Co.
Brooklyn Center, Minnesota

Alternative	Capital	O&M	Total Cost
Alternative 1 – No Action	$0	$530,000	$530,000
Alternative 2 – Stormwater Management Modifications	$1,700,000	$624,000	$2,320,000
Alternative 3 – Excavation for Offsite Treatment and Disposal	$67,350,000	$624,000	$67,970,000
Alternative 4 – In-Place Soil Cover	$14,590,000	$624,000	$15,210,000
Alternative 5 – Onsite Consolidation with Soil Cover at West Area	$4,330,000	$624,000	$4,950,000
Alternative 6 – Onsite Consolidation with Soil Cover at Azelia Avenue Pond	$4,740,000	$1,131,000	$5,870,000
Alternative 7 – Limited Onsite Consolidation with Soil Cover at Building 1A Pond	$4,600,000	$780,000	$5,380,000
Alternative 8A – Limited Onsite Consolidation with Soil Cover at West Area (Offsite Floodplain Mitigation)	$4,730,000	$624,000	$5,350,000
Alternative 8B – Limited Onsite Consolidation with Soil Cover at West Area (Onsite Floodplain Mitigation)	$4,160,000	$624,000	$4,780,000

Table 8

Cost Effectiveness Matrix
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Alternative	Cost Effective?	Total Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume (TMV) Through Treatment	Short-Term Effectiveness
Alternative 1- No Action	NA[1]	$530,000	N/A	No reduction in long-term risk	No reduction of TMV	No short-term risk to workers, community, or environment
Alternative 2- Stormwater Management Modifications	NA[1]	$2,320,000	+$1,790,000	+ Limited reduction in long-term risk	= No reduction of TMV	- Controllable risk to workers, community, and environment
Alternative 8B - Limited Onsite Consolidation with Soil Cover at West Area (Onsite Floodplain Mitigation)	Yes	$4,780,000	+$2,460,000	+ Reduces long-term risk to acceptable levels	+ Reduction of TMV through reduction in mobility through capping and off-site disposal of some soil	- Controllable risk to workers, community, and environment
Alternative 5 - Onsite Consolidation with Soil Cover at West Area	Yes	$4,950,000	+$170,000	- Reduces long-term risk to acceptable levels	- Reduction of TMV through reduction in mobility through capping	= Controllable risk to workers, community, and environment
Alternative 8A - Limited Onsite Consolidation with Soil Cover at West Area (Offsite Floodplain Mitigation)	Yes	$5,350,000	+$400,000	+ Reduces long-term risk to acceptable levels	+ Reduction of TMV through reduction in mobility through capping and off-site disposal of some soil	= Controllable risk to workers, community, and environment
Alternative 7 - Limited Onsite Consolidation with Soil Cover at Building 1A Pond	Yes	$5,380,000	+$30,000	= Reduces long-term risk to acceptable levels	= Reduction of TMV through reduction in mobility through capping and off-site disposal of some soil	- Controllable risk to workers, community, and environment
Alternative 6 – Onsite Consolidation with Soil Cover at Azelia Avenue Pond	Yes	$5,870,000	+$490,000	- Reduces long-term risk to acceptable levels	- Reduction of TMV through reduction in mobility through capping	= Controllable risk to workers, community, and environment
Alternative 4- In Place Soil Cover	No	$15,210,000	+$9,340,000	= Reduces long-term risk to acceptable levels	= Reduction of TMV through reduction in mobility through capping	+ Controllable risk to workers, community, and environment
Alternative 3- Excavation for Offsite Treatment and Disposal	No	$67,970,000	+$52,760,000	+ Reduces long-term risk to acceptable levels	+ Reduction of TMV through treatment	- Controllable risk to workers, community, and environment.

Notes: 1. These alternatives are not protective of human health or the environment and are therefore not considered cost effective.

Key:

+ More effective compared with previous alternative
- Less effective compared with previous alternative
= No change compared with previous alternative

Relevant Considerations for Cost Effectiveness Determination:

- Site is currently open space with a perimeter fence that makes it inaccessible to the public; it is directly adjacent to Middle Twin Lake.
- Targeted soil contamination cleanup area is 8.3 acres for Alternatives 3, 4, 5, 6, 7, and 8.
- Alternative 3 may result in longest possible exposure to COCs during construction.

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	WA-1	WA-1	WA1-2014-1	WA1-2014-2	WA-2	WA-2	WA-3	WA-4	WA-5	WA-6MID (ALTA)	WA-6MID (STL)	WA-6MID (CAS)	WA-6MID (CAS)	WA-6N	WA-6S (STL)	WA-6S (CAS)	WA-6S (CAS)	WA-6S (ALTA)	W
		Date	12/04/1998	10/06/2000	1/16/2014	1/16/2014	12/04/1998	10/06/2000	10/06/2000	12/04/1998	12/04/1998	10/6/2000	10/6/2000	10/6/2000	10/6/2000	10/06/2000	10/6/2000	10/6/2000	10/6/2000	10/6/2000	10/0
		Depth																			
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Analysis Location	Units																			
General Parameters																					
Carbon, total organic	Lab	%	--	4.97	--	--	--	1.31	2.90	--	--	--	--	26	24.8	2.51	--	21.7	21.4	--	1.32
pH	Field	pH units	--	7.85	--	--	--	7.99	7.43	--	--	--	--	--	6.21	7.58	--	--	6.01	--	7.32
Solids, percent	Lab	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Solids, total	Lab	%	73	--	70.4	86.8	85	--	87.3	89	27	--	--	--	30.9	77.0	--	--	33.5	--	88.4
SVOCs																					
1,6-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,8-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrofluorene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylcholanthrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Methylchrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Nitroacenapthene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6-Nitrochrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-Dimethylbenz(a)anthracene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7h-Dibenzo(c,g)carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	Lab	mg/kg	1.8	--	0.59	< 0.29	< 0.33	--	0.14	< 0.33	< 0.33	--	--	--	1.4	0.22	--	--	0.17	--	0.36
Benzo(a)pyrene	Lab	mg/kg	2.8	--	0.65	< 0.29	0.36	--	0.17	0.42	< 0.33	--	--	--	2.3	0.24	--	--	0.56	--	0.37
Benzo(b)fluoranthene	Lab	mg/kg	7.2	--	1.2	0.36	0.90	--	0.48	0.78	< 0.33	--	--	--	6.1	0.6	--	--	0.94	--	0.6
Benzo(k)fluoranthene	Lab	mg/kg	2.1	--	0.40	< 0.29	0.34	--	0.28	< 0.33	< 0.33	--	--	--	2.7	0.24	--	--	0.43	--	0.41
Chrysene	Lab	mg/kg	2.6	--	1.2	< 0.29	0.34	--	0.33	0.41	< 0.33	--	--	--	2.7	0.31	--	--	0.48	--	0.59
Dibenz(a,h)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	Lab	mg/kg	< 0.33	--	< 0.35	< 0.29	< 0.33	--	0.054	< 0.33	< 0.33	--	--	--	0.77	0.094	--	--	0.16	--	0.091
Dibenz(a,j)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,i)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,l)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	mg/kg	0.65	--	0.52	< 0.29	< 0.33	--	0.24	< 0.33	< 0.33	--	--	--	11	1.1	--	--	0.71	--	0.57
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Calc	mg/kg	4.0	--	0.93	0.036	0.49	--	0.32	0.50	ND	--	--	--	4.9	0.51	--	--	0.88	--	0.62
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Calc	mg/kg	4.1	--	1.0	0.31	0.61	--	0.32	0.64	0.33	--	--	--	4.9	0.51	--	--	0.88	--	0.62
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Calc	mg/kg	--	--	1.1	0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	Lab	mg/kg	< 0.33	--	< 0.35	< 0.29	< 0.33	--	< 0.005	< 0.33	< 0.33	--	--	--	<0.05	< 0.005	--	--	<0.05	--	< 0.005
2-Methylnaphthalene	Lab	mg/kg	< 0.33	--	< 0.35	< 0.29	< 0.33	--	0.022	< 0.33	< 0.33	--	--	--	0.26	< 0.005	--	--	0.11	--	0.033

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	WA-1	WA-1	WA1-2014-1	WA1-2014-2	WA-2	WA-2	WA-3	WA-4	WA-5	WA-6MID (ALTA)	WA-6MID (STL)	WA-6MID (CAS)	WA-6MID (CAS)	WA-6N	WA-6S (STL)	WA-6S (CAS)	WA-6S (CAS)	WA-6S (ALTA)	W
		Date	12/04/1998	10/06/2000	1/16/2014	1/16/2014	12/04/1998	10/06/2000	10/06/2000	12/04/1998	12/04/1998	10/6/2000	10/6/2000	10/6/2000	10/6/2000	10/06/2000	10/6/2000	10/6/2000	10/6/2000	10/6/2000	10/0
		Depth																			
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Analysis Location	Units																			
Acenaphthene	Lab	mg/kg	< 0.33	--	< 0.35	< 0.29	< 0.33	--	< 0.005	< 0.33	< 0.33	--	--	--	**0.063**	**0.048**	--	--	<0.05	--	**0.01**
Acenaphthylene	Lab	mg/kg	< 0.33	--	< 0.35	< 0.29	< 0.33	--	**0.023**	< 0.33	< 0.33	--	--	--	**0.54**	**0.053**	--	--	**0.13**	--	**0.032**
Anthracene	Lab	mg/kg	**0.56**	--	**0.53**	< 0.29	< 0.33	--	**0.11**	< 0.33	< 0.33	--	--	--	**3.1**	**0.44**	--	--	**0.38**	--	**0.89**
B(a)P Equivalent, 1999 PEFs	Lab	mg/kg	**3.8**	--	--	--	**0.45**	--	**0.31**	**0.50**	ND	--	--	--	**4.9**	**0.53**	--	--	**0.91**	--	**0.62**
Benzo(e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Lab	mg/kg	**0.67**	--	**0.52**	< 0.29	< 0.33	--	**0.15**	< 0.33	< 0.33	--	--	--	**3.1**	**0.49**	--	--	**0.38**	--	**0.32**
Carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	Lab	mg/kg	**4.1**	--	**1.3**	< 0.29	< 0.33	--	**0.2 b**	< 0.33	< 0.33	--	--	--	**3.6**	**0.55**	--	--	**0.29**	--	**0.64**
Fluorene	Lab	mg/kg	< 0.33	--	< 0.35	< 0.29	< 0.33	--	< 0.005	< 0.33	< 0.33	--	--	--	**0.065**	**0.055**	--	--	<0.05	--	**0.068**
Naphthalene	Lab	mg/kg	< 0.33	--	< 0.35	< 0.29	< 0.33	--	**0.012**	< 0.33	< 0.33	--	--	--	**0.2**	< 0.005	--	--	**0.061**	--	**0.025**
Pentachlorophenol	Lab	mg/kg	**4.2**	--	< 2.2	**2.2**	**2.3**	--	**39**	< 0.33	< 0.33	--	--	--	**120 e**	**0.72**	--	--	**120**	--	**0.83**
Perylene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	Lab	mg/kg	**1.5**	--	**0.59**	< 0.29	< 0.33	--	**0.066**	< 0.33	< 0.33	--	--	--	**0.85**	**0.16**	--	--	**0.14**	--	**0.23**
Pyrene	Lab	mg/kg	**5.1**	--	**1.2**	< 0.29	**0.41**	--	**0.33**	< 0.33	< 0.33	--	--	--	**3.6**	**0.48**	--	--	**0.49**	--	**0.62**
Chlorinated Dioxins / Furans																					
2,3,7,8-Dioxin, tetra	Lab	ng/kg	**7.8**	--	**5.56**	**2.65 EMPC**	**6.5**	--	**9.61**	< 0.1	**0.56 jEMPC**	**1100**	**2000**	--	**1330**	**7.18**	**430**	--	**466**	**262**	**1.41**
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	**63.4**	--	**52.3**	**24.8**	**51.7**	--	**256**	**0.44 jEMPC**	**4.2 j**	**20000**	**29000**	--	**14100**	**61.6**	**8000 e**	--	**5760**	**5880**	**15.3**
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	**177**	--	**231**	**94.2**	**218**	--	**561**	**1.6 j**	**12.1**	**144000**	**180000**	--	**79600**	**233**	**26000**	--	**29700**	**22900**	**381**
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	**1280**	--	**867**	**649**	**1000**	--	**10500**	**5.0**	**45.1**	**168000 e**	**210000**	--	**105000**	**627**	**110000**	--	**112000**	**95300**	**495**
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	**502**	--	**628**	**247**	**478**	--	**1920**	**3.9 j**	**33.3**	**96900**	**140000**	--	**60400**	**328**	**28000**	--	**31900**	**35900**	**81.8**
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	**32550 e**	--	**30200**	**28400**	**19920 e**	--	**251000**	**125**	**1310**	**6540000 e**	**4400000 ej**	--	**430000**	**16400**	**2300000 e**	--	**1870000**	**2930000 e**	**10100**
Dioxin, octa	Lab	ng/kg	**267630 e**	--	**301000**	**388000**	**237280 e**	--	**465000**	**968**	**11330 e**	**52000000 e**	**7000000 ej**	--	**2030000**	**117000**	**4900000 ej**	--	**1800000**	**23500000 e**	**120000**
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	**42.5**	--	**27.0**	**12.1**	**28.3**	--	**8.31**	**0.92 j**	**1.7 jEMPC**	**1340**	**1300 e**	--	**1120**	**4.75**	**130**	--	**114**	**124**	**9.91**
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	**164**	--	**111**	**69.3**	**103**	--	**59.2**	**0.56 j**	**3.8 j**	**8600**	**10000**	--	**6600**	**28.8**	**1000**	--	**722**	**893**	**63.2**
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	**183**	--	**113**	**71.3**	**105**	--	**145**	**0.70 j**	**5.1**	**16800**	**8600**	--	**12500**	**60.8**	**1300**	--	**1840**	**2290**	**123**
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	**1170**	--	**887**	**630**	**793**	--	**3050**	**3.7 j**	**33.0**	**62500**	**79000**	--	**54300**	**239**	**37000 e**	--	**30400**	**30900**	**458**
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**341**	--	**202**	**121**	**214**	--	**1770**	**1.3 j**	**10.0**	**17500**	**22000**	--	**14200 (1)**	**101**	**8900 e**	--	**12600**	**8490**	**149**
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**514**	--	**344**	**204**	**307**	--	**1440**	**2.0 jEMPC**	**16.2**	**34900**	**12000**	--	**17700**	**123**	**5200**	--	**13500**	**13900**	**1410**
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	**58.9**	--	< 10.7	< 7.44	**44.4 ***	--	**286**	< 0.06	**2.1 j***	**23600**	**3600**	--	**21000**	**110**	**500**	--	**3730**	**3270**	**302**
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	**9640 e**	--	**8560**	**7050**	**8500 e**	--	**101000**	**40.1**	**357**	**1210000 e**	**1100000 ej**	--	**151000**	**4230**	**1200000 ej**	--	**958000**	**1240000 e**	**4250**
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	**1110**	--	**504**	**421**	**686**	--	**7300**	**2.2 j**	**24.1**	**79700**	**91000 j**	--	**12700**	**286**	**88000 j**	--	**63500**	**65500**	**437**
Dibenzofuran, octa	Lab	ng/kg	**41080 BQU**	--	**29400**	**35900**	**39420 e**	--	**618000**	**111**	**961**	**4840000 e**	**3400000 ej**	--	**504000**	**17700**	**3200000 ej**	--	**920000**	**7900000 e**	**12200**
TEQ $_{DF}$ WHO05 ' non-detects at zero for the detection limit	Calc	ng/kg	**1065.173**	--	--	--	**775.13**	--	**6182.317**	**4.5055**	**42.3523**	**176621**	**157700**	--	**61407.2**	**514.029**	**68733**	--	**59925.06**	**79709.19**	**571.707**
TEQ DF WHO05, non-detects at half of the detection limit	Calc	ng/kg	**1065.173**	--	--	--	**775.13**	--	**6182.317**	**4.5585**	**42.3523**	**176621**	**157700**	--	**61407.2**	**514.029**	**68733**	--	**59925.06**	**79709.19**	**571.707**
Dioxin TEQ (by method 4425)	Lab	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	**905**	**733 a**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	**905**	**731 a**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	**907**	**733 a**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	**907**	**732 a**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	**906**	**733 a**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2)	Calc	ng/kg	--	--	**906**	**732 a**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

Location			A-8	WA4-2014-1 (0-0.5)	WA4-2014-2 (0-2.5)	WA4-2014-3 (0-5.5)	WA4-2014-3 (5.5-6)	WA4-2014-4 (0-4.5)	WA4-2014-4 (4.5-5)	WA4-2014-5 (0-0.5)	WA4-2014-5 (2-4.5)	WA4-2014-5 (4.5-5)	WA4-2014-6 (2-3.5)	WA4-2014-6 (3.5-4)	A-1	A-2	A-3 0-0.5'	A-3 0.5-1.5'	A-3 1.5-2.5'		A-3 2.5-4'
Date			6/2000	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003		2/04/2003
Depth				0 - 0.5 ft	0 - 2.5 ft	0 - 5.5 ft	5.5 - 6 ft	0 - 4.5 ft	4.5 - 5 ft	0 - 0.5 ft	2 - 4.5 ft	4.5 - 5 ft	2 - 3.5 ft	3.5 - 4 ft							
Sample Type			FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	Analysis Location	Units																			
General Parameters																					
Carbon, total organic	Lab	%	**1.08**	--	--	--	--	--	--	--	--	--	--	--	**0.44**	**5.08**	**9.63**	**3.36**	**0.51**	**0.61**	**0.65**
pH	Field	pH units	**7.28**	--	--	--	--	--	--	--	--	--	--	--	**7.27**	**7.06**	**6.82**	**7.01**	**7.26**	**7.58**	**7.27**
Solids, percent	Lab	%	--	--	--	--	--	--	--	--	--	--	--	--	**92.0**	**69.3**	**45.4**	**71.4**	**84.3**	**86.2**	**85.5**
Solids, total	Lab	%	**90.1**	**85.2**	**94.2**	**94.8**	**91.4**	**94.2**	**97.5**	**80.7**	**93.1**	**91.5**	**95.1**	**76.3**	--	--	--	--	--	--	--
SVOCs																					
1,6-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,8-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrofluorene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylcholanthrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Methylchrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Nitroacenapthene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6-Nitrochrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-Dimethylbenz(a)anthracene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7h-Dibenzo(c,g)carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	Lab	mg/kg	**0.26**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Benzo(a)pyrene	Lab	mg/kg	**0.29**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Benzo(b)fluoranthene	Lab	mg/kg	**0.45**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Benzo(k)fluoranthene	Lab	mg/kg	**0.32**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Chrysene	Lab	mg/kg	**0.43**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Dibenz(a,h)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	Lab	mg/kg	**0.068**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Dibenz(a,j)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,i)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,l)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	mg/kg	**0.42**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Calc	mg/kg	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Calc	mg/kg	--	**0.29**	**0.27**	**0.26**	**0.28**	**0.27**	**0.26**	**0.31**	**0.33**	**0.33**	**0.26**	**0.33**	**0.35**	**0.41**	**0.60**	**0.46**	**0.39**	**0.33**	**0.38**
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Calc	mg/kg	--	**0.57**	**0.53**	**0.51**	**0.55**	**0.53**	**0.51**	**0.61**	**0.65**	**0.65**	**0.51**	**0.65**	**0.71**	**0.83**	**1.2**	**0.93**	**0.79**	**0.65**	**0.77**
2-Chloronaphthalene	Lab	mg/kg	< 0.005	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
2-Methylnaphthalene	Lab	mg/kg	**0.007**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	/A-8	WA4-2014-1 (0-0.5)	WA4-2014-2 (0-2.5)	WA4-2014-3 (0-5.5)	WA4-2014-3 (5.5-6)	WA4-2014-4 (0-4.5)	WA4-2014-4 (4.5-5)	WA4-2014-5 (0-0.5)	WA4-2014-5 (2-4.5)	WA4-2014-5 (4.5-5)	WA4-2014-6 (2-3.5)	WA4-2014-6 (3.5-4)	A-1	A-2	A-3 0-0.5'	A-3 0.5-1.5'	A-3 1.5-2.5'		A-3 2.5-4'
		Date	6/2000	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	1/16/2014	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003		2/04/2003
		Depth		0 - 0.5 ft	0 - 2.5 ft	0 - 5.5 ft	5.5 - 6 ft	0 - 4.5 ft	4.5 - 5 ft	0 - 0.5 ft	2 - 4.5 ft	4.5 - 5 ft	2 - 3.5 ft	3.5 - 4 ft							
		Sample Type	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	Analysis Location	Units																			
Acenaphthene	Lab	mg/kg	**0.007**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Acenaphthylene	Lab	mg/kg	**0.021**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Anthracene	Lab	mg/kg	**0.11**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
B(a)P Equivalent, 1999 PEFs	Lab	mg/kg	**0.47**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Lab	mg/kg	**0.26**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	Lab	mg/kg	**0.46**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Fluorene	Lab	mg/kg	**0.007**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Naphthalene	Lab	mg/kg	**0.006**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Pentachlorophenol	Lab	mg/kg	**0.71**	< 1.8	< 1.6	< 1.6	< 1.7	< 1.6	< 1.6	< 1.9	< 2.0	< 2.0	< 1.6	< 2.0	< 2.2	< 2.6	< 3.7	< 2.8	< 2.4	< 2.0	**18**
Perylene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	Lab	mg/kg	**0.09**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Pyrene	Lab	mg/kg	**0.43**	< 0.29	< 0.27	< 0.26	< 0.28	< 0.27	< 0.26	< 0.31	< 0.33	< 0.33	< 0.26	< 0.33	< 0.36	< 0.42	< 0.61	< 0.47	< 0.40	< 0.33	< 0.39
Chlorinated Dioxins / Furans																					
2,3,7,8-Dioxin, tetra	Lab	ng/kg	**2.76**	**0.443 EMPC**	< 0.281	< 0.241	< 0.250	< 0.216	< 0.201	< 0.254	< 0.148	< 0.180	< 0.222	< 0.188	--	--	--	--	--	--	--
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	**22.1**	**1.64 j**	**0.337 j**	< 0.191	< 0.151	**0.191 EMPC**	< 0.163	**1.53 j**	< 0.140	< 0.141	< 0.134	**0.205 EMPC**	--	--	--	--	--	--	--
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	**72.1**	**4.79**	**0.738 j**	< 0.198	< 0.212	**0.431 EMPC**	< 0.156	**3.39**	< 0.303	< 0.198	< 0.153	**0.367 j**	--	--	--	--	--	--	--
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	**82.5**	**16.7**	**4.06 EMPC**	< 0.203	< 0.208	**1.69 j**	< 0.153	**13.2**	**0.780 j**	**0.450 EMPC**	**0.398 EMPC**	**2.07 j**	--	--	--	--	--	--	--
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	**98.5**	**12.2**	**1.83 j**	< 0.201	< 0.211	**1.20 j**	< 0.155	**8.50**	**0.406 jb**	< 0.202	**0.377 EMPC**	**1.05 jb**	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	**10400**	**541**	**124**	**4.15**	**1.87 j**	**50.3**	**0.622 j**	**393**	**16.1**	**8.29**	**5.62**	**74.5**	--	--	--	--	--	--	--
Dioxin, octa	Lab	ng/kg	**102000**	**5390 e**	**1400**	**40.5**	**19.8**	**498**	**4.50 jb**	**3920**	**154**	**84.0**	**31.4**	**1050**	--	--	--	--	--	--	--
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	**13.3**	< 0.660	< 0.155	< 0.148	< 0.154	< 0.123	< 0.107	< 0.750	< 0.0853	< 0.112	< 0.121	< 0.137	--	--	--	--	--	--	--
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	**70.5**	**1.17 j**	< 0.142	< 0.152	< 0.148	< 0.128	< 0.137	**1.09 EMPC**	< 0.132	< 0.115	< 0.121	< 0.169	--	--	--	--	--	--	--
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	**138**	**1.38 j**	**0.178 EMPC**	< 0.147	< 0.144	**0.274 EMPC**	< 0.135	**1.22 EMPC**	< 0.141	< 0.121	< 0.121	< 0.172	--	--	--	--	--	--	--
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	**554**	**10.7**	**0.935 EMPC**	< 0.148	< 0.112	**1.52 j**	< 0.144	**10.5**	**0.673 j**	**0.375 j**	< 0.145	**1.86 j**	--	--	--	--	--	--	--
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**186 EMPC**	**3.92 EMPC**	< 0.587	< 0.123	< 0.0918	**0.387 j**	< 0.121	**2.42 EMPC**	**0.217 j**	< 0.145	< 0.119	**0.502 EMPC**	--	--	--	--	--	--	--
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**206**	**7.19**	**0.742 EMPC**	< 0.139	< 0.104	**0.703 EMPC**	< 0.136	**5.09**	**0.374 EMPC**	< 0.168	< 0.133	**0.762 EMPC**	--	--	--	--	--	--	--
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	**197**	< 0.811	< 0.982	< 0.209	< 0.153	< 0.368	< 0.205	< 0.991	< 0.250	< 0.252	< 0.199	< 0.370	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	**4740**	**183**	**79.0**	**1.28 j**	**0.759 EMPC**	**17.4**	**0.209 EMPC**	**141**	**6.74**	**3.29**	**1.40 j**	**28.0**	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	**460**	**8.93**	**2.83 EMPC**	< 0.314	< 0.327	**1.26 j**	< 0.211	**9.23**	**0.753 bEMPC**	< 0.272	< 0.237	**1.77 j**	--	--	--	--	--	--	--
Dibenzofuran, octa	Lab	ng/kg	**12800**	**749**	**413**	**5.07 j**	**2.31 j**	**61.3**	**0.956 j**	**580**	**17.2**	**8.91**	**3.85 j**	**118**	--	--	--	--	--	--	--
TEQ $_{DF}$ WHO05 ' non-detects at zero for the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEQ DF WHO05, non-detects at half of the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin TEQ (by method 4425)	Lab	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	**40 b**	**194**	**227**	**189**	**56 ***	**15 b***	**106**
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	**17.3 a**	**3.82 a**	**0.0680 a**	**0.0329 a**	**1.72 a**	**0.00860 a**	**13.0 a**	**0.484 a**	**0.226 a**	**0.158 a**	**2.15 a**	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	**16.8 a**	**3.50 a**	**0.068 a**	**0.0291 a**	**1.53 a**	**0.00755 a**	**12.7 a**	**0.465 a**	**0.204 a**	**0.120 a**	**1.99 a**	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	**17.4 a**	**4.28 a**	**0.689 a**	**0.609 a**	**1.99 a**	**0.537 a**	**13.4 a**	**0.882 a**	**0.697 a**	**0.644 a**	**2.45 a**	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	**17.0 a**	**3.95 a**	**0.689 a**	**0.606 a**	**1.80 a**	**0.536 a**	**13.1 a**	**0.864 a**	**0.675 a**	**0.605 a**	**2.28 a**	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	**17.3 a**	**4.05 a**	**0.378 a**	**0.321 a**	**1.86 a**	**0.273 a**	**13.2 a**	**0.683 a**	**0.462 a**	**0.401 a**	**2.30 a**	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2)	Calc	ng/kg	--	**16.9 a**	**3.72 a**	**0.378 a**	**0.317 a**	**1.66 a**	**0.272 a**	**12.9 a**	**0.665 a**	**0.439 a**	**0.362 a**	**2.14 a**	--	--	--	--	--	--	--

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	A-4	B-1		B-1	B-1	B-1	B-1	B-2	B-3	B-3	B-3	B-3 0.5-1.5'	B-3 0-0.5'	B-3 1.5-2.5'	B-3 2.5-4'	B-4	B-5	C-1	C-2		C-3 0-0.5'
		Date	2/04/2003	2/04/2003		2/02/2015	2/02/2015	2/02/2015	2/02/2015	2/04/2003	2/02/2015	2/02/2015	2/02/2015	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/03/2003		2/04/2003
		Depth				0.5 - 2 ft	2 - 3.5 ft	6.5 - 9 ft	9 - 10 ft		3.5 - 5 ft	5 - 6.5 ft	6.5 - 9 ft										
		Sample Type	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	Analysis Location	Units																					
General Parameters																							
Carbon, total organic	Lab	%	**5.38**	**6.05**	**5.52**	**3.81**	**2.47 h**	**0.553 h**	**0.124 h**	**3.03**	**43.7**	**42.2 h**	**11.3 h**	**21.2**	**22.8**	**31.3**	**42.3**	**13.9**	**5.34**	**10.5**	**2.79**	**2.87**	**25.8**
pH	Field	pH units	**7.31**	**7.32**	**7.47**	--	--	--	--	**6.69**	--	--	--	**6.34**	**6.65**	**6.24**	**6.22**	**5.93**	**7.37**	**6.87**	**5.95**	**6.09**	**6.07**
Solids, percent	Lab	%	**66.9**	**63.2**	**64.7**	--	--	--	--	**70.1**	--	--	--	**17.0**	**4.10**	**22.9**	**23.9**	**34.1**	**73.5**	**44.4**	**64.6**	**70.3**	**11.2**
Solids, total	Lab	%	--	--	--	**80.5**	**74.0**	**82.3**	**83.6**	--	**22.1**	**19.0**	**27.6**	--	--	--	--	--	--	--	--	--	--
SVOCs																							
1,6-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,8-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrofluorene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylcholanthrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Methylchrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Nitroacenapthene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6-Nitrochrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-Dimethylbenz(a)anthracene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7h-Dibenzo(c,g)carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
Benzo(a)pyrene	Lab	mg/kg	< 0.48	< 2.3	< 2.3	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 7.0	< 0.51	< 0.36	**3.3**
Benzo(b)fluoranthene	Lab	mg/kg	< 0.48	< 2.3	< 2.3	--	--	--	--	< 0.46	--	--	--	**2.6**	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 7.0	**0.65**	**0.58**	**14**
Benzo(k)fluoranthene	Lab	mg/kg	< 0.48	< 2.3	< 2.3	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 7.0	< 0.51	< 0.36	**6.5**
Chrysene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	**1.0**	< 0.51	< 0.36	**5.6**
Dibenz(a,h)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	Lab	mg/kg	< 0.48	< 2.3	< 2.3	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 7.0	< 0.51	< 0.36	< 3.0
Dibenz(a,j)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,i)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,l)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	mg/kg	< 0.48	< 2.3	< 2.3	--	--	--	--	< 0.46	--	--	--	**2.2**	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 7.0	< 0.51	**0.39**	**9.2**
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Calc	mg/kg	ND	ND	--	--	--	--	--	ND	--	--	--	ND	ND	**0.48**	ND	ND	ND	**0.010**	**0.065**	--	**6.3**
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Calc	mg/kg	**0.47**	**2.2**	--	--	--	--	--	**0.45**	--	--	--	**2.3**	**8.0**	**1.4**	**1.4**	**0.72**	**0.38**	**6.6**	**0.54**	**--**	**7.3**
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Calc	mg/kg	**0.95**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
2-Methylnaphthalene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	A-4	B-1		B-1	B-1	B-1	B-1	B-2	B-3	B-3	B-3	B-3 0.5-1.5'	B-3 0-0.5'	B-3 1.5-2.5'	B-3 2.5-4'	B-4	B-5	C-1	C-2		C-3 0-0.5'
		Date	2/04/2003	2/04/2003		2/02/2015	2/02/2015	2/02/2015	2/02/2015	2/04/2003	2/02/2015	2/02/2015	2/02/2015	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/04/2003	2/03/2003		2/04/2003
		Depth				0.5 - 2 ft	2 - 3.5 ft	6.5 - 9 ft	9 - 10 ft		3.5 - 5 ft	5 - 6.5 ft	6.5 - 9 ft										
		Sample Type	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	Analysis Location	Units																					
Acenaphthene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
Acenaphthylene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
Anthracene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
B(a)P Equivalent, 1999 PEFs	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Lab	mg/kg	< 0.48	< 2.3	< 2.3	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	**2.0**	< 0.39	< 7.0	< 0.51	**0.38**	**8.4**
Carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	Lab	mg/kg	**0.63**	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	**1.1**	< 0.51	< 0.36	**4.6**
Fluorene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
Naphthalene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
Pentachlorophenol	Lab	mg/kg	< 2.9	**69**	**69**	--	--	--	--	**8.1**	--	--	--	**51**	**71**	**59**	< 8.4	< 4.4	< 2.4	**76**	< 3.1	< 2.2	**55**
Perylene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	Lab	mg/kg	< 0.48	< 0.45	< 0.45	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	< 0.70	< 0.51	< 0.36	< 3.0
Pyrene	Lab	mg/kg	**0.57**	**0.54**	**0.56**	--	--	--	--	< 0.46	--	--	--	< 2.0	< 8.1	< 1.4	< 1.4	< 0.73	< 0.39	**1.6**	< 0.51	< 0.36	**5.8**
Chlorinated Dioxins / Furans																							
2,3,7,8-Dioxin, tetra	Lab	ng/kg	--	--	--	**5.88**	**0.575 EMPC**	**0.247 EMPC**	< 0.307	--	< 0.572	**4.59**	< 0.592	--	< 1.0 h	--	--	--	--	--	--	--	--
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	--	--	--	**149**	**17.9**	**5.77**	< 0.773	--	**14.5**	**41.4**	< 0.755	--	**3266.494 jh**	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	--	--	--	**522**	**96.4**	**74.2**	**6.51**	--	**160**	**194**	< 0.454	--	**13807.604 jh**	--	--	--	--	--	--	--	--
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	--	--	--	**11900**	**4510 EMPC**	**4620**	**329**	--	**3430**	**1530**	**2.37 EMPC**	--	**34183.592 h**	--	--	--	--	--	--	--	--
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	--	--	--	**1070**	**292**	**497**	**101**	--	**306**	**336**	< 0.435	--	**35156.664 h**	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	--	--	--	**453000**	**122000 ***	**99200 ***	**27700 ***	--	**192000**	**94900 ***	**72.3**	--	**1106991.3 h**	--	--	--	--	--	--	--	--
Dioxin, octa	Lab	ng/kg	--	--	--	**15000000 e**	**3050000 ***	**762000 ***	**289000 ***	--	**3730000**	**1430000 ***	**828**	--	**5282956.4 h**	--	--	--	--	--	--	--	--
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	--	--	--	**49.8**	**41.3**	**0.529 j**	< 0.280	--	< 0.622	< 0.910	< 1.64	--	< 1.0 h	--	--	--	--	--	--	--	--
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	--	**316**	**322**	**2.39 EMPC**	< 1.07	--	**3.22 j**	**6.09 EMPC**	< 0.379	--	< 2.5 h	--	--	--	--	--	--	--	--
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	--	**702**	**697**	**10.9**	< 1.07	--	**2.51 j**	**16.4 EMPC**	< 0.368	--	< 2.5 h	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	**4820**	**2230 EMPC**	**1040 ***	**16.8**	--	**443 ***	**299 ***	**1.09 EMPC**	--	**13247.806 jh**	--	--	--	--	--	--	--	--
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	**724**	**643**	**96.8**	< 1.31	--	< 3.74	< 4.57	< 0.354	--	**3687.053 jh**	--	--	--	--	--	--	--	--
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	**1390**	**1210**	**383**	**9.31**	--	**197**	**133**	< 0.372	--	**8107.860 jh**	--	--	--	--	--	--	--	--
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	**957**	**1080**	**98.4**	< 1.44	--	< 4.35	< 5.28	< 0.471	--	**3505.404 jh**	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	--	--	--	**120000**	**39600**	**24100**	**1330**	--	**57800**	**23700**	**25.7 EMPC**	--	**394237.764 h**	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	--	--	--	**8990**	**3080**	**1260 EMPC**	**63.0**	--	**1800**	**911**	< 0.812	--	**17944.152 jh**	--	--	--	--	--	--	--	--
Dibenzofuran, octa	Lab	ng/kg	--	--	--	**3160000**	**479000 ***	**308000 ***	**9780 ***	--	**856000**	**264000 ***	**153**	--	**1609545.0 h**	--	--	--	--	--	--	--	--
TEQ $_{DF}$ WHO05 ' non-detects at zero for the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEQ DF WHO05, non-detects at half of the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin TEQ (by method 4425)	Lab	ng/kg	**229**	**13720 ***	**808 ***	--	--	--	--	**4270**	--	--	--	**76960**	**17290**	**13000**	**552**	**355**	**38 b**	**1425**	**222**	**174**	**5562**
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	**13800**	**3950 a**	**2260 a**	**427 a**	--	**4360 a**	**2000 a**	**1.62 a**	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	**13800**	**3620 a**	**2250 a**	**427 a**	--	**4360 a**	**2000 a**	**1.32 a**	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	**13800**	**3950 a**	**2260 a**	**429 a**	--	**4360 a**	**2000 a**	**3.47 a**	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	**13800**	**3620 a**	**2250 a**	**429 a**	--	**4360 a**	**2000 a**	**3.17 a**	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	**13800**	**3950 a**	**2260 a**	**428 a**	--	**4360 a**	**2000 a**	**2.55 a**	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2)	Calc	ng/kg	--	--	--	**13800**	**3620 a**	**2250 a**	**428 a**	--	**4360 a**	**2000 a**	**2.24 a**	--	--	--	--	--	--	--	--	--	--

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	C-3 0.5-1.5'	C-3 1.5-2.5'	C-3 2.5-4'	C-3	C-3	C-3	C-3	C-3	C-4	C-5	C-5R	C-5R	D-1	D-1		D-1	D-1	D-1	D-2	D-3 0-0.5'	D-3 0.5-1.5'	D-3 1.5-2.5'
		Date	2/04/2003	2/04/2003	2/04/2003	4/21/2003	2/02/2015	2/02/2015	2/02/2015	2/02/2015	2/03/2003	2/03/2003	4/21/2003	4/21/2003	2/03/2003	4/21/2003		2/02/2015	2/02/2015	2/02/2015	2/03/2003	2/04/2003	2/04/2003	2/04/2003
		Depth					3.5 - 5 ft	5 - 6.5 ft	6.5 - 9 ft	9 - 10 ft								0.5 - 2 ft	2 - 3.5 ft	3.5 - 9 ft				
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N
Parameter	Analysis Location	Units																						
General Parameters																								
Carbon, total organic	Lab	%	**24.3**	**38.2**	**40.4**	--	**39.4**	**40.2 h**	**32.2 h**	**7.33 h**	**23.8**	**9.06**	--	**4.07**	**4.35**	--	--	**1.33**	**1.37 h**	**14.3 h**	**3.13**	**35.1**	**34.7**	**37.5**
pH	Field	pH units	**6.24**	**6.03**	**6.13**	--	--	--	--	--	**6.30**	**6.87**	--	**6.82**	**7.55**	--	--	--	--	--	**6.59**	**6.07**	**6.38**	**6.74**
Solids, percent	Lab	%	**20.8**	**20.9**	**21.7**	--	--	--	--	--	**31.8**	**78.6**	--	**81.5**	**83.8**	--	--	--	--	--	**75.0**	**18.6**	**26.5**	**25.3**
Solids, total	Lab	%	--	--	--	--	**22.1**	**17.5**	**18.7**	**35.5**	--	--	--	--	--	--	--	**87.8**	**84.2**	**39.9**	--	--	--	--
SVOCs																								
1,6-Dinitropyrene	Lab	mg/kg	--	--	--	< 50.0	--	--	--	--	--	--	< 20.0	--	--	< 20.0	< 20.0 < 20.0	--	--	--	--	--	--	--
1,8-Dinitropyrene	Lab	mg/kg	--	--	--	< 50.0	--	--	--	--	--	--	< 20.0	--	--	< 20.0	< 20.0 < 20.0	--	--	--	--	--	--	--
1-Nitropyrene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	< 10.0	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
2-Nitrofluorene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	< 10.0	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
3-Methylcholanthrene	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	< 2.00	--	--	< 2.00	< 2.00 < 2.00	--	--	--	--	--	--	--
4-Nitropyrene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	< 10.0	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
5-Methylchrysene	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	**41.9**	--	--	ND pp	ND pp ND pp	--	--	--	--	--	--	--
5-Nitroacenapthene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	< 10.0	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
6-Nitrochrysene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	< 10.0	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
7,12-Dimethylbenz(a)anthracene	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	< 2.00	--	--	< 2.00	< 2.00 < 2.00	--	--	--	--	--	--	--
7h-Dibenzo(c,g)carbazole	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	< 2.00	--	--	< 2.00	< 2.00 < 2.00	--	--	--	--	--	--	--
Benz(a)anthracene	Lab	mg/kg	**1.7**	< 1.6	< 1.6	< 5.00	--	--	--	--	**1.6**	**160**	**41.7**	**43**	**2.7**	ND pp	ND pp ND pp	--	--	--	**1.1**	< 1.6	< 0.94	< 1.1
Benzo(a)pyrene	Lab	mg/kg	**2.5**	< 1.6	< 1.6	**7.26**	--	--	--	--	**3.4**	**240**	**57.5**	**80**	**1.7**	**2.09**	ND pp 2.24	--	--	--	**1.2**	< 1.6	< 0.94	< 1.1
Benzo(b)fluoranthene	Lab	mg/kg	**11**	< 1.6	< 1.6	**8.10 c**	--	--	--	--	**5.5**	**300**	**120 c**	**89**	**5.1**	**8.14 c**	**7.92 c** **8.36 c**	--	--	--	**2.8**	< 1.6	< 0.94	< 1.1
Benzo(k)fluoranthene	Lab	mg/kg	**4.6**	< 1.6	< 1.6	**8.10 c**	--	--	--	--	**2.8**	**230**	**120 c**	**76**	**2.1**	**8.14 c**	**7.92 c** **8.36 c**	--	--	--	**1.5**	< 1.6	< 0.94	< 1.1
Chrysene	Lab	mg/kg	**4.4**	< 1.6	< 1.6	< 5.00	--	--	--	--	**3.6**	**320**	**49.6**	**68**	**3.9**	**3.63**	**3.47** **3.79**	--	--	--	**2.4**	< 1.6	< 0.94	< 1.1
Dibenz(a,h)acridine	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	**4.87**	--	--	< 2.00	< 2.00 < 2.00	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	Lab	mg/kg	**1.8**	< 1.6	< 1.6	< 5.00	--	--	--	--	< 0.95	**49**	**17.8**	**23**	**0.53**	< 2.00	< 2.00 < 2.00	--	--	--	< 0.38	< 1.6	< 0.94	< 1.1
Dibenz(a,j)acridine	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	**6.27**	--	--	< 2.00	< 2.00 < 2.00	--	--	--	--	--	--	--
Dibenzo(a,e)pyrene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	< 10.0	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
Dibenzo(a,h)pyrene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	**23.8**	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
Dibenzo(a,i)pyrene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	< 10.0	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
Dibenzo(a,l)pyrene	Lab	mg/kg	--	--	--	< 25.0	--	--	--	--	--	--	**42.5**	--	--	< 10.0	< 10.0 < 10.0	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	mg/kg	**8.5**	< 1.6	< 1.6	**2.5 pp**	--	--	--	--	**2.5**	**140**	**39.4**	**53**	**1.7**	ND pp	ND pp ND pp	--	--	--	**1.2**	< 1.6	< 0.94	< 1.1
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Calc	mg/kg	**6.1**	ND	ND	--	--	--	--	--	**4.7**	**350**	--	**120**	**3.2**	--	--	--	--	--	**1.9**	ND	ND	ND
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Calc	mg/kg	**6.1**	**1.6**	**1.6**	--	--	--	--	--	**4.9**	**350**	--	**120**	**3.2**	--	--	--	--	--	**2.0**	**1.6**	**0.93**	**1.1**
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Calc	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	Lab	mg/kg	< 1.6	< 1.6	< 1.6	--	--	--	--	--	< 0.95	< 0.67	--	< 0.66	< 0.33	--	--	--	--	--	< 0.38	< 1.6	< 0.94	< 1.1
2-Methylnaphthalene	Lab	mg/kg	< 1.6	< 1.6	< 1.6	< 5.00	--	--	--	--	< 0.95	**8.4**	< 2.00	**0.83**	**0.48**	< 2.00	< 2.00 < 2.00	--	--	--	**0.43**	< 1.6	< 0.94	< 1.1

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

Location			C-3 0.5-1.5'	C-3 1.5-2.5'	C-3 2.5-4'	C-3	C-3	C-3	C-3	C-3	C-4	C-5	C-5R	C-5R	D-1	D-1		D-1	D-1	D-1	D-2	D-3 0-0.5'	D-3 0.5-1.5'	D-3 1.5-2.5'
Date			2/04/2003	2/04/2003	2/04/2003	4/21/2003	2/02/2015	2/02/2015	2/02/2015	2/02/2015	2/03/2003	2/03/2003	4/21/2003	4/21/2003	2/03/2003	4/21/2003		2/02/2015	2/02/2015	2/02/2015	2/03/2003	2/04/2003	2/04/2003	2/04/2003
Depth							3.5 - 5 ft	5 - 6.5 ft	6.5 - 9 ft	9 - 10 ft								0.5 - 2 ft	2 - 3.5 ft	3.5 - 9 ft				
Sample Type			N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N
Parameter	Analysis Location	Units																						
Acenaphthene	Lab	mg/kg	< 1.6	< 1.6	< 1.6	< 5.00	--	--	--	--	< 0.95	22	< 2.00	< 0.66	< 0.33	< 2.00	< 2.00 < 2.00	--	--	--	< 0.38	< 1.6	< 0.94	< 1.1
Acenaphthylene	Lab	mg/kg	< 1.6	< 1.6	< 1.6	< 5.00	--	--	--	--	< 0.95	2.2	7.02	1.1	< 0.33	< 2.00	< 2.00 < 2.00	--	--	--	< 0.38	< 1.6	< 0.94	< 1.1
Anthracene	Lab	mg/kg	2.4	< 1.6	< 1.6	8.92	--	--	--	--	< 0.95	99	17.9	11	0.64	3.11	3.18 3.04	--	--	--	11	< 1.6	< 0.94	< 1.1
B(a)P Equivalent, 1999 PEFs	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	83.7	--	--	3.32	3.23 3.41	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Lab	mg/kg	7.8	< 1.6	< 1.6	5.06	--	--	--	--	2.2	120	42.6	53	1.6	ND pp	ND pp 2.01	--	--	--	1.0	< 1.6	< 0.94	< 1.1
Carbazole	Lab	mg/kg	--	--	--	2.5 pp	--	--	--	--	--	--	2.67	--	--	ND pp	ND pp ND pp	--	--	--	--	--	--	--
Fluoranthene	Lab	mg/kg	3.6	< 1.6	< 1.6	< 5.00	--	--	--	--	1.3	150	20.5	25	6.2	3.87	3.94 3.79	--	--	--	1.6	< 1.6	< 0.94	< 1.1
Fluorene	Lab	mg/kg	< 1.6	< 1.6	< 1.6	< 5.00	--	--	--	--	< 0.95	24	1.00 pp	0.89	< 0.33	< 2.00	< 2.00 < 2.00	--	--	--	0.71	< 1.6	< 0.94	< 1.1
Naphthalene	Lab	mg/kg	< 1.6	< 1.6	< 1.6	< 5.00	--	--	--	--	< 0.95	12	1.00 pp	2.0	0.53	< 2.00	< 2.00 < 2.00	--	--	--	< 0.38	< 1.6	< 0.94	< 1.1
Pentachlorophenol	Lab	mg/kg	62	13	< 9.3	450	--	--	--	--	< 5.8	< 4.1	< 10.0	< 4.0	77	227	238 215	--	--	--	23	9.2	< 5.7	< 6.5
Perylene	Lab	mg/kg	--	--	--	< 5.00	--	--	--	--	--	--	17.5	--	--	< 2.00	< 2.00 < 2.00	--	--	--	--	--	--	--
Phenanthrene	Lab	mg/kg	< 1.6	< 1.6	< 1.6	< 5.00	--	--	--	--	< 0.95	110	6.86	4.7	1.6	2.69	2.65 2.73	--	--	--	1.9	< 1.6	< 0.94	< 1.1
Pyrene	Lab	mg/kg	4.8	< 1.6	< 1.6	< 5.00	--	--	--	--	1.8	180	51.0	48	9.1	5.09	5.16 5.03	--	--	--	2.2	2.1	< 0.94	< 1.1
Chlorinated Dioxins / Furans																								
2,3,7,8-Dioxin, tetra	Lab	ng/kg	--	--	--	--	< 0.156	2.04 EMPC	< 2.50	< 0.224	--	--	--	--	--	--	--	24.1	1.88 EMPC	< 0.824	--	--	--	--
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	--	--	--	--	11.8	104	29.4	0.268 EMPC	--	--	--	--	--	--	--	521	32.0	1.72 EMPC	--	--	--	--
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	--	--	--	--	79.0	501	111	1.11 EMPC	--	--	--	--	--	--	--	1700	171	7.17	--	--	--	--
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	--	--	--	--	6270	18500	1280	8.76	--	--	--	--	--	--	--	21400	2180	52.3	--	--	--	--
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	--	--	--	--	385	1100	284	1.78 j	--	--	--	--	--	--	--	4160	359	13.5 EMPC	--	--	--	--
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	--	--	--	--	290000	382000 *	73200	351	--	--	--	--	--	--	--	650000	52000 *	1860	--	--	--	--
Dioxin, octa	Lab	ng/kg	--	--	--	--	5390000	4450000 *	725000	3750	--	--	--	--	--	--	--	5200000	684000 *	25300 e	--	--	--	--
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	--	--	--	--	61.3	327	17.3 EMPC	< 0.291	--	--	--	--	--	--	--	201	5.36	< 0.863	--	--	--	--
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	--	--	411	2350	85.6	0.700 j	--	--	--	--	--	--	--	950	25.7	3.03 EMPC	--	--	--	--
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	--	--	3.39 j	4770	200	1.22 j	--	--	--	--	--	--	--	3090	138	5.14 j	--	--	--	--
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	3630	20500	890	4.90 j	--	--	--	--	--	--	--	16800	1000	41.6	--	--	--	--
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	741	4370	205	1.45 j	--	--	--	--	--	--	--	3170	195	9.58 EMPC	--	--	--	--
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	1230	6410	344	2.34 j	--	--	--	--	--	--	--	5320	328	13.5	--	--	--	--
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	1400	7660	288	1.71 j	--	--	--	--	--	--	--	4190	101	10.5	--	--	--	--
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	--	--	--	--	141000	171000	35600	101	--	--	--	--	--	--	--	151000	22700	547	--	--	--	--
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	--	--	--	--	5500	16900	1060	5.89 j	--	--	--	--	--	--	--	15400	2020	38.0	--	--	--	--
Dibenzofuran, octa	Lab	ng/kg	--	--	--	--	1850000	1290000 *	147000	571	--	--	--	--	--	--	--	2800000	180000 *	2750	--	--	--	--
TEQ $_{DF}$ WHO05 ' non-detects at zero for the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEQ DF WHO05, non-detects at half of the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin TEQ (by method 4425)	Lab	ng/kg	3003	756	766	--	--	--	--	--	493	829	--	1126	9010	--	--	--	--	--	2850	7810	4920	666
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	7940 a	15000 a	1790 a	8.74 a	--	--	--	--	--	--	--	17800	1540 a	51 a	--	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	7940 a	15000 a	1790 a	8.55 a	--	--	--	--	--	--	--	17800	1540 a	49 a	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	7940 a	15000 a	1800 a	8.99 a	--	--	--	--	--	--	--	17800	1540 a	51.9 a	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	7940 a	15000 a	1800 a	8.8 a	--	--	--	--	--	--	--	17800	1540 a	49.9 a	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	7940 a	15000 a	1800 a	8.86 a	--	--	--	--	--	--	--	17800	1540 a	51.5 a	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2)	Calc	ng/kg	--	--	--	--	7940 a	15000 a	1790 a	8.67 a	--	--	--	--	--	--	--	17800	1540 a	49.4 a	--	--	--	--

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	D-3 2.5-4'	D-4	D-5	E-1	E-2	E-3	E-3	E-4	E-4	E-4	E-4	F-1	F-2	F-3	F-3	F-3	F-3	F-3	F-4		G-1
		Date	2/04/2003	2/03/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	4/21/2003	2/02/2015	2/02/2015	2/02/2015	2/02/2015	1/20/2003	1/20/2003	1/20/2003	2/02/2015	2/02/2015	2/02/2015	2/02/2015	1/20/2003		1/20/2003
		Depth								3.5 - 5 ft	5 - 6.5 ft	6.5 - 9 ft	9 - 10 ft				2.5 - 4 ft	4 - 5.5 ft	5.5 - 9 ft	9 - 10 ft			
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	Analysis Location	Units																					
General Parameters																							
Carbon, total organic	Lab	%	**38.3**	**26.6**	**28.9**	**6.01**	**34.1**	**40.6**	--	**44.3**	**31.9 h**	**8.01 h**	**3.91 h**	**4.80**	**8.72**	**39.1**	**11.0**	**17.9 h**	**38.4 h**	**11.8 h**	**39.4**	**39.9**	**1.12**
pH	Field	pH units	**6.83**	**7.18**	**7.22**	**6.78**	**5.84**	**6.35**	--	--	--	--	--	**7.58**	**7.31**	**5.77**	--	--	--	--	**6.32**	**6.30**	**7.88**
Solids, percent	Lab	%	**23.7**	**29.4**	**14.9**	**47.6**	**7.19**	**16.4**	--	--	--	--	--	**79.1**	**55.5**	**8.67**	--	--	--	--	**9.64**	**10.3**	**83.5**
Solids, total	Lab	%	--	--	--	--	--	--	--	**22.0**	**16.5**	**32.9**	**40.8**	--	--	--	**31.3**	**25.8**	**13.4**	**30.6**	--	--	--
SVOCs																							
1,6-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	< 10.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,8-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	< 10.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrofluorene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylcholanthrene	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Methylchrysene	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Nitroacenapthene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6-Nitrochrysene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-Dimethylbenz(a)anthracene	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7h-Dibenzo(c,g)carbazole	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 41	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Benzo(a)pyrene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 41	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Benzo(b)fluoranthene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	**1.1**	< 4.6	**99**	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Benzo(k)fluoranthene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	**0.71**	< 4.6	< 41	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Chrysene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	**0.82**	< 4.6	< 41	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Dibenz(a,h)acridine	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.71	< 4.7	< 41	< 1.00	--	--	--	--	--	--	< 3.9	--	--	--	--	< 3.5	< 3.3	< 0.40
Dibenz(a,j)acridine	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,e)pyrene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)pyrene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,i)pyrene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,l)pyrene	Lab	mg/kg	--	--	--	--	--	--	< 5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.71	< 4.7	**97**	< 1.00	--	--	--	--	--	--	< 3.9	--	--	--	--	< 3.5	< 3.3	< 0.40
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Calc	mg/kg	ND	ND	ND	**0.19**	ND	**20**	--	--	--	--	--	--	--	ND	--	--	--	--	ND	--	ND
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Calc	mg/kg	**2.2**	**0.83**	**2.3**	**0.81**	**4.6**	**56**	--	--	--	--	--	--	--	**3.8**	--	--	--	--	**3.4**	--	**0.39**
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Calc	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 8.1	--	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
2-Methylnaphthalene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 8.1	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

Location			D-3 2.5-4'	D-4	D-5	E-1	E-2	E-3	E-3	E-4	E-4	E-4	E-4	F-1	F-2	F-3	F-3	F-3	F-3	F-3	F-4		G-1
Date			2/04/2003	2/03/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	4/21/2003	2/02/2015	2/02/2015	2/02/2015	2/02/2015	1/20/2003	1/20/2003	1/20/2003	2/02/2015	2/02/2015	2/02/2015	2/02/2015	1/20/2003		1/20/2003
Depth										3.5 - 5 ft	5 - 6.5 ft	6.5 - 9 ft	9 - 10 ft				2.5 - 4 ft	4 - 5.5 ft	5.5 - 9 ft	9 - 10 ft			
Sample Type			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Parameter	Analysis Location	Units																					
Acenaphthene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 8.1	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Acenaphthylene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 8.1	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Anthracene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	**14**	**0.50 pp**	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
B(a)P Equivalent, 1999 PEFs	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.71	< 4.7	**100**	< 1.00	--	--	--	--	--	--	< 3.9	--	--	--	--	< 3.5	< 3.3	< 0.40
Carbazole	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	**0.87**	< 4.6	**35**	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Fluorene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 8.1	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Naphthalene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 8.1	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Pentachlorophenol	Lab	mg/kg	< 14	< 5.1	< 14	**7.5**	< 28	**77**	< 5.00	--	--	--	--	< 2.6	**4.6**	< 24	--	--	--	--	< 21	< 20	< 2.4
Perylene	Lab	mg/kg	--	--	--	--	--	--	< 1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	< 0.70	< 4.6	< 8.1	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Pyrene	Lab	mg/kg	< 2.2	< 0.84	< 2.3	**0.92**	< 4.6	**74**	< 1.00	--	--	--	--	--	--	< 3.8	--	--	--	--	< 3.5	< 3.2	< 0.40
Chlorinated Dioxins / Furans																							
2,3,7,8-Dioxin, tetra	Lab	ng/kg	--	--	< 1.0	--	--	**140.802 j**	--	**6.54**	**3.80 EMPC**	**47.2**	< 1.47	--	--	--	**21.6**	**26.5**	**17.7**	< 0.298	--	--	--
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	--	--	**0.628 j**	--	--	**2003.655**	--	**66.4**	**55.3**	**124**	**35.9 EMPC**	--	--	--	**119**	**190**	**98.3**	**0.850 j**	--	--	--
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	--	--	**1.613 j**	--	--	**10035.896**	--	**164**	**275**	**31.6**	**184**	--	--	--	**538**	**547**	**265**	**0.826 EMPC**	--	--	--
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	--	--	**29.186**	--	--	**69659.364**	--	**634**	**1050**	**279**	**2050**	--	--	--	**2560**	**2440**	**480**	**2.63 EMPC**	--	--	--
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	--	--	**5.946**	--	--	**33422.315 b**	--	**487**	**407**	**54.1**	**168**	--	--	--	**995**	**800**	**301**	**1.37 j**	--	--	--
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	--	--	**1156.072**	--	--	**2442188.8 eb**	--	**40500**	**55100 ***	**22500 ***	**232000 ***	--	--	--	**122000**	**72000 ***	**11500**	**62.7**	--	--	--
Dioxin, octa	Lab	ng/kg	--	--	**8082.694 eb**	--	--	**5830616.8 e**	--	**366000**	**397000 ***	**134000 ***	**2220000 ***	--	--	--	**1450000**	**602000 ***	**145000**	**685**	--	--	--
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	--	--	**1.208 jc**	--	--	**81.296 j**	--	**6.36**	< 2.91	**40.7**	< 1.17	--	--	--	**27.0**	**28.9 EMPC**	**18.6 EMPC**	< 0.312	--	--	--
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	**1.623 j**	--	--	**396.863 j**	--	**34.2**	**34.1**	**123**	**1.66 EMPC**	--	--	--	**75.4**	**88.3**	**61.2**	**1.01 EMPC**	--	--	--
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	**6.145**	--	--	**187.590 j**	--	**25.8**	**75.2**	**2.66 j**	< 3.02	--	--	--	**179**	**237**	**136**	**0.732 j**	--	--	--
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	**32.754**	--	--	**10050.701 b**	--	**260**	**316**	**21.7**	**170 ***	--	--	--	**720 ***	**847**	**379**	**1.53 j**	--	--	--
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	**4.254 jEMPC**	--	--	**2324.595**	--	**72.5**	**81.5**	**72.7**	**30.3 ***	--	--	--	**330**	**290**	**106**	**0.844 EMPC**	--	--	--
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	**7.749**	--	--	**5274.657**	--	**112**	**141**	**9.92**	**64.8**	--	--	--	**473**	**186 EMPC**	**162**	**1.08 j**	--	--	--
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	--	--	**5.520**	--	--	< 2.5	--	**144**	**85.2 ***	< 4.22 *	< 31.5	--	--	--	**358**	**258 ***	**164**	**1.57 j**	--	--	--
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	--	--	**333.079**	--	--	**642346.511 e**	--	**3730**	**7290**	**1350**	**12400 j***	--	--	--	**30700**	**17800**	**3150**	**16.7**	--	--	--
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	--	--	**13.245**	--	--	**23567.064**	--	**279**	**422**	**67.9**	**533 ***	--	--	--	**1220**	**1270**	**298**	**2.02 j**	--	--	--
Dibenzofuran, octa	Lab	ng/kg	--	--	**2018.758**	--	--	**3021912.8 eb**	--	**29900**	**29300 EMPC***	**9360 ***	**91700 ***	--	--	--	**228000**	**91300 ***	**7960**	**106**	--	--	--
TEQ $_{DF}$ WHO05 ' non-detects at zero for the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEQ DF WHO05, non-detects at half of the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin TEQ (by method 4425)	Lab	ng/kg	**223**	**448**	**25**	**5440**	**1624**	**38110**	--	--	--	--	--	**64**	**440**	**2300**	--	--	--	--	**586**	**285**	**101**
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	**834**	**1070 a**	**509 a**	**3450 a**	--	--	--	**2840 a**	**1950 a**	**542 a**	**3.14 a**	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	--	--	--	**834**	**1070 a**	**509 a**	**3430 a**	--	--	--	**2840 a**	**1940 a**	**541 a**	**2.91 a**	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	**834**	**1070 a**	**509 a**	**3450 a**	--	--	--	**2840 a**	**1950 a**	**542 a**	**3.47 a**	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	--	--	--	**834**	**1070 a**	**509 a**	**3430 a**	--	--	--	**2840 a**	**1940 a**	**541 a**	**3.24 a**	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	**834**	**1070 a**	**509 a**	**3450 a**	--	--	--	**2840 a**	**1950 a**	**542 a**	**3.3 a**	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2)	Calc	ng/kg	--	--	--	--	--	--	--	**834**	**1070 a**	**509 a**	**3430 a**	--	--	--	**2840 a**	**1940 a**	**541 a**	**3.07 a**	--	--	--

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	G-2	G-3 0-0.5'	G-3 0.5-1.5'	G-3 1.5-2.5'	G-3 2.5-4'	G-3 H-3	G-4 0-0.5'	G-4 0.5-1.5'	G-4 0.5-1.5'	G-4 1.5-2.5'	G-4 2.5-4'	G-5 0-0.5'	G-5 0.5-1.5'	G-5 1.5-2.5'	G-5 2.5-4'	H-1	H-2	H-3		H-4	H-5	
		Date	2/04/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	12/04/1998	1/21/2003	1/20/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/20/2003	1/20/2003	2/04/2003		2/04/2003	1/20/2003	
		Depth																						
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD
Parameter	Analysis Location	Units																						
General Parameters																								
Carbon, total organic	Lab	%	**0.95**	**35.2**	**35.4**	**40.2**	**40.1**	--	**40.2**	--	**31.7**	**32.0**	**4.33**	**35.3**	**30.0**	**10.8**	**4.70**	**0.96**	**5.16**	**2.61**	**2.46**	**6.45**	**38.3**	**34.5**
pH	Field	pH units	**7.71**	**6.16**	**6.19**	**6.19**	**6.93**	--	**6.62**	--	**6.26**	**6.53**	**7.16**	**7.05**	**7.19**	**7.38**	**7.43**	**7.43**	**7.00**	**7.39**	**7.27**	**9.98**	**6.06**	**6.07**
Solids, percent	Lab	%	**85.2**	**7.43**	**7.72**	**11.8**	**13.2**	--	**8.05**	--	**19.8**	**21.4**	**43.3**	**7.49**	**11.4**	**33.6**	**52.8**	**81.1**	**66.1**	**76.7**	**77.9**	**74.8**	**11.8**	**12.6**
Solids, total	Lab	%	--	--	--	--	--	**84**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs																								
1,6-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,8-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitrofluorene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylcholanthrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Methylchrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Nitroacenapthene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6-Nitrochrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7,12-Dimethylbenz(a)anthracene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7h-Dibenzo(c,g)carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	Lab	mg/kg	**0.49**	< 4.5	< 4.3	< 2.8	< 2.5	**0.64**	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	**1.7**	**0.58**	**0.40**	< 1.7	< 2.8	< 2.7
Benzo(a)pyrene	Lab	mg/kg	**0.47**	< 4.5	< 4.3	< 2.8	< 2.5	**1.0**	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	**0.43**	< 5.0	< 1.7	< 1.7	< 1.7	< 2.8	< 2.7
Benzo(b)fluoranthene	Lab	mg/kg	**0.70**	< 4.5	< 4.3	< 2.8	< 2.5	**1.8**	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 5.0	< 1.7	< 1.7	< 1.7	< 2.8	< 2.7
Benzo(k)fluoranthene	Lab	mg/kg	**0.48**	< 4.5	< 4.3	< 2.8	< 2.5	**0.76**	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 5.0	< 1.7	< 1.7	< 1.7	< 2.8	< 2.7
Chrysene	Lab	mg/kg	**0.64**	< 4.5	< 4.3	< 2.8	< 2.5	**0.78**	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	**0.44**	**1.8**	**0.77**	**0.55**	< 1.7	< 2.8	< 2.7
Dibenz(a,h)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	Lab	mg/kg	< 0.33	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.2	--	< 1.7	< 1.6	< 0.77	< 4.5	< 3.0	< 0.99	< 0.63	< 0.42	< 5.0	< 1.7	< 1.7	< 1.7	< 2.9	< 2.7
Dibenz(a,j)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,i)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,l)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	mg/kg	**0.37**	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.2	--	< 1.7	< 1.6	< 0.77	< 4.5	< 3.0	< 0.99	< 0.63	< 0.42	< 5.0	< 1.7	< 1.7	< 1.7	< 2.9	< 2.7
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Calc	mg/kg	**0.68**	ND	ND	ND	ND	--	ND	--	ND	ND	ND	ND	ND	ND	ND	**0.43**	**0.19**	**0.066**	--	ND	ND	--
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Calc	mg/kg	**0.77**	**4.4**	**4.2**	**2.8**	**2.5**	--	**4.1**	--	**1.7**	**1.6**	**0.76**	**4.4**	**2.9**	**0.98**	**0.62**	**0.63**	**4.8**	**1.6**	**--**	**1.7**	**2.8**	**--**
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Calc	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	Lab	mg/kg	< 0.33	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 0.50	< 0.33	< 0.33	< 0.33	< 2.8	< 2.7
2-Methylnaphthalene	Lab	mg/kg	< 0.33	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 0.50	< 0.33	< 0.33	< 0.33	< 2.8	< 2.7

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West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

Location			G-2	G-3 0-0.5'	G-3 0.5-1.5'	G-3 1.5-2.5'	G-3 2.5-4'	G-3 H-3	G-4 0-0.5'	G-4 0.5-1.5'	G-4 0.5-1.5'	G-4 1.5-2.5'	G-4 2.5-4'	G-5 0-0.5'	G-5 0.5-1.5'	G-5 1.5-2.5'	G-5 2.5-4'	H-1	H-2	H-3		H-4	H-5	
Date			2/04/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	12/04/1998	1/21/2003	1/20/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/21/2003	1/20/2003	1/20/2003	2/04/2003		2/04/2003	1/20/2003	
Depth																								
Sample Type			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD
Parameter	Analysis Location	Units																						
Acenaphthene	Lab	mg/kg	< 0.33	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 0.50	< 0.33	< 0.33	< 0.33	< 2.8	< 2.7
Acenaphthylene	Lab	mg/kg	< 0.33	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 0.50	< 0.33	< 0.33	< 0.33	< 2.8	< 2.7
Anthracene	Lab	mg/kg	**0.69**	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	**0.62**	**0.89**	**1.2**	< 0.33	< 2.8	< 2.7
B(a)P Equivalent, 1999 PEFs	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Lab	mg/kg	**0.34**	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.2	--	< 1.7	< 1.6	< 0.77	< 4.5	< 3.0	< 0.99	< 0.63	< 0.42	< 5.0	< 1.7	< 1.7	< 1.7	< 2.9	< 2.7
Carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	Lab	mg/kg	**0.97**	< 4.5	< 4.3	< 2.8	< 2.5	**0.91**	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	**0.47**	**3.0**	**1.2**	**0.68**	< 0.33	< 2.8	< 2.7
Fluorene	Lab	mg/kg	< 0.33	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 0.50	< 0.33	< 0.33	< 0.33	< 2.8	< 2.7
Naphthalene	Lab	mg/kg	< 0.33	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	< 0.50	< 0.33	< 0.33	< 0.33	< 2.8	< 2.7
Pentachlorophenol	Lab	mg/kg	**3.3**	< 27	< 26	< 17	< 16	**1.0**	< 25	--	< 11	< 9.4	< 4.7	< 27	< 18	< 6.0	< 3.8	< 2.5	< 3.1	< 2.0	< 2.0	< 2.0	< 17	< 16
Perylene	Lab	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	Lab	mg/kg	**0.94**	< 4.5	< 4.3	< 2.8	< 2.5	< 0.33	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	< 0.41	**2.7**	**1.2**	**0.63**	< 0.33	< 2.8	< 2.7
Pyrene	Lab	mg/kg	**1.0**	< 4.5	< 4.3	< 2.8	< 2.5	**1.1**	< 4.1	--	< 1.7	< 1.6	< 0.77	< 4.5	< 2.9	< 0.99	< 0.63	**0.71**	**3.5**	**1.7**	**1.2**	< 1.7	< 2.8	< 2.7
Chlorinated Dioxins / Furans																								
2,3,7,8-Dioxin, tetra	Lab	ng/kg	--	--	--	--	--	--	--	< 1.0	--	--	--	--	--	--	--	--	< 1.0	--	--	--	--	--
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	--	--	--	--	--	--	--	**14.206 j**	--	--	--	--	--	--	--	--	**11.183 j**	--	--	--	--	--
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	--	--	--	--	--	--	--	**48.588**	--	--	--	--	--	--	--	--	**25.260 j**	--	--	--	--	--
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	--	--	--	--	--	--	--	**246.881**	--	--	--	--	--	--	--	--	**295.504**	--	--	--	--	--
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	--	--	--	--	--	--	--	**104.928**	--	--	--	--	--	--	--	--	**77.656**	--	--	--	--	--
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	--	--	--	--	--	--	--	**8658.012 b**	--	--	--	--	--	--	--	--	**7855.079**	--	--	--	--	--
Dioxin, octa	Lab	ng/kg	--	--	--	--	--	--	--	**61751.673 eb**	--	--	--	--	--	--	--	--	**61893.534 eb**	--	--	--	--	--
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	--	--	--	--	--	--	--	**12.805 jc**	--	--	--	--	--	--	--	--	**39.043 jc**	--	--	--	--	--
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	--	--	--	--	--	**36.098**	--	--	--	--	--	--	--	--	**51.525**	--	--	--	--	--
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	--	--	--	--	--	--	--	**21.062 j**	--	--	--	--	--	--	--	--	**42.979**	--	--	--	--	--
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	--	--	--	**225.651 b**	--	--	--	--	--	--	--	--	**310.538**	--	--	--	--	--
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	--	--	--	**69.542**	--	--	--	--	--	--	--	--	**79.983**	--	--	--	--	--
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	--	--	--	**105.359**	--	--	--	--	--	--	--	--	**133.655**	--	--	--	--	--
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	--	--	--	--	--	--	--	**75.530**	--	--	--	--	--	--	--	--	**96.315 EMPC**	--	--	--	--	--
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	--	--	--	--	--	--	--	**2426.956**	--	--	--	--	--	--	--	--	**2551.074**	--	--	--	--	--
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	--	--	--	--	--	--	--	**169.898**	--	--	--	--	--	--	--	--	**229.146**	--	--	--	--	--
Dibenzofuran, octa	Lab	ng/kg	--	--	--	--	--	--	--	**6130.769 b**	--	--	--	--	--	--	--	--	**5278.028**	--	--	--	--	--
TEQ $_{DF}$ WHO05 , non-detects at zero for the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TEQ DF WHO05, non-detects at half of the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin TEQ (by method 4425)	Lab	ng/kg	**171**	**774**	**1791**	**94**	**64**	--	**270**	--	**723**	**114**	**<5**	**523**	**850**	**643**	**28**	**102**	**306**	**62 ***	**42 b***	**59**	**534**	**465**
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2)	Calc	ng/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

Parameter	Analysis Location	Units	I-1	I-2 0-0.5'	I-2 0.5-1.5'	I-2 1.5-2.5'	I-2 2.5-4'	I-3	J-1	J-2	J-3
Date			1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003
Depth											
Sample Type			N	N	N	N	N	N	N	N	N
General Parameters											
Carbon, total organic	Lab	%	**39.2**	**39.4**	**37.9**	**38.4**	**42.5**	**38.6**	**39.4**	**38.3**	**39.3**
pH	Field	pH units	**6.03**	**6.25**	**5.89**	**6.44**	**6.53**	**6.29**	**5.90**	**5.90**	**6.22**
Solids, percent	Lab	%	**5.68**	**4.90**	**7.30**	**10.6**	**9.09**	**10.5**	**7.49**	**6.22**	**15.8**
Solids, total	Lab	%	--	--	--	--	--	--	--	--	--
SVOCs											
1,6-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
1,8-Dinitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
1-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
2-Nitrofluorene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
3-Methylcholanthrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
4-Nitropyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
5-Methylchrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
5-Nitroacenapthene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
6-Nitrochrysene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
7,12-Dimethylbenz(a)anthracene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
7h-Dibenzo(c,g)carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Benzo(a)pyrene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Benzo(b)fluoranthene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Benzo(k)fluoranthene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Chrysene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Dibenz(a,h)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.4	< 2.2
Dibenz(a,j)acridine	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Dibenzo(a,e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Dibenzo(a,i)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Dibenzo(a,l)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.4	< 2.2
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Calc	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Calc	mg/kg	**5.8**	**6.7**	**4.5**	**3.2**	**3.6**	**3.2**	**4.4**	**5.3**	**2.1**
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Calc	mg/kg	--	--	--	--	--	--	--	--	--
2-Chloronaphthalene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
2-Methylnaphthalene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1

Table A-1
West Area Soil Quality Data
Joslyn Manufacturing Supply Co.
Brooklyn Center, Minnesota

		Location	I-1	I-2 0-0.5'	I-2 0.5-1.5'	I-2 1.5-2.5'	I-2 2.5-4'	I-3	J-1	J-2	J-3
		Date	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003	1/20/2003
		Depth									
		Sample Type	N	N	N	N	N	N	N	N	N
Parameter	Analysis Location	Units									
Acenaphthene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Acenaphthylene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Anthracene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
B(a)P Equivalent, 1999 PEFs	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Benzo(e)pyrene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.4	< 2.2
Carbazole	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Fluoranthene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Fluorene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Naphthalene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Pentachlorophenol	Lab	mg/kg	< 36	< 41	< 28	< 19	< 23	< 20	< 27	< 33	< 13
Perylene	Lab	mg/kg	--	--	--	--	--	--	--	--	--
Phenanthrene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Pyrene	Lab	mg/kg	< 5.9	< 6.8	< 4.6	< 3.2	< 3.7	< 3.2	< 4.5	< 5.3	< 2.1
Chlorinated Dioxins / Furans											
2,3,7,8-Dioxin, tetra	Lab	ng/kg	< 1.0	--	--	--	--	--	--	**1.013 jEMPC**	--
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	< 2.5	--	--	--	--	--	--	**4.348 j**	--
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	**44.231 j**	--	--	--	--	--	--	**10.716 j**	--
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	**184.018 j**	--	--	--	--	--	--	**45.538**	--
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	**62.073 jEMPC**	--	--	--	--	--	--	**27.005**	--
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	**7180.028 eb**	--	--	--	--	--	--	**1272.648**	--
Dioxin, octa	Lab	ng/kg	**37177.779 b**	--	--	--	--	--	--	**7284.551 eb**	--
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	< 1.0	--	--	--	--	--	--	**5.352 jc**	--
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	< 2.5	--	--	--	--	--	--	**6.576 j**	--
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	< 2.5	--	--	--	--	--	--	**6.918 jEMPC**	--
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	**106.487 jb**	--	--	--	--	--	--	**39.183**	--
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**31.46 j**	--	--	--	--	--	--	**11.419 j**	--
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**42.957 jEMPC**	--	--	--	--	--	--	**18.091**	--
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	**11.995 j**	--	--	--	--	--	--	**8.059 j**	--
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	**1490.469**	--	--	--	--	--	--	**358.658**	--
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	**67.155 j**	--	--	--	--	--	--	**27.197 EMPC**	--
Dibenzofuran, octa	Lab	ng/kg	**6414.033 b**	--	--	--	--	--	--	**976.888**	--
TEQ $_{DF}$ WHO05 ' non-detects at zero for the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--
TEQ DF WHO05, non-detects at half of the detection limit	Calc	ng/kg	--	--	--	--	--	--	--	--	--
Dioxin TEQ (by method 4425)	Lab	ng/kg	**1921**	<44	**689**	**145**	**181**	**35**	**17**	**252**	**123**
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 0, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1, TEF 2005 (EMPC @ 1/2)	Calc	ng/kg	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC @ 1)	Calc	ng/kg	--	--	--	--	--	--	--	--	--
TCDD Equivalent, reporting limit at 1/2, TEF 2005 (EMPC@1/2)	Calc	ng/kg	--	--	--	--	--	--	--	--	--

Barr Standard Footnotes and Qualifiers (Historical)

--	Not analyzed/Not available.
N	Sample Type: Normal
FD	Sample Type: Field Duplicate
a	Estimated value, calculated using some or all values that are estimates.
b	Potential false positive value based on blank data validation procedures.
c	Coeluting compound.
e	Estimated value, exceeded the instrument calibration range.
h	EPA recommended sample preservation, extraction or analysis holding time was exceeded.
j	Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.
p	Relative percent difference is >40% (25% CLP pesticides) between primary and confirmation GC columns.
pp	Small peak in chromatogram below method detection limit.
EMPC	Estimated maximum possible concentration.

Minnesota Soil Reference Values

DI	Value represents a criteria for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.

Table A-2
Historic Soil Quality Data - Southern Lots and Roadway
Joslyn Manufacturing and Supply Company
Brooklyn Center, Minnesota

Location			RES1-SI1	RES1-SI2	RES1-SI3		RES2-SI1	RES2-SI3	RES2-SI4	SA1-Comp	SA2-Comp	SA3-COMP	SA4-COMP	SA5-Comp	SA6-Comp	SA7-Comp	T1-Comp	T2-Comp	T3-Comp	T4-1
Date			3/04/2005	3/04/2005	3/04/2005		3/04/2005	3/04/2005	3/04/2005	9/02/2004	9/02/2004	9/02/2004	9/02/2004	9/02/2004	9/02/2004	9/02/2004	07/29/2009	07/29/2009	07/29/2009	07/29/2009
Depth			0 - 0.5 ft				0 - 0.5 ft	0.5 - 1.5 ft	1.5 -4 ft								0-4 ft	0-4 ft	0-4 ft	0-4 ft
Sample Type			N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Analysis Location	Units																		
General Parameters																				
Carbon, total organic	Lab	%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**19.3**	**7.15**	**5.75**	**28.8**
Solids, total	Lab	%	--	--	--	--	--	--	--	**82.5**	**80.6**	**75.2 h**	**68.1 h**	--	--	--	--	--	--	--
Herbicides																				
Pentachlorophenol	Lab	mg/kg	--	--	--	--	--	--	--	< 0.0061	< 0.0062	< 0.0067 h	< 0.0073 h	--	--	--	--	--	--	--
Chlorinated Dioxins / Furans																				
2,3,7,8-Dioxin, tetra	Lab	ng/kg	< 1.0	< 1.0	**2.725 EMPC**	< 1.0	< 1.0	< 1.0	< 0.992	< 1.0	< 1.0	< 0.019 h	< 0.057 h	< 1.0	< 1.0	**0.165 jEMPC**	**2.26**	**0.913 j**	**0.610 jEMPC**	< 0.167
1,2,3,7,8-Dioxin, penta	Lab	ng/kg	**0.642 j**	**1.956 j**	**4.333**	**5.957**	< 2.5	< 2.5	< 2.481	< 2.5	< 2.5	**0.280 jh**	< 0.035 h	**0.214 j**	**0.179 jEMPC**	**0.317 j**	**10.8**	**8.07**	**4.47**	**3.57 j**
1,2,3,4,7,8-Dioxin, hexa	Lab	ng/kg	**1.944 j**	**7.1940**	**77.327**	**102.864**	**0.232 j**	**0.285 j**	< 2.481	< 2.5	< 2.5	**0.471 jhEMPC**	**0.078 jh**	**0.455 j**	**0.313 jEMPC**	**0.347 jEMPC**	**34.7**	**26.7**	**12.6**	**5.78**
1,2,3,6,7,8-Dioxin, hexa	Lab	ng/kg	**7.813**	**62.854**	**390.921**	**719.823**	**0.660 j**	**0.911 j**	**2.830 j**	< 2.5	< 2.5	**1.277 jh**	**0.306 jh**	**1.255 j**	**0.948 j**	**1.206 j**	**794 e**	**471**	**108**	**169**
1,2,3,7,8,9-Dioxin, hexa	Lab	ng/kg	**5.529**	**25.329**	**58.555**	**122.937**	**0.490 j**	**0.708 j**	< 2.481	< 2.5	< 2.5	**1.134 jh**	**0.224 jhEMPC**	**1.128 j**	**1.003 j**	**1.227 j**	**123**	**83.6**	**35.1**	**25.4**
1,2,3,4,6,7,8-Dioxin, hepta	Lab	ng/kg	**248.611**	**2656.809**	**16540.965**	**36059.420**	**21.136**	**29.226**	**145.291**	**132.713**	**46.878**	**39.439 bh**	**7.937 bh**	**35.232**	**27.327**	**29.941**	**32900**	**17300**	**5360**	**10100**
Dioxin, octa	Lab	ng/kg	**1843.382 eb**	**19942.814 eb**	**271822.016 eb**	**570865.629 eb**	**145.517 b**	**193.481 b**	**1002.516 eb**	**1073.116 e**	**341.913**	**280.959 bh**	**49.565 bh**	**294.493**	**244.150**	**228.059**	**234000 e**	**132000**	**44700**	**97400**
2,3,7,8-Dibenzofuran, tetra	Lab	ng/kg	< 1.0	**7.499 c**	**6.097 c**	**6.274 c**	< 1.0	< 1.0	< 0.992	< 1.0	< 1.0	**0.425 ch**	< 0.058 h	< 0.443	< 0.350	< 0.464	**1.49 EMPC**	**4.26**	**0.772 j**	< 0.558
1,2,3,7,8-Dibenzofuran, penta	Lab	ng/kg	< 2.5	**0.969 j**	**33.480**	**37.517**	< 2.5	< 2.5	< 2.481	< 2.5	< 2.5	**0.149 jh**	< 0.047 h	**0.158 j**	< 2.5	< 2.5	**5.34 P**	**11.8 P**	**2.12 jEMPC**	**1.67 j EMPCP**
2,3,4,7,8-Dibenzofuran, penta	Lab	ng/kg	< 2.5	**1.930 j**	**27.610**	**31.845**	< 2.5	< 2.5	< 2.481	< 2.5	< 2.5	**0.276 jh**	< 0.044 h	**0.284 j**	**0.342 j**	**0.420 j**	**6.18**	**10.6**	**1.52 j**	**0.471 j**
1,2,3,4,7,8-Dibenzofuran, hexa	Lab	ng/kg	**2.945 jEMPC**	**11.841**	**246.71**	**300.766**	**0.464 j**	**0.458 j**	**0.572 jEMPC**	< 2.5	< 2.5	**0.998 jbh**	**0.218 jbh**	**0.635 jEMPC**	**0.563 jEMPC**	**0.605 j**	**170**	**154 P**	**22.5**	**28**
1,2,3,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**0.923 jEMPC**	**3.356**	**47.883**	**60.483**	< 2.5	< 2.5	< 2.481	< 2.5	< 2.5	**0.430 jh**	**0.120 jh**	**0.521 j**	**0.395 jEMPC**	**0.654 j**	**27.7**	**36.5**	**5.82**	**4.64 j**
1,2,3,7,8,9-Dibenzofuran, hexa	Lab	ng/kg	< 2.5	< 2.5	< 2.5	**15.142**	< 2.5	< 2.5	< 2.481	< 2.5	< 2.5	< 0.120 h	< 0.022 h	< 2.5	< 2.5	< 2.5	**4.38 P**	**10.2 P**	**2.15 j**	< 1.37
2,3,4,6,7,8-Dibenzofuran, hexa	Lab	ng/kg	**2.278 j**	**2.871**	**64.604**	**48.965**	< 2.5	< 2.5	< 2.481	< 2.5	< 2.5	**0.490 jh**	**0.191 jh**	**1.093 j**	**1.000 j**	**1.611 j**	**70**	**66.3 P**	**14.1**	**13.7**
1,2,3,4,6,7,8-Dibenzofuran, hepta	Lab	ng/kg	**73.351**	**441.851**	**4050.639**	**6750.237**	**4.831**	**6.755**	**37.458**	**23.134**	**8.163**	**10.748 bh**	**1.736 jbh**	**14.027**	**9.191**	**10.379**	**7540**	**4310**	**1120**	**1880**
1,2,3,4,7,8,9-Dibenzofuran, hepta	Lab	ng/kg	**5.477**	**37.704**	**311.2**	**524.085**	**0.469 j**	**0.486 jEMPC**	< 2.481	< 2.5	< 2.5	**0.958 jh**	**0.159 jh**	**0.677 j**	**0.581 j**	**0.512 j**	**529**	**331**	**71.2**	**119**
Dibenzofuran, octa	Lab	ng/kg	**360.604**	**2142.915**	**20242.349 e**	**42579.379**	**15.455**	**22.554**	**250.824**	**98.848**	**32.620**	**35.586 h**	**5.404 h**	**49.653**	**31.620**	**41.648**	**63000**	**32400**	**7640**	**15400**
TCDD Equivalent, reporting limit at 0, TEF 2005	Calc	ng/kg	**6.53 a**	**52.6 a**	**401 a**	**772 a**	**0.497 a**	**0.663 a**	**2.52 a**	**1.91 a**	**0.663**	**1.43 a**	**0.196 a**	**1.38 a**	**1.00 a**	**1.56 a**	**639**	**367**	**107**	**183**
TCDD Equivalent, reporting limit at 1/2, TEF 2005	Calc	ng/kg	**7.61 a**	**53.3 a**	**401 a**	**772 a**	**3.08 a**	**3.25 a**	**5.34 a**	**5.01 a**	**3.76**	**2.07 a**	**2.53 a**	**2.03 a**	**1.68 a**	**1.75 a**	**639**	**367**	**107**	**183**

Footnotes and Qualifiers

--	Not analyzed/Not available.
N	Sample Type: Normal
FD	Sample Type: Field Duplicate
a	Estimated value, calculated using some or all values that are estimates.
b	Potential false positive value based on blank data validation procedures.
c	Coeluting compound.
e	Estimated value, exceeded the instrument calibration range.
h	EPA recommended sample preservation, extraction or analysis holding time was exceeded.
j	Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.
p	Relative percent difference is >40% (25% CLP pesticides) between primary and confirmation GC columns.
EMPC	Estimated maximum possible concentration.

Minnesota Soil Reference Values

DI	Value represents a criteria for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.

Table B-1
Alternative 8B - Limited Onsite Consolidation with Soil Cover at West Area (Onsite Floodplain Mitigation)
Operable Unit 5
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Item	Quantity	Unit		Unit Cost		Total Cost
Capital Costs						
Mobilization (general conditions & safety plan)	1	LS	$	125,465	$	125,465
Temporary Erosion and Sediment Control						
Construction entrance into West Area	1	EA	$	1,800	$	1,800
Establish silt fence	3,110	LF	$	3	$	9,330
Other erosion control items for NPDES requirements	1	LS	$	2,500	$	2,500
Site Preparation						
Remove existing fence	2,562	LF	$	3	$	7,686
Dewatering (pump to onsite system)	1	LS	$	25,000	$	25,000
Remove misc demolition debris present on surface	1	LS	$	1,000	$	1,000
Clearing and grubbing, chip and spread onsite- West Area	4.33	AC	$	10,000	$	43,300
Clearing and grubbing, chip and spread onsite- Southern Lots	0.19	AC	$	10,000	$	1,900
Access road aggregate (1,500' x 15' x 1' avg)	833	CY	$	20	$	16,667
Decontamination pad/liner/drainage for south end	1	LS	$	15,000	$	15,000
Decon water management	1	LS	$	20,000	$	20,000
Contaminated Soil Excavation and Consolidation						
Consolidation Required						
Excavate 3.5', and consolidate WA-2C	273	CY	$	8	$	2,185
Excavate 1.0', and consolidate WA-2D	134	CY	$	8	$	1,070
Excavate 3.5', and consolidate WA-3A	626	CY	$	8	$	5,006
Excavate 1.0', and consolidate WA-3B	444	CY	$	8	$	3,548
Excavate 3.5', and consolidate WA-4A	987	CY	$	8	$	7,895
Excavate 2.0', and consolidate WA-4B	933	CY	$	8	$	7,463
Excavate 3.5', and consolidate WA-6MID	2,791	CY	$	8	$	22,328
Excavate 3.5', and consolidate WA-6N	1,353	CY	$	8	$	10,821
Excavate 3.5', and consolidate WA-6S	2,939	CY	$	8	$	23,516
Subtotal Excavation Volume	**10,479**	**CY**				
Transport and Disposal to Subtitle D Landfill						
Excavate 2.5' and consolidate WA-1A	6,061	TON	$	25	$	151,521
Excavate 2.0' and consolidate WA-1B	2,134	TON	$	25	$	53,340
Excavate 2.5', stage, load, and transport WA-2A	1,876	TON	$	25	$	46,890
Excavate 2.0', stage, load, and transport WA-2B	716	TON	$	25	$	17,907
Excavate 2.5', stage, load, and transport WA-5 (former ice chute)	681	TON	$	25	$	17,024
Excavate 2.5', stage, load, and transport WA-7	13,735	TON	$	25	$	343,373
Excavate 2.5', stage, load, and transport WA-8 (former rail spur)	387	TON	$	25	$	9,683
Excavate 4.0', stage, load, and transport Southern Lots	1,742	TON	$	25	$	43,556
Total Excavation Weight	**27,332**	**TON**				
Total Excavation Volume	**19,523**	**CY**				
Construction of Onsite Repository						
Geotextile (16 oz Nonwoven needle-punched)	6,837	SY	$	3	$	20,510
Import / grade 1.5 ft engineered cover soil	3,160	CY	$	-	$	-
Import / grade 0.5' topsoil	1,139	CY	$	-	$	-
Upland planting/seeding	1.41	ACRE	$	3,000	$	4,238

Table B-1
Alternative 8B - Limited Onsite Consolidation with Soil Cover at West Area (Onsite Floodplain Mitigation)
Operable Unit 5
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Item	Quantity	Unit	Unit Cost	Total Cost
OU5 Site Restoration				
WA-1A				
Geotextile (16 oz Nonwoven needle-punched)	5,195	SY	$ 3	$ 15,585
Import backfill - 1.5 ft	2,598	CY	$ -	$ -
Import 1.0' wetland-like soil	1,732	CY	$ 30	$ 51,950
Wetland planting/seeding	1.07	AC	$ 10,000	$ 10,733
WA-1B				
Import backfill - 1.5 ft	1,143	CY	$ -	$ -
Import 0.5' topsoil	381	CY	$ -	$ -
Upland planting/seeding	0.47	AC	$ 3,000	$ 1,417
WA-2A				
Geotextile (16 oz Nonwoven needle-punched)	1,608	SY	$ 3	$ 4,823
Import backfill - 1.5 ft	804	CY	$ -	$ -
Import 1.0' wetland-like soil	536	CY	$ 30	$ 16,077
Wetland planting/seeding	0.33	AC	$ 10,000	$ 3,322
WA-2B				
Import backfill - 1.5 ft	384	CY	$ -	$ -
Import 0.5' topsoil	128	CY	$ -	$ -
Upland planting/seeding	0.16	AC	$ 3,000	$ 476
WA-2C				
Geotextile (16 oz Nonwoven needle-punched)	234	SY	$ 3	$ 702
Import backfill - 2.5 ft	195	CY	$ -	$ -
Import 1.0' wetland-like soil	78	CY	$ 30	$ 2,341
Wetland planting/seeding	0.05	AC	$ 10,000	$ 484
WA-2D				
Import backfill - 2.5 ft	334	CY	$ -	$ -
Import 0.5' topsoil	67	CY	$ -	$ -
Upland planting/seeding	0.08	AC	$ 3,000	$ 249
WA-3A				
Geotextile (16 oz Nonwoven needle-punched)	328	SY	$ 3	$ 985
Import backfill - 2.5 ft	274	CY	$ -	$ -
Import 1.0' wetland-like soil	109	CY	$ 30	$ 3,284
Wetland planting/seeding	0.07	AC	$ 10,000	$ 679
WA-3B				
Import backfill - 2.5 ft	205	CY	$ -	$ -
Import 0.5' topsoil	41	CY	$ -	$ -
Upland planting/seeding	0.05	AC	$ 3,000	$ 153
WA-4A				
Geotextile (16 oz Nonwoven needle-punched)	838	SY	$ 3	$ 2,513
Import backfill - 2.5 ft	698	CY	$ -	$ -
Import 1.0' wetland-like soil	279	CY	$ 30	$ 8,377
Wetland planting/seeding	0.17	AC	$ 10,000	$ 1,731
WA-4B				
Import backfill - 1.5 ft	700	CY	$ -	$ -
Import 0.5' topsoil	233	CY	$ -	$ -
Upland planting/seeding	0.29	AC	$ 3,000	$ 867

Table B-1
Alternative 8B - Limited Onsite Consolidation with Soil Cover at West Area (Onsite Floodplain Mitigation)
Operable Unit 5
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Item	Quantity	Unit	Unit Cost	Total Cost
WA-5 (former ice chute)				
Geotextile (16 oz Nonwoven needle-punched)	584	SY	$ 3	$ 1,751
Import backfill - 2.0 ft	389	CY	$ -	$ -
Import 0.5' topsoil	97	CY	$ -	$ -
Upland planting/seeding	0.12	AC	$ 3,000	$ 362
WA-6MID				
Geotextile (16 oz Nonwoven needle-punched)	2,392	SY	$ 3.00	$ 7,177
Import backfill - 2.5 ft	1,994	CY	$ -	$ -
Import 1.0' wetland-like soil	797	CY	$ 30.00	$ 23,923
Wetland planting/seeding	0.49	AC	$ 10,000.00	$ 4,943
WA-6N				
Geotextile (16 oz Nonwoven needle-punched)	1,159	SY	$ 3.00	$ 3,478
Import backfill - 2.5 ft	966	CY	$ -	$ -
Import 1.0' wetland-like soil	386	CY	$ 30.00	$ 11,594
Wetland planting/seeding	0.24	AC	$ 10,000.00	$ 2,396
WA-6S				
Geotextile (16 oz Nonwoven needle-punched)	2,046	SY	$ 3.00	$ 6,138
Import backfill - 2.5 ft	1,705	CY	$ -	$ -
Import 1.0' wetland-like soil	682	CY	$ 30.00	$ 20,461
Wetland planting/seeding	0.42	AC	$ 10,000.00	$ 4,228
WA-7				
Geotextile (16 oz Nonwoven needle-punched)	11,773	SY	$ 3.00	$ 35,318
Import backfill - 1.5 ft	5,886	CY	$ -	$ -
Import 1.0' wetland-like soil	3,924	CY	$ 30.00	$ 117,728
Wetland planting/seeding	2.43	AC	$ 10,000.00	$ 24,324
WA-8 (former rail spur)				
Geotextile (16 oz Nonwoven needle-punched)	332	SY	$ 3.00	$ 996
Import backfill - 2.0 ft	221	CY	$ -	$ -
Import 0.5' topsoil	55	CY	$ -	$ -
Upland planting/seeding	0.07	AC	$ 3,000.00	$ 206
Cover/Backfill Required Summary				
Cover for Repository	(3,160)	CY		
Backfill Required for OU5	(18,496)	CY		
Total Cover/Backfill Required	**(21,656)**	**CY**		
Cover/Backfill Source Summary				
Onsite Mitigation Area Soil for use on OU5	7,200	CY		
Total Cover/Backfill Required	(21,656)	CY		
Backfill Imported	**(14,456)**	**CY**		
Topsoil Required Summary				
Topsoil for Repository	(1,139)	CY		
Topsoil for OU5	(1,003)	CY		
Total Topsoil Required	**(2,142)**	**CY**		
Topsoil Source Summary				
Total Topsoil Required	(2,142)	CY		
Topsoil Imported	**(2,142)**	**CY**		
Wetland-Like Soils Source Summary				
Wetland-Like Soils Required	(8,525)	CY		
Wetland-Like Soils Imported	**(8,525)**	**CY**		

Table B-1
Alternative 8B - Limited Onsite Consolidation with Soil Cover at West Area (Onsite Floodplain Mitigation)
Operable Unit 5
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Item	Quantity	Unit		Unit Cost		Total Cost
Imported Soil Costs						
Onsite Mitigation Area Soil for use on OU5	7,200	CY	$	8	$	57,600
Import Backfill	14,456	CY	$	20	$	289,114
Import Topsoil	2,142	CY	$	15	$	32,132
Soil Quality Testing for Imported Backfill	1	LS	$	21,600	$	21,600
Soil Quality Testing for Imported and OnsiteTopsoil	1	LS	$	4,320	$	4,320
Soil Quality Testing for Imported Wetland-Like Soil	1	LS	$	12,960	$	12,960
OU5 Stormwater Management Plan (see Table B-2 for details)	1	LS	$	440,000	$	440,000
Potential Mitigation Area Costs (see Table B-3 for details)	1	LS	$	270,000	$	270,000
Final Improvements						
Remove decon pad	1	LS	$	2,500	$	2,500
Reestablish fence around entire West Area	2,562	FT	$	20	$	51,240
Purchases for Floodplain and Wetland Mitigation						
Permanent Wetland 1S Impacts (2.5:1 replacement) minus credit	1.36	ACRE	$	63,650	$	86,564
Direct Subtotal					**$**	**2,721,322**
Engineering (Design, Permitting, & Admin)	1	LS	$	196,685	$	196,685
Construction (Mgmt, Oversight, Survey, & Reporting)	1	LS	$	282,900	$	282,900
Direct and Indirect Subtotal					**$**	**3,200,907**
Contingency 30%	1	LS	$	960,272	$	960,272
Capital Total					**$**	**4,160,000**
Operation and Maintenance						
Perimeter fence replacement ($40,000/10 years)	1	LS	$	4,000	$	4,000
Annual routine site maintenance (signs, tree cleanup, etc)	1	LS	$	4,500	$	4,500
Annual wetland vegetation monitoring and maintenance	1	LS	$	2,500	$	2,500
Quarterly Site Inspection and Annual Report	1	LS	$	5,000	$	5,000
Direct Subtotal					**$**	**16,000**
O&M Contingency 30%	1	LS	$	4,800	$	4,800
Annual Operation and Maintenance Total					**$**	**20,800**
30-year O&M Total - No discount rate applied					**$**	**624,000**
TOTAL CAPITAL & O&M					**$**	**4,780,000**

Table B-2
OU 5 Stormwater Management Plan- Alternative 8B
Operable Unit 5
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Item	Quantity	Unit	UnitCost		Total Cost
Temporary Stormwater Management					
South Swale					
Import fill and create swale diversion	30	CY	$	20	$ 600
Stormwater Diversion					
Sheet Pile 935' to direct flow around WA-7	14,025	SF	$	25	$ 350,625
Pump Building 1B Manhole	1	LS	$	26,000	$ 26,000
Permanent Stormwater Management					
WA-5 (Former Ice Chute)					
Build up area of former ice chute to prevent direct connection to lake	292	CY	$	20	$ 5,838
WA-8 (Former Rail Spur)					
Build up area of railroad spur to recreate DNR jurisdictional boundary	43	CY	$	20	$ 860
Building 1B Pond (Roof Drainage)					
Remove, decon and dispose/recycle existing 24" RCP	92	LF	$	30	$ 2,760
Remove, decon and dispose/recycle existing 24" RC Flared End Section	1	EA	$	100	$ 100
24" RCP, CL. III	92	LF	$	40	$ 3,680
24" RC Flared End Section	1	EA	$	600	$ 600
Pipe to West					
24" RCP, CL. III	255	LF	$	40	$ 10,200
24" RC Flared End Section	1	EA	$	1,200	$ 1,200
24" Tideflex TF-1 Check Valve	1	EA	$	5,000	$ 5,000
Riprap and Granular Filter	10	CY	$	50	$ 500
Site Restoration					
Remove swale diversion	1	LS	$	200	$ 200
Remove (or drive deeper) sheet piling around WA-7	14,025	SF	$	2	$ 28,050
Pipe to Lake					
Import 0.5' topsoil	30	CY	$	15	$ 444
Upland planting/seeding	0.04	ACRE	$	3,000	$ 110
Building 1B Pond					
Import 0.5' topsoil	17	CY	$	15	$ 256
Upland planting/seeding	0.02	ACRE	$	3,000	$ 63
Imported Backfill Soil Summary					
South Swale	(30)				
WA-5 (Former Ice Chute)	(292)				
WA-8 (Former Rail Spur)	(43)				
TOTAL	**(365)**				
Imported Topsoil Summary					
Pipe to Lake	(30)				
Building 1B Pond	(17)				
TOTAL	**(47)**				
Soil Testing					
Soil Quality Testing for Imported Backfill	1	LS	$	1,440	$ 1,440
Soil Quality Testing for Imported Topsoil	1	LS	$	1,440	$ 1,440
TOTAL					**$ 440,000**

Table B-3
Onsite Mitigation Area Preparation and Restoration- Alternative 8B
Focused Feasibility Study - Operable Unit 5
Joslyn Manufacturing & Supply Co. Site
Brooklyn Center, Minnesota

Item	Quantity	Unit	Unit Cost	Total Cost
Temporary Erosion and Sediment Control				
Miscellaneous erosion control items for NPDES requirements	1	LS	$ 2,500	$ 2,500
Site Preparation				
Dewatering	1	LS	$ 6,000	$ 6,000
Clearing and grubbing, chip and spread onsite	1.2	ACRE	$ 5,000	$ 6,200
Site Restoration				
Excavate/regrade mitigation area	7,200	CY	$ 8	$ 57,600
Reuse soil onsite for clean cover/backfill	7,200	CY	$ -	$ -
Import 0.5' topsoil	1,000	CY	$ 15	$ 15,000
Upland planting/seeding	1.2	ACRE	$ 3,000	$ -
Plant trees	1	LS	$ 25,000	$ 25,000
Direct Subtotal				**$ 112,300**
Engineering (Design, Permitting, & Admin)	1	LS	$ 11,230	$ 11,230
Construction (Mgmt, Oversight, Survey, & Reporting)	1	LS	$ 22,460	$ 22,460
Direct and Indirect Subtotal				**$ 145,990**
Contingency 30%	1	LS	$ 43,797	$ 43,797
Capital Total				**$ 190,000**
Operation and Maintenance				
Annual routine maintenance and repairs (tree cleanup, etc)	1	LS	$ 4,500	$ 4,500.00
Annual wetland vegetation monitoring and maintenance	1	LS	$ 2,500	$ 2,500.00
Wetland Site Inspection and Annual Report	1	LS	$ 5,000	$ 5,000.00
Direct Subtotal				**$ 12,000.00**
O&M Contingency 30%	1	LS	$ 3,600	$ 3,600.00
Annual Operation and Maintenance Total				**$ 15,600.00**
5-year O&M Total - No discount rate applied				**$ 78,000.00**
TOTAL				**$ 270,000**